United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with the
Regents of the University
of California (Agricultural
Experiment Station) and
the California Department
of Conservation

Soil Survey of San Joaquin County, California

How To Use This Soil Survey

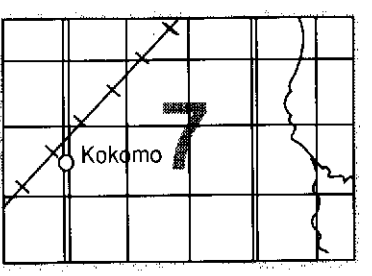
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

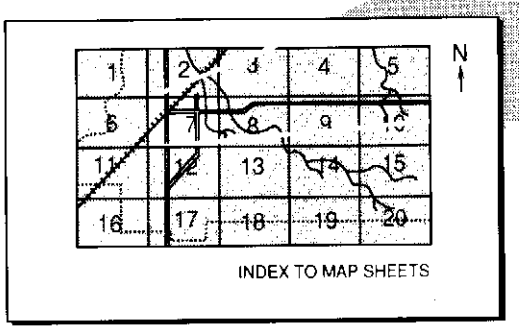
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



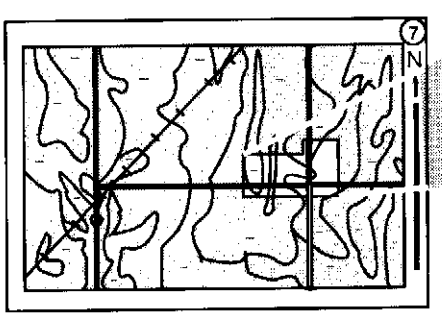
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

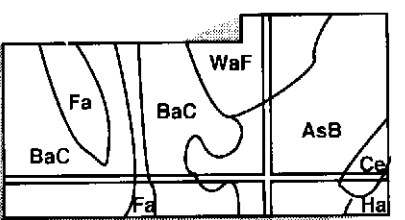


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in April 1988. Soil names and descriptions were approved in May 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1988. This survey was made cooperatively by the Soil Conservation Service, the Regents of the University of California (Agricultural Experiment Station), and the California Department of Conservation. It is part of the technical assistance furnished to the San Joaquin County Resource Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An irrigated area of Kingdon fine sandy loam, 0 to 2 percent slopes. Pentz sandy loam, 15 to 50 percent slopes, is on the hills in the background.

Contents

Index to map units v
Summary of tables ix
Foreword xi
General nature of the county 1
How this survey was made 9
General soil map units 11
Soil descriptions 11
Detailed soil map units 25
Soil descriptions 26
Prime farmland 147
Use and management of the soils 149
Crops and pasture 149
Rangeland 159
Vegetative soil groups 162
Environmental plantings 162
Recreation 163
Wildlife habitat 164
Engineering 168
Soil properties 175
Engineering index properties 175
Physical and chemical properties 176
Soil and water features 177
Physical and chemical analyses of selected soils 179
Classification of the soils 181
Taxonomic units and their morphology 181
Acampo series 181
Alamo series 182
Alo series 183
Amador series 183
Arburua series 184
Archerdale series 184
Arents 185
Bellota series 185
Bisgani series 186
Boggiano series 187
Bruella series 187
Calla series 188
Capay series 189
Carbona series 190
Chuloak series 190
Cogna series 191
Columbia series 191
Cometa series 192
Corning series 193
Cortina series 194
Cosumnes series 194
Coyotecreek series 195
Delhi series 196
Dello series 196
Devries series 197
Egbert series 197
El Solyo series 198
Exeter series 199
Finrod series 199
Fluvaquents 200
Franciscan series 201
Galt series 201
Gonzaga series 202
Grangeville series 202
Guard series 203
Hicksville series 203
Hollenbeck series 204
Honcut series 205
Honker series 205
Itano series 206
Jacktone series 206
Jahant series 208
Kaseberg series 208
Keyes series 209
Kingdon series 210
Kingile series 211
Lithic Xerorthents 211
Madera series 211
Manteca series 212
Merritt series 213
Montpellier series 214
Nord series 215
Orognen series 215
Pardee series 216
Peltier series 216
Pentz series 217

Pescadero series 218
Peters series 218
Piper series 219
Pleito series 220
Ramoth series 220
Redding series 221
Reiff series 222
Rindge series 222
Rioblancho series 223
Rocklin series 224
Ryde series 224
Sailboat series 225
San Joaquin series 226
San Timoteo series 227
Scribner series 228
Shima series 228
Shinkee series 229
Stockton series 230
Stomar series 231
Timor series 231
Tinnin series 232
Tokay series 232
Toomes series 233
Trahern series 234
Tujunga series 235
Valdez series 235
Vallecitos series 236
Vaquero series 236
Venice series 237
Veritas series 237
Vernalis series 238
Vignolo series 238
Vina series 239
Webile series 240
Willows series 241
Wisflat series 241
Xerofluvents 242
Xerorthents 242
Yellowlark series 242
Zacharias series 244
Formation of the soils 245
References 253
Glossary 255
Appendixes 267
Tables 293

Issued October 1992

Index to Map Units

101—Acampo sandy loam, 0 to 2 percent slopes.... 26
102—Alamo clay, 0 to 2 percent slopes 26
103—Alo-Vaquero complex, 8 to 30 percent slopes..... 27
104—Alo-Vaquero complex, 30 to 50 percent slopes..... 28
105—Amador-Lithic Xerorthents complex, 2 to 15 percent slopes 28
106—Archerdale very fine sandy loam, 0 to 2 percent slopes, overwashed..... 29
107—Archerdale clay loam, 0 to 2 percent slopes..... 29
108—Arents, saline-sodic, 0 to 2 percent slopes 30
109—Bisgani loamy coarse sand, partially drained, 0 to 2 percent slopes 31
110—Boggiano clay loam, 0 to 2 percent slopes 31
111—Bruella sandy loam, 0 to 2 percent slopes..... 32
112—Bruella sandy loam, hard substratum, 0 to 2 percent slopes 32
113—Calla clay loam, 2 to 8 percent slopes 33
114—Calla-Carbona complex, 8 to 30 percent slopes..... 34
115—Calla-Carbona complex, 30 to 50 percent slopes..... 34
116—Calla-Pleito complex, 8 to 30 percent slopes..... 35
117—Capay clay loam, 0 to 2 percent slopes 35
118—Capay clay, 0 to 2 percent slopes 36
119—Capay clay, 2 to 5 percent slopes 36
120—Capay clay, saline-sodic, 0 to 2 percent slopes..... 37
121—Capay clay, wet, 0 to 2 percent slopes..... 38
122—Capay-Urban land complex, 0 to 2 percent slopes..... 38
123—Carbona clay loam, 2 to 8 percent slopes 39
124—Carbona-Orognen complex, 15 to 30 percent slopes 39
125—Carbona-Orognen complex, 30 to 50 percent slopes 40
126—Carbona ccmplex, 15 to 50 percent slopes 41
127—Chuloak coarse sandy loam, 0 to 2 percent slopes..... 41
128—Cogna fine sandy loam, 0 to 2 percent slopes, overwashed 42
129—Cogna loam, 0 to 2 percent slopes 42
130—Columbia fine sandy loam, drained, 0 to 2 percent slopes 43
131—Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded 43
132—Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded 44
133—Columbia fine sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes..... 44
134—Cometa sandy loam, 2 to 5 percent slopes.... 45
135—Corning-Redding complex, 2 to 8 percent slopes..... 46
136—Corning-Redding complex, 8 to 15 percent slopes..... 47
137—Cortina gravelly sandy loam, 0 to 5 percent slopes..... 48
138—Cosumnes silty clay loam, drained, 0 to 2 percent slopes 49
139—Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded 49
140—Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded..... 50
141—Delhi fine sand, 0 to 5 percent slopes 50
142—Delhi loamy sand, 0 to 2 percent slopes 51
143—Delhi-Urban land complex, 0 to 2 percent slopes..... 51
144—Dello sand, partially drained, 0 to 2 percent slopes, occasionally flooded..... 52
145—Dello loamy sand, drained, 0 to 2 percent slopes..... 53
146—Dello loamy sand, partially drained, 0 to 2 percent slopes 53
147—Dello sandy loam, clayey substratum, drained, 0 to 2 percent slopes 54

148—Dello clay loam, drained, 0 to 2 percent slopes, overwashed 54
149—Devries sandy loam, drained, 0 to 2 percent slopes 55
150—Dumps 55
151—Dumps, tailings 56
152—Egbert mucky clay loam, partially drained, 0 to 2 percent slopes 56
153—Egbert silty clay loam, partially drained, 0 to 2 percent slopes 56
154—Egbert silty clay loam, sandy substratum, partially drained, 0 to 2 percent slopes 57
155—Egbert-Urban land complex, partially drained, 0 to 2 percent slopes 58
156—El Solyo clay loam, 0 to 2 percent slopes 59
157—Exeter sandy loam, 0 to 2 percent slopes 59
158—Finrod clay loam, 0 to 2 percent slopes 60
159—Fluvaquents, 0 to 2 percent slopes, frequently flooded 61
160—Galt clay, 0 to 2 percent slopes 61
161—Galt clay, 2 to 5 percent slopes 62
162—Galt-Urban land complex, 0 to 2 percent slopes 62
163—Gonzaga-Franciscan complex, 30 to 50 percent slopes 63
164—Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes 64
165—Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes 65
166—Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes 66
167—Grangeville clay loam, partially drained, 0 to 2 percent slopes 66
168—Guard clay loam, 0 to 2 percent slopes 67
169—Guard clay loam, drained, 0 to 2 percent slopes 67
170—Hicksville loam, 0 to 2 percent slopes, occasionally flooded 68
171—Hicksville loam, bedrock substratum, 2 to 5 percent slopes, occasionally flooded 69
172—Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded 69
173—Hollenbeck silty clay, 0 to 2 percent slopes 70
174—Hollenbeck clay, 1 to 3 percent slopes 71
175—Honcut sandy loam, 0 to 2 percent slopes 72
176—Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes 72
177—Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes 73
178—Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes 74
179—Itano silty clay loam, partially drained, 0 to 2 percent slopes 74
180—Jacktone clay, 0 to 2 percent slopes 75
181—Jacktone-Urban land complex, 0 to 2 percent slopes 76
182—Jahant loam, 0 to 2 percent slopes 77
183—Jahant loam, 2 to 8 percent slopes 77
184—Kaseberg loamy sand, 5 to 15 percent slopes 78
185—Kaseberg fine sandy loam, 2 to 15 percent slopes 79
186—Kaseberg loam, 15 to 30 percent slopes 79
187—Keyes-Bellota complex, 2 to 15 percent slopes 80
188—Keyes-Redding complex, 2 to 8 percent slopes 81
189—Kingdon fine sandy loam, 0 to 2 percent slopes 81
190—Kingile muck, partially drained, 0 to 2 percent slopes 82
191—Kingile-Ryde complex, partially drained, 0 to 2 percent slopes 83
192—Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes 83
193—Madera sandy loam, 0 to 2 percent slopes 84
194—Madera loam, 2 to 5 percent slopes 85
195—Madera-Alamo complex, leveled, 0 to 1 percent slopes 86
196—Manteca fine sandy loam, 0 to 2 percent slopes 87
197—Merritt silty clay loam, partially drained, 0 to 2 percent slopes 88

198—Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded 88
199—Montpellier sandy loam, 8 to 15 percent slopes. 89
200—Montpellier-Cometa complex, 5 to 8 percent slopes 90
201—Nord loam, 0 to 2 percent slopes 91
202—Pardee gravelly loam, 0 to 3 percent slopes. 91
203—Pardee cobbly loam, 3 to 15 percent slopes. 92
204—Peltier mucky clay loam, partially drained, 0 to 2 percent slopes 92
205—Peltier mucky clay loam, organic substratum, partially drained, 0 to 2 percent slopes. 93
206—Pentz sandy loam, 2 to 15 percent slopes. 94
207—Pentz sandy loam, 15 to 50 percent slopes. 94
208—Pentz cobbly sandy loam, 5 to 8 percent slopes. 95
209—Pentz-Bellota complex, 2 to 15 percent slopes. 95
210—Pentz-Redding complex, 2 to 15 percent slopes. 96
211—Pescadero clay loam, partially drained, 0 to 2 percent slopes 97
212—Peters clay, 2 to 8 percent slopes 98
213—Piper sandy loam, partially drained, 0 to 2 percent slopes 98
214—Pits, gravel. 99
215—Pleito clay loam, 2 to 8 percent slopes. 99
216—Ramoth sandy loam, 5 to 8 percent slopes 100
217—Ramoth sandy loam, 8 to 15 percent slopes 100
218—Ramoth sandy loam, 15 to 30 percent slopes 101
219—Redding loam, 0 to 3 percent slopes 101
220—Redding gravelly loam, 2 to 8 percent slopes 102
221—Redding gravelly loam, 8 to 30 percent slopes 103
222—Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded. 103
223—Reiff loam, 0 to 2 percent slopes 104
224—Rindge mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed. 104
225—Rindge muck, partially drained, 0 to 2 percent slopes 105
226—Rioblancho clay loam, drained, 0 to 2 percent slopes 106
227—Rioblancho-Urban land complex, drained, 0 to 2 percent slopes 106
228—Rocklin sandy loam, 2 to 5 percent slopes 107
229—Rocklin fine sandy loam, 0 to 2 percent slopes 108
230—Ryde clay loam, partially drained, 0 to 2 percent slopes 109
231—Ryde silty clay loam, organic substratum, partially drained, 0 to 2 percent slopes 109
232—Ryde clay loam, sandy substratum, partially drained, 0 to 2 percent slopes 110
233—Ryde-Peltier complex, partially drained, 0 to 2 percent slopes 111
234—Sailboat silt loam, drained, 0 to 2 percent slopes 111
235—Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded. 112
236—San Joaquin sandy loam, 0 to 2 percent slopes 113
237—San Joaquin sandy loam, 2 to 5 percent slopes 114
238—San Joaquin loam, 0 to 2 percent slopes. 115
239—San Joaquin loam, 2 to 8 percent slopes, eroded 116
240—San Joaquin loam, thick surface, 0 to 2 percent slopes 117
241—San Joaquin complex, 0 to 1 percent slopes 118
242—San Joaquin-Urban land complex, 0 to 2 percent slopes 119

243—Scribner clay loam, partially drained, 0 to 2 percent slopes 120
244—Scribner clay loam, sandy substratum, partially drained, 0 to 2 percent slopes 120
245—Scribner-Urban land complex, partially drained, 0 to 2 percent slopes 121
246—Shima muck, partially drained, 0 to 2 percent slopes 122
247—Shinkee muck, partially drained, 0 to 2 percent slopes 122
248—Stockton fine sandy loam, 0 to 2 percent slopes, overwashed 123
249—Stockton silty clay loam, 0 to 2 percent slopes, overwashed 124
250—Stockton clay, 0 to 2 percent slopes 124
251—Stockton-Urban land complex, 0 to 2 percent slopes 125
252—Stomar clay loam, 0 to 2 percent slopes 126
253—Stomar clay loam, wet, 0 to 2 percent slopes 127
254—Timor loamy sand, 0 to 2 percent slopes 127
255—Tinnin loamy coarse sand, 0 to 2 percent slopes 128
256—Tokay fine sandy loam, 0 to 2 percent slopes 128
257—Tokay-Urban land complex, 0 to 2 percent slopes 129
258—Trahern clay loam, partially drained, 0 to 2 percent slopes 129
259—Tujunga loamy sand, 0 to 2 percent slopes ... 130
260—Urban land 131
261—Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes 131
262—Vaquero-Carbona complex, 8 to 30 percent slopes 131
263—Venice mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed 132
264—Venice muck, partially drained, 0 to 2 percent slopes 132
265—Veritas sandy loam, partially drained, 0 to 2 percent slopes 133
266—Veritas fine sandy loam, 0 to 2 percent slopes 134
267—Veritas silty clay loam, 0 to 2 percent slopes, overwashed 134
268—Vernalis clay loam, 0 to 2 percent slopes 135
269—Vernalis clay loam, wet, 0 to 2 percent slopes 135
270—Vignolo silt loam, 0 to 2 percent slopes 136
271—Vignolo silty clay loam, 0 to 2 percent slopes 137
272—Vina fine sandy loam, 0 to 2 percent slopes 137
273—Webile muck, partially drained, 0 to 2 percent slopes 138
274—Willows clay, partially drained, 0 to 2 percent slopes 138
275—Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes 139
276—Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes 140
277—Xerofluvents, 0 to 2 percent slopes, frequently flooded 141
278—Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded 142
279—Yellowlark gravelly loam, 0 to 2 percent slopes 143
280—Yellowlark gravelly loam, 2 to 5 percent slopes 143
281—Zacharias clay loam, 0 to 2 percent slopes ... 144
282—Zacharias gravelly clay loam, 0 to 2 percent slopes 145
283—Zacharias gravelly clay loam, 2 to 8 percent slopes 145

Summary of Tables

Temperature and precipitation (table 1) 294

Freeze dates in spring and fall (table 2) 296
Probability. Temperature.

Growing season (table 3) 298

Average windspeed and average fastest windspeed (table 4) 299

Acreage and proportionate extent of the soils (table 5) 300
Acres. Percent.

Prime farmland (table 6) 304

Yields per acre of crops (table 7) 306
Alfalfa hay. Almonds. Wheat. Corn. Wine grapes. Sugar beets. Tomatoes.

Land capability (table 8) 315

Storie index rating (table 9) 324
Rating factors. Index. Grade. Limitation in X factor.

Rangeland productivity and characteristic plant communities (table 10) 335
Range site. Total production. Characteristic vegetation. Composition.

Recreational development (table 11) 347
Camp areas. Picnic areas. Playgrounds. Paths and trails. Golf fairways.

Wildlife habitat (table 12) 360
Vegetative elements.

Building site development (table 13) 373
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets. Lawns and landscaping.

Sanitary facilities (table 14) 387
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 15) 401
Roadfill. Sand. Gravel. Topsoil.

Water management (table 16) 414
Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.

Engineering index properties (table 17) 427
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Physical and chemical properties of the soils (table 18) 447
Depth. Clay. Moist bulk density. Permeability. Available water capacity. Soil reaction. Salinity. Shrink-swell potential. Erosion factors. Wind erodibility group. Organic matter.

Water features (table 19) 462
Hydrologic group. Flooding. High water table.

Soil features (table 20) 471
Bedrock. Cemented pan. Subsidence. Risk of corrosion.

Classification of the soils (table 21) 479
Family or higher taxonomic class.

Foreword

This soil survey contains information that can be used in land-planning programs in San Joaquin County, California. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of San Joaquin County, California

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United States Department of Agriculture, Soil Conservation Service,
in cooperation with the
Regents of the University of California (Agricultural Experiment Station) and the
California Department of Conservation

SAN JOAQUIN COUNTY is in the lower San Joaquin Valley in California (fig. 1). It has 901,760 acres of land, including small areas of water. In addition, it has 19,840 acres of large water areas consisting of rivers and sloughs that are more than ⅛ mile wide and reservoirs that are more than 40 acres in size. A small strip of land adjoining the northeastern boundary of the county is included on the maps of this survey area. This land is part of Amador County. It was considered to be part of San Joaquin County at the time the soil survey of Amador County was made. As a result, it was not included in the survey of Amador County.

San Joaquin County is bounded by Sacramento County on the north; Amador, Calaveras, and Stanislaus Counties on the east; Stanislaus County on the south; and Alameda and Contra Costa Counties on the west. Elevations range from about 20 feet below sea level in the Sacramento-San Joaquin Delta area, in the northwestern part of the county, to about 3,300 feet in the mountains of the Coast Range, in the southwestern part of the county. The city of Stockton is the county seat.

Irrigated cropland, livestock grazing, and urban development are the primary land uses in the survey area. The acreage of cropland has been reduced by urban expansion in recent years. Most of the land in the county is privately owned.

Several earlier surveys cover parts of the present survey. These older surveys, which were completed by the United States Department of Agriculture, are a reconnaissance survey of the Sacramento Valley area published in 1916 *(15)*, a reconnaissance survey of the San Francisco Bay region published in 1917 *(16)*, a reconnaissance survey of the lower San Joaquin Valley area published in 1918 *(23)*, a survey of the Lodi area published in 1937 *(10)*, a survey of the Sacramento-San Joaquin Delta area published in 1941 *(9)*, a survey of the Tracy area published in 1943 *(8)*, and a survey of the Stockton area published in 1951 *(28)*. The survey of the entire county was published by the University of California in 1952 *(37)*. The present survey updates these earlier surveys. It provides additional information and has larger maps, which show the soils in greater detail.

The descriptions, names, and delineations of the soils on the maps of this survey area do not fully agree with those on the maps of adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, and variations in the intensity of mapping or in the extent of the soils within the survey areas. Differences also result from urban development in areas where natural soils have been altered by extensive shaping and grading.

General Nature of the County

The following paragraphs give general information about San Joaquin County. They describe history and

Figure 1.—Location of San Joaquin County in California.

development; the water supply; agriculture; physiography, relief, and drainage; and climate.

History and Development

By Guy J. Romito, Soil Conservation Service.

San Joaquin County, one of the original 27 counties in California, holds a significant place in the history of California.

The first recorded inhabitants in the survey area were Native American Indians. The Yachikamni, the largest of the local tribes, originally inhabited the Stockton area *(28)*. The Yokuts claimed the territory south of French Camp. Much of the landscape surrounding the Stockton area was originally flat grassland interspersed with valley oak.

Little information is available regarding the condition of the San Joaquin Valley prior to 1840. The limited records indicate that Native Americans inhabited the area and that the valley had plentiful game and a large number of wild horses and cattle. The Native Americans made no effort to till the soil, and the agricultural enterprises of the Mexicans who succeeded them were limited to cattle raising *(23)*. The settlers who homesteaded in the valley in the 1840's initially engaged in cattle raising. During the 1850's, the production of agricultural crops increased because of the needs of the gold miners who had settled in the region.

The first settlement in the survey area was French Camp, which was occupied by the French Canadian fur trappers employed by the Hudson Bay Company. This settlement was important during the mining days because the coarse textured soils allowed winter travel by fortune seekers to the gold mines of the Sierra Nevada foothills. The streams and rivers throughout the county were rich with beaver. Between 1828 and 1845, as many as 400 trappers camped at "Beaver Settlement," now known as Castoria *(28)*.

Much of the land in the vicinity of Stockton was part of the second largest land grant ever awarded by the Mexican Government. This land grant was called Campo de los Franceses. It totaled 48,747 acres *(14)*. El Rancho del Campo de los Franceses belonged to Guillermo Gulnac, who later sold it to Captain Charles M. Weber, a German immigrant. In 1847, Captain Weber laid out the town of Tuleberg on what is now the south side of the Stockton Channel. In 1849, the town was given its present name to honor Commodore Robert F. Stockton of the United States Navy *(14)*. Stockton was the first city in the state to receive a name that was not of Indian or Spanish origin. It was incorporated in 1850. By 1854, it had a population of 7,000 and was the fourth largest city in California *(14)*.

The city continued to grow after the gold rush because its strategic location allowed year-round navigation in the San Joaquin Valley. Many farmers who had left their fields in search of gold returned to the rich land for farming. The city became a major commercial center because of the successful export of farming commodities. It became the focal point for grain warehousing, flour milling, grain and flour export, and farm implement manufacturing.

Combined harvesters were first mass-produced in Stockton in 1876. The first track-type caterpillar tractor also was manufactured in this city. In the late 1870's, the city had a paper company that was a pioneer recycling plant specializing in the manufacture of newsprint from rags, old paper, and straw. By the late 1880's, Stockton was the second most industrialized

city in California, after San Francisco *(14)*.

Boat building is the oldest industry in Stockton. It can be traced back to the 1850's. Many of the paddle-wheel steamers that navigated the San Joaquin River, the Sacramento River, and the Delta between 1849 and 1938 were launched from this city *(14)*.

The Port of Stockton opened in 1933. It was the first inland seaport in California and is still the largest. Grain is the major cargo for the ocean vessels that visit this port.

In 1869, the first transcontinental railroad linking California to the East Coast was completed. The first bridge across the San Joaquin River was at Mossdale. Ocean-to-ocean rail travel was not possible until the completion of this bridge, which provided trains access to the San Francisco Bay and the terminal at Oakland *(14)*.

Before the U.S. Congress passed the Swamp and Overflow Act in 1850, no attempts had been made to grow crops in the Delta region, which was a vast tule marsh dissected by drainageways and rich in wildlife. This area was visited by fishermen, trappers, and hunters. After passage of the act, title to the Delta islands passed from the Federal Government to the state and gradually to private individuals and organizations *(9)*. The first levees in this area were built by crews of Chinese laborers using only shovels and wheelbarrows as tools. These levees were built of mineral alluvium. The only levees that resisted floodwater were those built along natural levee ridges. Although farming was difficult at first, high yields were encouraging and reclamation efforts continued. After the development of a clamshell dredger in the late 1800's, larger, more stable levees were constructed and agriculture expanded.

Except for a few small islands, the entire Delta area is now used for the production of crops. Agricultural activity has resulted in subsidence of the area at an initial rate of approximately 2 to 3 inches per year. Many areas that were once at mean sea level now are 10 to 20 feet below this elevation. A complex system of open and closed drains and pumps helps to lower the water table in these areas.

The towns of Manteca, Escalon, Lathrop, and Ripon came into prominence after the turn of the century, when irrigation water and railroad facilities gave rise to diversified farming. Prior to this period, agriculture was limited by the lack of water on land above the flood plains.

During the gold mining days of 1849, there was an acute shortage of vegetables and fresh fruit. Those who turned their attention to truck crops and orchards received enormous profits. One rancher planted several acres of watermelons and sold them for as much as $5 each. He netted a profit of $30,000 in one season. Another rancher netted an $8,000 profit from 2 acres of onions *(28)*. Because of high profits, a long growing season, and productive soils, many miners became farmers.

In some areas windmills provided irrigation water. Hilly areas were used mainly as rangeland. Ponds were built and springs and seeps developed to supply water for livestock. Intensive pumping of ground water opened up more areas to irrigated agriculture. Gas engines in the early 1900's and electric motors in the 1920's were used to pump the ground water. Irrigation districts were formed, and improvements in technology opened up areas to irrigated pasture, corn, vineyards, and orchard crops.

Currently, Stockton is among the fastest growing urban centers in the United States. A steady industrial growth has accompanied residential development throughout the county. Various firms are engaged in manufacturing machinery, concrete pipe, and wood and paper products; in the production of bakery goods; and in steel fabrication, ship building, and food processing. The economy is diverse, relying on government, wholesale, retail, services, manufacturing, transportation, utilities, construction, and agriculture. The county is centrally located in California. It has a wide diversity of soils that produce many commodities, such as asparagus, corn, grapes, tomatoes, and almonds.

Water Supply

Water for agricultural, domestic, and industrial uses in San Joaquin County is obtained from wells, rivers, creeks, canals, and sloughs. The water flows to the county mainly through the Mokelumne, Calaveras, Stanislaus, and San Joaquin Rivers. All of the rivers have dams and reservoirs upstream that help to control flooding and regulate the delivery of surface water during dry periods. The rivers supply most of the water for irrigation and for ground-water recharge. Nearly all of the water released during dry periods is used before it reaches the Sacramento-San Joaquin Delta.

The Sacramento-San Joaquin Delta is the mixing point of the Sacramento River and the San Joaquin River before the water flows into the San Francisco Bay. Near Tracy, two major pump stations lift this water into two large canals—the Delta-Mendota Canal and the California Aqueduct. These canals convey the water south along the west side of the San Joaquin Valley.

The water in the northern and eastern parts of the county is of relatively good quality. The natural source of this water is runoff from the accumulation of rainfall and snowfall in the Sierra Nevada. The water is of

poorer quality in the central, southern, and western parts of the county, where the natural source is runoff from the lower rainfall area in the Coast Range. The lower positions collect runoff of lower quality *(13)*.

Ground water supplies about 30 percent of the irrigation water in San Joaquin County *(7)*. Ground-water levels are declining in wells at a rate of about 1 foot per year in some parts of the county to about 3 feet per year in the northern part *(4)*. Differences in pumping patterns, annual rainfall, and the hydraulic characteristics of the sediments are attributed to the variations in the area.

The supply of ground water is being depleted in the Stockton area, where overdraft has resulted in an intrusion of poor-quality saline water from the west. The poor-quality ground water moves eastward through the Delta at a rate of 140 to 150 feet per year *(4)*.

Continued overdraft of the ground water will result in additional subsurface inflow of saline water and the abandonment of some wells. It may result in land subsidence in a few areas. The cost of electrical power also is affected by the overdraft. In recent years the cost of electrical power needed to pump the ground water used for irrigation has tripled.

Agriculture

Approximately 586,000 acres in San Joaquin County is used for irrigated crops and pasture, and 169,000 acres is used for dryland pasture or for range. Field, fruit, nut, and vegetable crops are the leading agricultural commodities, closely followed by livestock and poultry products, which are consistently among the top 10 commodities in the county. In terms of agricultural cash receipts, the county is among the top 10 counties in the state each year.

About 98 percent of the cropland is used for irrigated fruit, nut, field, and vegetable crops. About 132,000 acres is used for fruit and nut crops, 72,000 acres for corn, 68,000 acres for hay, 46,000 acres for wheat, 32,000 acres for sugar beets, and 64,000 acres for vegetable crops. Other important crops are beans, corn silage, sunflowers, and barley. About 28,000 acres is used as irrigated pasture. Seed crops, such as beans, clover, potatoes, and grain seed, are grown on 8,500 acres *(12)*.

The acreage used for crops and pasture has steadily decreased in the past decade and will probably continue to decrease in the future. Urban development has grown rapidly in the Stockton area and in Tracy, Lodi, Manteca, and Ripon.

Since the early days of agriculture in San Joaquin County, significant changes in the types of crops grown have taken place because of physical, cultural, and economic factors. When agriculture was first introduced into the county, dryland crops and range were the dominant land uses. Fruit and vegetable crops were relatively unimportant. Reclamation of the Delta area, the introduction of improved methods of irrigation, and the development of markets opened up new areas to agriculture and allowed a wider variety of crops to be grown. Some of the crops that were grown on large acreages in the past, such as wheat, barley, and oats, are now grown on much smaller acreages, and fruit and nut crops, such as walnuts, almonds, wine and table grapes, and cherries, have become major crops.

Physiography, Relief, and Drainage

San Joaquin County is part of four physiographic regions. About 64 percent of the county is in areas where the lower San Joaquin Valley extends from south to north through most of the eastern part of the county. About 23 percent is in the Sacramento-San Joaquin Delta, in the western part of the county. About 5 percent is in the foothills of the Sierra Nevada, along the eastern edge of the county. About 8 percent is in the Coast Range, along the southwestern edge of the county. Most of the county is in the San Joaquin Valley. Some areas are in the southern half of the Central Valley. The Central Valley is enclosed on all sides by mountains, except where the Sacramento and San Joaquin Rivers enter the San Francisco Bay.

The lower San Joaquin Valley includes flood plains, alluvial fans, fan terraces, basins, dunes, low terraces, and high terraces. Slopes generally are nearly level, although some areas are undulating to hilly because of dissection and erosion. Elevation ranges from sea level to 360 feet in the eastern part of the county.

Nearly level flood plains are along the Stanislaus, Calaveras, San Joaquin, and Mokelumne Rivers. Before major levees and reservoirs were built, all of these flood plains were subject to overflow. Flood plains also are along Hospital, Lonetree, and Corral Hollow Creeks. They dissipate on leveled alluvial fans before reaching the San Joaquin River. Drainage into the San Joaquin Valley is mainly from the Sierra Nevada to the east.

The Stanislaus and Mokelumne Rivers deposited alluvial material from the mountains of the Sierra Nevada, forming alluvial fans and fan terraces in extensive areas *(26)*. Sand dunes are common on the alluvial fan along the Stanislaus River as a result of modification of the alluvium by the wind. Many of the dunes have been leveled or stabilized and are now farmed. The highest elevation on the fan terrace along the Mokelumne River is 180 feet, and the highest elevation on the fan terrace along the Stanislaus River is 150 feet.

An alluvial fan and a fan terrace formed along the Calaveras River through the deposition of alluvial material from the foothills of the Sierra Nevada. The soils in this area have considerably less sand and considerably more clay and silt than the soils in other areas. The highest elevation on the fan terrace along the Calaveras River is 170 feet.

The areas along the Stanislaus, Mokelumne, and Calaveras Rivers have been dissected and cut by shallow, meandering sloughs. Many of these old sloughs have been filled and leveled and are now farmed. Hardpans are common in the soils on fan terraces, which no longer receive deposits of alluvium. The dominant slope of the alluvial fans and fan terraces along the three rivers is towards the west.

Alluvial fans and fan terraces along Hospital, Lonetree, and Corral Hollow Creeks coalesce to form one vast alluvial plain. This area has been dissected and cut by shallow, meandering sloughs, many of which have been filled and leveled and are now farmed. The soils in this area have a high content of clay and silt. The highest elevation is 400 feet. The dominant slope is towards the northeast.

Basins are extensive in the San Joaquin Valley. They are in the central part of the county, near Stockton. Hardpans are common in the soils in these areas, and the content of clay is high. The soils on the basin rims also have hardpans. Nearly all areas have slopes of less than 1 percent.

Low and high terraces also are extensive in the San Joaquin Valley. Claypans and hardpans are common in the soils in these areas, which are at a higher elevation than the soils on alluvial fans and fan terraces. Most areas are dissected and are nearly level to gently rolling. In some areas stream terraces are adjacent to the dissected drainageways.

On the eastern edge of the county, hills are in areas where dissection of the high terraces is so complete that the original surface of the terraces is no longer evident and old consolidated sediments are exposed. These hills are undulating to hilly. They range in elevation from 170 to 360 feet.

The mountains of the Coast Range are undulating to very steep. This area has been uplifted and dissected. It includes uplifted and dissected terraces that are substantially higher than the low terrace remnants below. Elevation ranges from 150 to 3,300 feet.

Many low and high terraces on the eastern edge of the San Joaquin Valley have complex surface drainage patterns and microrelief. One of the drainage patterns occurs as a meandering or disarranged pattern of intermittent channels. These channels double back on each other. Short segments terminate at small closed basins, which commonly fill with water during the spring and are identified as vernal pools (fig. 2). These pools are most common in nearly level and gently sloping areas and become less numerous as the slope increases. In the more sloping areas, the drainage pattern is more aligned downslope and more integrated. It generally is poorly integrated in nearly level areas on low and high terraces where the surface has not been modified by land leveling or grading.

The Sacramento-San Joaquin Delta area is made up of many tracts of land surrounded by water. These islands have been reclaimed and are protected from flooding by levees. Much of the area is at or below sea level. Elevations range from 10 feet above sea level to 20 feet below. Some of the islands are dish shaped, having a natural levee on the higher land around the perimeter and a low center.

In the Sacramento-San Joaquin Delta area, nearly level natural levees, flood plains, and freshwater marshes are all components of the landscape. The freshwater marshes consist of thick deposits of peat and muck, which subside naturally and subside at a greater rate when drained and allowed to oxidize. Since reclamation began in the 1850's, total subsidence in some areas has been 15 to 20 feet.

The numerous sloughs and channels that meander through the Sacramento-San Joaquin Delta area are influenced by tides. The tides extend up the mouth of the Mokelumne River and upstream on the San Joaquin River as far east as the city of Stockton.

Levees have been constructed along many channels, including the San Joaquin, Stanislaus, and Mokelumne Rivers, to protect the adjacent land from flooding. Without levees, flood plains along the rivers and creeks in the lower San Joaquin Valley would be flooded after periods of heavy rainfall in winter and early in spring. In addition, much of the Sacramento-San Joaquin Delta area would be inundated most of the year because of the subsidence of highly organic soils.

Levees and reclamation projects have improved the internal drainage of most of the alluvial soils on flood plains and the lower alluvial fans in the lower San Joaquin Valley and the Sacramento-San Joaquin Delta area. During winter and spring, the water table rises because of runoff and precipitation and, in areas adjacent to levees, because of seepage. Drainage is generally improved by ditches and pumping plants, which elevate the drainage water into the adjacent rivers or sloughs. In many areas the soils have a perched water table that has been lowered but remains within 6 feet of the surface. A drainage system is needed if these soils are used for some purposes.

The natural drainageways in San Joaquin County generally flow from east to west, but the San Joaquin River, which is the largest river in the county, flows from

Figure 2.—The meandering drainageways and closed depressions in this area of Redding loam, 0 to 3 percent slopes, fill with water to form vernal pools in the winter. More than 50 percent of the surface is covered with cobbles. The cobbles and the ponding result in only sparse vegetation in the pools. An area of a Pentz sandy loam is on the hillslopes in the background.

south to north. Large aqueducts have been constructed to export water to counties south of the survey area and have changed the natural flow of the San Joaquin River and the Mokelumne River through the Sacramento-San Joaquin Delta. These aqueducts and the diversions in areas of the Sacramento River system in the northern part of the Central Valley have resulted in reverse flows in the Sacramento-San Joaquin Delta area and in the part of the San Joaquin River in the survey area.

Upstream dams protect areas along all of the major rivers in San Joaquin County. They control the flow of the San Joaquin, Mokelumne, and Stanislaus Rivers. The Camanche Dam, on the Mokelumne River, provides water for the Camanche Reservoir, the only major reservoir in the county. Farmington Dam, on Little Johns Creek, controls seasonal flooding by impounding floodwater in a flood-control basin during peak flows.

Climate

By William R. Reed and Guy J. Romito, Soil Conservation Service.

The climate of San Joaquin County is characterized by hot, dry summers and cool, moist winters. The Sierra Nevada shields the county from the continental climatic extremes that are evident to the east. To the west, the Coast Range moderates the effects of moisture-laden weather systems from the Pacific Ocean. Summers are hot and dry because a persistent high-pressure area

offshore keeps most weather systems from entering the county. A southward shift of the high-pressure area in winter allows weather systems to enter the county, producing cool, moist weather and frequent heavy fogs.

Temperature and precipitation data for the survey area as recorded at Stockton, Tracy-Carbona, and Lodi are given in table 1. The average annual air temperature ranges from 59 degrees F in the northern part of the county to 61 degrees F in the southern part. The average monthly temperature at Stockton is about 77 degrees F in July and about 45 degrees F in January.

Table 1 shows the normal average daily maximum and minimum temperatures in each month. At Stockton the average maximum temperature in summer ranges from about 89 degrees F in June to about 94 degrees F in July. The average minimum temperature in winter ranges from about 37 degrees F in January to about 42 degrees F in March. The daily variation in temperature between high and low readings ranges from 10 to 20 degrees F in winter and from 25 to 35 degrees F in summer. The highest temperature recorded at Stockton was 114 degrees F on July 14, 1972, and the lowest was 16 degrees F on January 11, 1949 *(22)*.

A cool, moist wind from the Pacific enters the northern and central parts of the county through the Carquinez Strait gap. As a result, the county has slightly lower average summer temperatures and a longer frost-free period than is typical in areas directly to the south. A high-pressure system in summer occasionally produces heat waves that usually last 3 to 5 days *(21)*. Low humidity makes these heat waves more tolerable.

Growing degree days are shown in table 1. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Table 2 shows probable dates of the first freeze in fall and the last freeze in spring at Stockton, Tracy-Carbona, and Lodi. Table 3 provides data on length of the growing season. The growing season, or the average period between the last day with a specified temperature in spring and the first in fall, varies widely from year to year. Based on a temperature of 32 degrees F, the growing season ranges from 200 to 275 days.

The average annual precipitation in the survey area is shown in figure 3 *(6)*. Precipitation is lowest, 8 to 12 inches, south of Stockton and north of the Coast Range, primarily because of the rain shadow effect of the Coast Range. It increases to a maximum of 18 inches north of Stockton and at the higher elevations of the Coast Range. About 90 percent of the total annual rainfall falls between November and April. Of this, about 55 percent falls in December, January, and February. About 1 percent of the average annual rainfall falls during June, July, and August. The highest annual rainfall recorded at Stockton was 25.5 inches in 1982, and the lowest was 5.6 inches in 1976. Because winter and spring storm systems are moderated by the Coast Range, intense rainfall is rare in San Joaquin County. The highest 1-day precipitation was 3.13 inches in September of 1918, and the highest 1-hour rainfall was 0.86 inches in March of 1978 *(22)*. Snowfall is rare because the Pacific storms that bring rainfall to this area are associated with above-freezing temperatures at sea level.

Thunderstorms and hailstorms occur infrequently in San Joaquin County, and tornadoes occur virtually never. Most thunderstorms occur late in winter or early in spring. They occasionally occur in summer. The average number of thunderstorms is 3 or 4 per year *(21)*.

Humidity is high during the moist winter months but becomes quite low on hot summer afternoons. Because of the low humidity, the evapotranspiration rate is high during the growing season and soil moisture reserves are depleted rapidly. Potential evapotranspiration for a growing season above 32 degrees F is the rate at which water is lost to the atmosphere from a soil that has a permanent plant cover. Potential evapotranspiration is about 29 inches at Stockton, 27 inches at Lodi, and 30 inches at Tracy. Actual evapotranspiration from a soil that is not irrigated and that has the capacity to hold 4 inches of available water in the root zone is about 12 inches at Lodi and Tracy and 11 inches at Stockton. It is considered to be more than 9 but less than 12 inches for interpretations relating to dryland crops *(3)*.

Late in fall and early in winter, cold air from the surrounding mountains and radiational cooling result in fog under stable atmospheric conditions. Under these conditions, the fog can persist for days or weeks during December and January. At Stockton, dense fog occurs during some part of the day on an average of 43 days of the year. Lighter fogs that dissipate early in the day are common during cool, wet periods, especially along the rivers and sloughs.

Table 4 provides data on windspeed in the survey area as recorded at the Stockton Airport Weather Station *(21)*. The average windspeed is about 8 miles per hour. The prevailing wind is from the northwest during all periods, including the growing season. High winds occur infrequently and are usually associated with the passage of Pacific storm systems in winter.

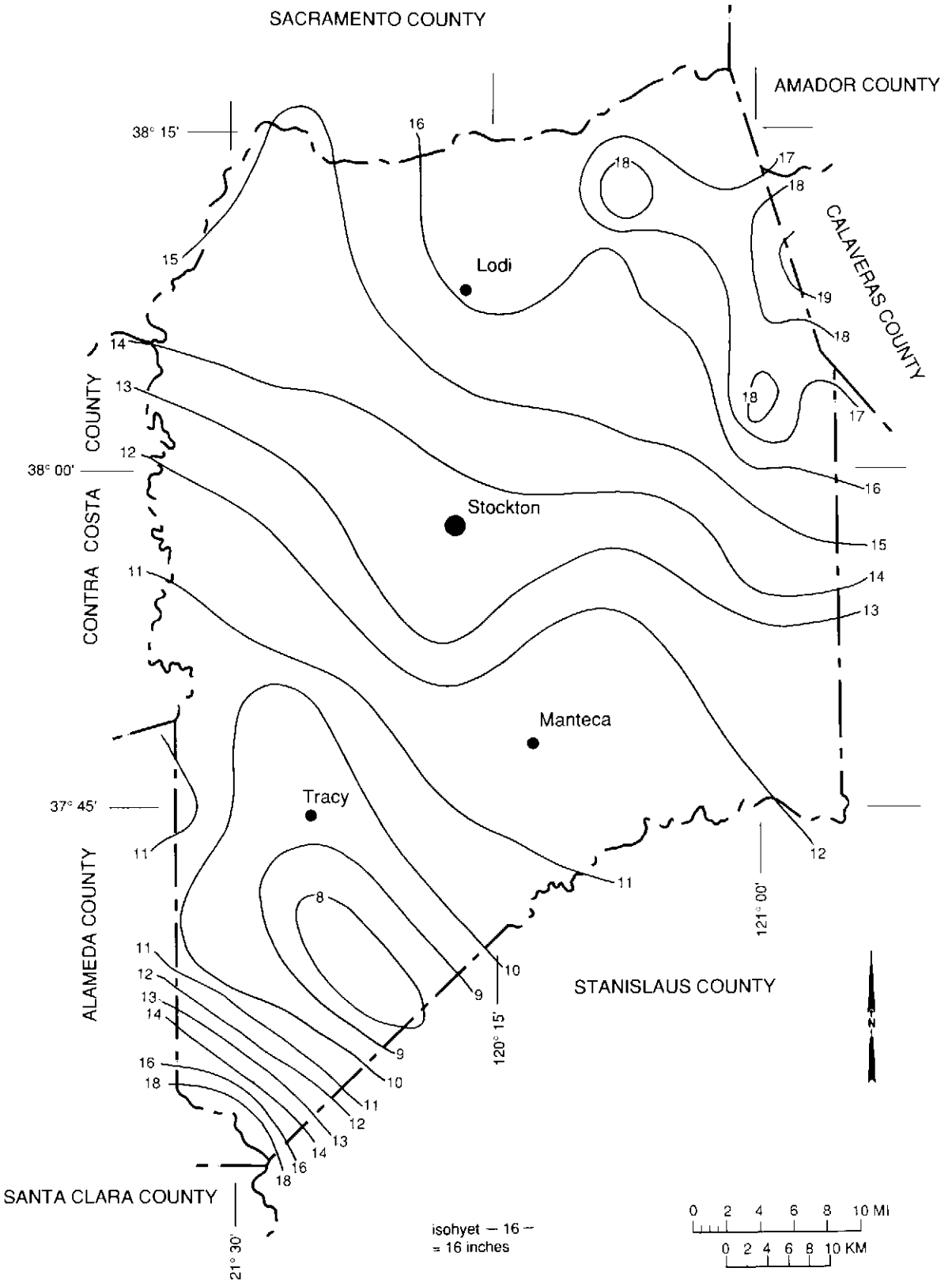

Figure 3.—The average annual precipitation, in inches, in San Joaquin County.

These winds rarely damage crops during the growing season. Coarse textured soils and organic soils are subject to soil blowing in the spring, when the surface is bare and loose.

Stockton has an average of about 184 clear days, 75 partly cloudy days, and 105 cloudy days annually *(22)*.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows the broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils or miscellaneous areas. It is named for the major soils. The soils making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Nearly Level Soils on Deltas and Flood Plains

The soils in this group are in the lowest positions in the county. They are in the Delta area in the western part of the county and along rivers and creeks in the eastern part. Elevation ranges from about 20 feet below sea level on Mandeville Island to 100 feet above sea level in an area along Dry Creek at the northeastern county line. These soils are protected by levees or are subject to flooding. The levees should be periodically checked, and a proper maintenance program should be developed. Drainage ditches and pumps are needed in most areas to maintain the water table below the rooting depth of crops. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 60 degrees F. The average frost-free period is 270 days.

These soils are very deep and are very poorly drained to well drained. Most have a high water table. Both mineral and organic soils are in this group. The surface layer of the soils on deltas is dominantly muck or moderately fine textured, mucky material. The surface layer of the soils on flood plains generally is moderately coarse textured to moderately fine textured.

These soils are used mainly for irrigated crops. Some areas are used for wildlife habitat or homesite development.

Four map units are in this group. They make up about 25 percent of the survey area.

1. Rindge-Kingile-Ryde

Very poorly drained, organic soils and very poorly drained, highly organic, moderately fine textured, mineral soils, all of which are very deep and have been partially drained; on deltas and flood plains

This map unit is on deltas and flood plains along rivers in the Sacramento-San Joaquin Delta area. It is at elevations near and below sea level. The soils formed in hydrophytic plant remains and in alluvium derived from mixed rock sources. The construction of levees has reduced the hazard of flooding. A high water table is regulated by pumping water from drainage ditches into the adjacent sloughs and rivers.

This unit makes up about 11 percent of the survey area. It is about 48 percent Rindge and similar soils, 22 percent Kingile and similar soils, 15 percent Ryde and similar soils, and 15 percent components of minor extent.

The organic Rindge soils are on deltas. Slope ranges from 0 to 2 percent. Typically, the surface layer and underlying material are muck. A high water table is at a depth of 3 to 4 feet and is regulated by pumps. The hazard of soil blowing is severe. The soils are subject to rare flooding.

The organic Kingile soils are on deltas. Slope ranges from 0 to 2 percent. Typically, the surface layer is muck. The underlying material is moderately fine textured and fine textured. A high water table is at a depth of 3 to 4 feet and is regulated by pumps. The hazard of soil blowing is severe. The soils are subject to rare flooding.

The highly organic, mineral Ryde soils are on deltas and flood plains. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately fine textured. The underlying material is moderately fine textured or is

peat. A high water table is at a depth of 3 to 4 feet and is regulated by pumps. The soils are subject to rare flooding.

Minor in this unit are Fluvaquents and the Itano and Valdez soils. Fluvaquents are frequently flooded and are in the main water channels. Itano and Valdez soils are poorly drained and are slightly higher on the landscape than the Rindge and Kingile soils. They do not have a high content of organic matter in the surface layer.

Areas of this unit are used mainly as irrigated cropland. The major soils are suited to irrigated crops. Limitations include depth to the high water table and subsidence. Soil blowing is the main hazard on the Rindge and Kingile soils. Flooding and seepage are additional hazards. Slow permeability is a limitation in the Kingile soils. The soils are commonly subirrigated. The growth of most perennial, deep-rooted crops is limited by the high water table.

2. Peltier-Egbert

Poorly drained, highly organic, moderately fine textured soils that are very deep and have been partially drained; on deltas and flood plains

This map unit is on flood plains and deltas in the Sacramento-San Joaquin Delta area. It is at elevations near and below sea level. The soils formed in alluvium derived from mixed rock sources and have a high content of hydrophytic plant remains in some areas. The construction of levees has reduced the hazard of flooding. A high water table is regulated by pumping water from drainage ditches into the adjacent sloughs and rivers.

This unit makes up about 6 percent of the survey area. It is about 46 percent Peltier and similar soils, 41 percent Egbert and similar soils, and 13 percent components of minor extent. The major components do not occur together in all of the delineations.

The highly organic, mineral Peltier soils are on flood plains and deltas. Slope ranges from 0 to 2 percent. Typically, the surface layer and subsoil are mucky and moderately fine textured. The underlying material is fine textured. The shrink-swell potential is high. A high water table is at a depth of 3 to 4 feet and is regulated by pumps. The soils are subject to rare flooding.

The mineral Egbert soils are on flood plains. Slope ranges from 0 to 2 percent. Typically, the surface layer is mucky and moderately fine textured. The underlying material is stratified and is moderately fine textured and fine textured. The shrink-swell potential is high. A high water table is at a depth of 3 to 6 feet and is regulated by pumps. The soils are subject to rare flooding.

Minor in this unit are the Dello, Grangeville, and Valdez soils and Urban land. Dello soils are very poorly drained and rapidly permeable. Grangeville soils are somewhat poorly drained and moderately rapidly permeable. Valdez soils are moderately slowly permeable. All of the minor soils are slightly higher on the landscape than the Peltier and Egbert soils. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for urban development. The major soils are suited to irrigated crops. Limitations include depth to the high water table, subsidence, and slow permeability. Soil blowing is a hazard. Flooding and seepage are additional hazards. The major soils are commonly subirrigated. The growth of most perennial, deep-rooted crops is limited by the high water table.

Where this unit is used for urban development, the main limitations are depth to the high water table, subsidence, slow permeability, a high shrink-swell potential, and low strength. The main hazard is rare flooding. Onsite sewage disposal is difficult because of the slow permeability and the high water table and may cause contamination of the ground water. Structural damage can result from the high shrink-swell potential, low strength, and subsidence. These limitations should be considered when foundations, buildings, and roads are designed. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

3. Merritt-Grangeville-Columbia

Poorly drained and somewhat poorly drained, moderately coarse textured and moderately fine textured soils that are very deep and have been partially drained or drained; on flood plains

This map unit is on low flood plains adjacent to the San Joaquin River and in the channels and sloughs adjacent to the Sacramento-San Joaquin Delta area. The soils formed in alluvium derived from granitic or mixed rock sources. The construction of levees has reduced the hazard of flooding. Drainage has been improved in most areas by pumps and reclamation projects.

This unit makes up about 7 percent of the survey area. It is about 43 percent Merritt and similar soils, 21 percent Grangeville and similar soils, 18 percent Columbia and similar soils, and 18 percent components of minor extent. The major components do not occur together in all of the delineations.

Merritt soils are poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately fine textured. The subsoil is medium textured and moderately fine textured. The underlying layers are

moderately coarse textured. A high water table is at a depth of 4 to 6 feet and is regulated by pumps. The soils are subject to rare or occasional flooding.

Grangeville soils are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately coarse textured. The underlying material is stratified and is coarse textured to medium textured. A high water table is at a depth of 4 to 6 feet and is regulated by pumps. The soils are subject to rare flooding.

Columbia soils are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately coarse textured. The underlying material is stratified and is coarse textured to medium textured. A high water table is at a depth of 3 to 5 feet, or drainage measures have lowered the apparent water table to a depth of 5 feet or more. The soils are rarely flooded to frequently flooded.

Minor in this unit are the Dello, Egbert, and Ryde soils. Dello soils are very poorly drained, are coarse textured, and are in the same landscape position as the major soils. Egbert soils are moderately fine textured and fine textured throughout. Ryde soils are very poorly drained and have a high organic matter content. The Egbert and Ryde soils are slightly lower on the landscape than the surrounding major soils.

Areas of this unit are used mainly as irrigated cropland or for homesite development. The major soils are suited to irrigated crops. Limitations include depth to the high water table in most areas. The main hazard is occasional or frequent flooding in areas that are not protected by levees. In some areas the underlying layers in the Columbia soils are slowly permeable. The growth of most perennial, deep-rooted crops is limited by the high water table.

Where this unit is used for homesite development, the main limitation is depth to the high water table. The main hazard is rare, occasional, or frequent flooding in some areas. Onsite sewage disposal is difficult because of the high water table and may cause contamination of the ground water. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

4. Columbia-Vina-Coyotecreek

Somewhat poorly drained and well drained, moderately coarse textured and medium textured soils that are very deep and are subject to flooding or protected by levees; on flood plains

This map unit is on high flood plains, primarily adjacent to the Mokelumne River, Dry Creek, and the Calaveras River. The soils formed in alluvium derived from mixed rock sources. The construction of levees has reduced the hazard of flooding in some areas. Drainage has been improved in areas near the lower reaches of Dry Creek and the Mokelumne River.

This unit makes up about 1 percent of the survey area. It is about 38 percent Columbia and similar soils, 22 percent Vina and similar soils, 21 percent Coyotecreek and similar soils, and 19 percent components of minor extent. The major components do not occur together in all of the delineations.

Columbia soils are somewhat poorly drained. A drainage system has lowered the apparent water table to a depth of 3 to 5 feet or more. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately coarse textured. The underlying material is stratified and is coarse textured to medium textured. The soils are subject to rare or occasional flooding.

Vina soils are well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately coarse textured. The underlying material is medium textured. The soils are subject to rare flooding.

Coyotecreek soils are well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is medium textured. The underlying material is medium textured and moderately fine textured. The soils are subject to occasional flooding.

Minor in this unit are Xerofluvents; Cosumnes, Guard, and Merritt soils; and areas of Dumps, tailings, and Pits, gravel. Cosumnes soils are moderately fine textured in the upper part and fine textured in the lower part. Guard and Merritt soils are poorly drained. Xerofluvents are frequently flooded. All of these soils are in the lower landscape positions, downstream from the major soils. Dumps are smoothed or uneven accumulations of tailings. Without major reclamation, they cannot support plants. Pits are open excavations from which soil has been removed and in which other material that supports few or no plants has been exposed.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development or wildlife habitat. The major soils are suited to irrigated crops. Limitations include depth to the high water table in some areas. The main hazard is occasional flooding in areas that are not protected by levees. The growth of most perennial, deep-rooted crops is limited by the high water table.

Where this unit is used for homesite development, the main limitation is depth to the water table in some areas. The main hazard is rare or occasional flooding. Onsite sewage disposal is difficult in some areas because of the high water table and may cause contamination of the ground water. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

Nearly Level Soils in Basins and on Basin Rims

The soils in this group are in low positions on the landscape, primarily in the central part of the county. Elevation ranges from about 5 feet below sea level near Thornton to 200 feet above sea level near Farmington. Levees have been constructed in some areas to control floodwater. They should be periodically checked, and a proper maintenance program should be developed. Drainage ditches and pumps are needed to maintain the water table below the rooting depth of crops. The average annual precipitation is 10 to 14 inches, and the average annual air temperature is 60 degrees F. The average frost-free period is 250 to 300 days.

These soils are deep or moderately deep to a cemented hardpan or are very deep. They are poorly drained to moderately well drained. Depth to the high water table is commonly more than 5.0 feet but ranges from 1.5 to 5.0 feet in some areas. The soils in basins have a moderately fine textured or fine textured surface layer and a high shrink-swell potential. The soils on basin rims have a moderately coarse textured or moderately fine textured surface layer and commonly have a hardpan.

These soils are used mainly for irrigated crops or pasture. A few areas are used for homesite development.

Three map units are in this group. They make up about 18 percent of the survey area.

5. Willows-Pescadero

Poorly drained, moderately fine textured and fine textured, saline-sodic soils that are very deep and have been partially drained; in basins

This map unit is in basins in the southwestern part of the county. It is in two long and narrow areas south of the San Joaquin River. The soils formed in alluvium derived from mixed or sedimentary rock sources. Levees have been constructed to control floodwater from the San Joaquin River. Also, drainage systems have been installed.

This unit makes up about 1 percent of the survey area. It is about 61 percent Willows and similar soils, 20 percent Pescadero and similar soils, and 19 percent components of minor extent.

Willows soils have a slope of 0 to 2 percent. Typically, the surface layer and underlying material are fine textured. The soils are calcareous and saline-sodic throughout. The shrink-swell potential is high. A high water table is at a depth of 4 to 6 feet. It is regulated by drainage systems in some areas. The soils are subject to rare flooding.

Pescadero soils have a slope of 0 to 2 percent. Typically, the surface layer is moderately fine textured. The subsoil is fine textured, and the underlying material is moderately fine textured. The soils are calcareous and saline-sodic throughout. The shrink-swell potential is high. A high water table is regulated at a depth of 3 to 6 feet by drainage systems. The soils are subject to rare flooding.

Minor in this unit are the Capay, Merritt, and Vernalis soils. These soils are not calcareous or saline-sodic throughout. Capay soils are in the higher interfan basins. Merritt soils are on the lower flood plains. Vernalis soils are on the higher alluvial fans.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development. The major soils generally are suited to irrigated crops, but they are poorly suited to most perennial, deep-rooted crops. Limitations include saline-sodic conditions, depth to the high water table, and very slow permeability. Intensive management is required to reduce salinity and maintain productivity.

Where this unit is used for homesite development, the main limitations are very slow permeability, a high shrink-swell potential, low strength, depth to the high water table, and saline-sodic conditions. The main hazard is rare flooding. Onsite sewage disposal is difficult because of the very slow permeability and the high water table and may cause contamination of the ground water. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed. The plants selected for landscaping should be those that are adapted to saline-sodic conditions. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

6. Jacktone-Hollenbeck-Stockton

Somewhat poorly drained and moderately well drained, fine textured soils that are moderately deep and deep to a cemented hardpan and that have been drained in some areas; on basin rims and in basins

This map unit is in basins and on basin rims in the central part of the county. The soils formed in alluvium derived from mixed rock sources. Levees have been constructed in some areas to control floodwater. They are used in conjunction with drainage ditches to reduce wetness.

This unit makes up about 13 percent of the survey area. It is about 46 percent Jacktone and similar soils, 21 percent Hollenbeck and similar soils, 20 percent

Stockton and similar soils, and 13 percent components of minor extent.

Jacktone soils are in basins. They are 20 to 40 inches deep to a cemented hardpan and are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is fine textured. The subsoil is moderately fine textured. The shrink-swell potential is high. Depth to the water table is more than 5 feet. The soils are subject to rare flooding.

Hollenbeck soils are on basin rims. They are 40 to 60 inches deep to a cemented hardpan and are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is fine textured. The subsoil is fine textured and moderately fine textured. The shrink-swell potential is high. The soils are subject to rare flooding.

Stockton soils are in basins. They are 40 to 60 inches deep to a cemented hardpan and are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is fine textured. The subsoil is fine textured and moderately fine textured. The shrink-swell potential is high. Depth to the water table is more than 5 feet. The soils are subject to rare flooding.

Minor in this unit are the Archerdale soils and Urban land. Archerdale soils are well drained and are on the higher fan terraces. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland or pasture. A few areas are used for homesite development. The major soils are suited to irrigated crops and pasture. Limitations include slow permeability and depth to the hardpan. In most areas the growth of perennial, deep-rooted crops is limited by the hardpan.

Where this unit is used for homesite development, the main limitations are slow permeability, a high shrink-swell potential, low strength, and depth to the hardpan. The main hazard is rare flooding. Onsite sewage disposal is difficult because of the slow permeability and the hardpan. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

7. Guard-Devries-Rioblancho

Poorly drained and somewhat poorly drained, moderately coarse textured and moderately fine textured soils that are moderately deep to a cemented hardpan or are very deep and that have been drained in most areas; on basin rims

This map unit is on basin rims along the eastern edge of the Sacramento-San Joaquin Delta area. The soils formed in alluvium derived from mixed rock sources. Levees have been constructed to control floodwater. They are used in conjunction with drainage ditches and pumps to reduce wetness.

This unit makes up about 4 percent of the survey area. It is about 43 percent Guard and similar soils, 30 percent Devries and similar soils, 18 percent Rioblancho and similar soils, and 9 percent components of minor extent.

Guard soils are very deep and poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and underlying material are moderately fine textured. The soils are calcareous throughout and have weakly cemented layers below a depth of 15 inches. A high water table is at a depth of 1.5 to 3.0 feet in most areas, but it has been lowered to a depth of more than 5.0 feet in areas where water from drainage ditches is pumped into the adjacent sloughs and rivers. The soils are subject to rare flooding.

Devries soils are 20 to 40 inches deep to a cemented hardpan and are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and subsoil are moderately coarse textured. Depth to the water table is more than 5 feet. The soils are subject to rare flooding.

Rioblancho soils are 20 to 40 inches deep to a cemented hardpan and are somewhat poorly drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately fine textured. The subsoil is moderately fine textured and moderately coarse textured. Depth to the water table is more than 6 feet. The soils are subject to rare flooding.

Minor in this unit are the Dello soils and Urban land. Dello soils are very poorly drained and are in the lower landscape positions. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland or pasture. A few areas are used for homesite development. The major soils are suited to irrigated crops and pasture. Limitations include depth to the hardpan in the Devries and Rioblancho soils and a low available water capacity in the Devries soils. Guard soils are limited by depth to the high water table, slow permeability, and weakly cemented layers. The growth of most perennial, deep-rooted crops is limited by the high water table or the hardpan.

Where this unit is used for homesite development, the main limitations are depth to the high water table and the hardpan. The main hazard is rare flooding. Onsite sewage disposal is difficult because of depth to the hardpan and the high water table and may cause contamination of the ground water. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

Nearly Level Soils in Interfan Basins and on Alluvial Fans, Low Fan Terraces, Stream Terraces, and Dunes

The soils in this group are in intermediate landscape positions in the southwestern, southern, central, and northern parts of the county. Elevation ranges from about 10 feet near Thornton to 400 feet near Clements. The average annual precipitation is 10 to 16 inches, the average annual air temperature is 60 degrees F, and the average frost-free period is 260 to 270 days.

These soils are very deep in most areas but are deep to a cemented hardpan in some areas. They are moderately well drained to somewhat excessively drained. The surface layer is coarse textured to fine textured. The texture remains nearly uniform with increasing depth. Some areas are subject to rare flooding.

These soils are used mainly for irrigated crops. A few areas are used for homesite development.

Five map units are in this group. They make up about 31 percent of the survey area.

8. Capay

Moderately well drained, fine textured soils that are very deep and have been subject to artificial wetness; mainly in interfan basins

This map unit is in the southwestern part of the county. The soils formed in alluvium derived from mixed rock sources. As a result of the application of irrigation water, a high water table is at a depth of 2 to 4 feet. Drainage systems that require continual maintenance have been used to lower the water table to a depth of 4 to 6 feet.

This unit makes up about 2 percent of the survey area. It is about 95 percent Capay and similar soils and 5 percent components of minor extent.

Capay soils have a slope of 0 to 2 percent. Typically, the surface layer and underlying material are fine textured. The soils are calcareous below a depth of 20 inches. The shrink-swell potential is high. An artificial high water table is maintained at a depth of 4 to 6 feet by drainage systems. The soils are subject to rare flooding.

Minor in this unit are the Stomar and Vernalis soils. These soils are well drained and are in the higher positions on fans.

Areas of this unit are used mainly for irrigated crops. A few areas are used for homesite development. The Capay soils are suited to irrigated crops. Limitations include slow permeability and depth to the high water table. The growth of most perennial, deep-rooted crops is limited by the high water table.

Where this unit is used for homesite development, the main limitations are slow permeability, a high shrink-swell potential, low strength, and depth to the high water table. Onsite sewage disposal is difficult because of the slow permeability and high water table and may cause contamination of the ground water. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed.

9. Capay-Stomar-Zacharias

Moderately well drained and well drained, moderately fine textured, gravelly moderately fine textured, and fine textured soils that are very deep; in interfan basins and on alluvial fans and stream terraces

This map unit is in interfan basins and on alluvial fans and stream terraces in the southwestern part of the county. The soils formed in alluvium derived from sedimentary and mixed rock sources.

This unit makes up about 6 percent of the survey area. It is about 53 percent Capay and similar soils, 26 percent Stomar and similar soils, 14 percent Zacharias and similar soils, and 7 percent components of minor extent.

Capay soils are in interfan basins. They are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer, subsoil, and underlying material are fine textured. The soils are calcareous below a depth of 20 inches. The shrink-swell potential is high.

Stomar soils are on alluvial fans. They are well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately fine textured. The subsoil is fine textured and moderately fine textured. The soils are calcareous below a depth of 17 inches. The shrink-swell potential is high.

Zacharias soils are on alluvial fans and stream terraces. They are well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is gravelly and moderately fine textured. The subsoil is gravelly and moderately fine textured and medium textured.

Minor in this unit are areas of Pits, gravel, and Urban land. Pits are open excavations from which soil has been removed and in which other material that supports few or no plants has been exposed. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development or dryland grain crops. The major soils are suited to irrigated crops. Limitations include slow permeability in the Capay and Stomar soils. The growth of perennial, deep-rooted crops is limited by the high

water table in some areas of the Stomar and Capay soils.

Where this unit is used for homesite development, the main limitations are slow permeability, a high shrink-swell potential, and low strength in areas of the Capay and Stomar soils and moderately slow permeability, a moderate shrink-swell potential, and low strength in areas of the Zacharias soils. The restricted permeability should be considered when onsite sewage disposal systems are designed. Structural damage can result from the shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed.

Where this unit is used for dryland grain crops, the main limitation is low rainfall. The amount of precipitation is not sufficient for annual cropping.

10. Delhi-Veritas-Tinnin

Moderately well drained to somewhat excessively drained, coarse textured and moderately coarse textured soils that are deep to a cemented hardpan or are very deep; on dunes, alluvial fans, and low fan terraces

This map unit is on dunes, low fan terraces, and alluvial fans along the Stanislaus River in the southern and southeastern parts of the county. The soils formed in alluvium derived from granitic and mixed rock sources.

This unit makes up about 10 percent of the survey area. It is about 35 percent Delhi and similar soils, 26 percent Veritas and similar soils, 22 percent Tinnin and similar soils, and 17 percent components of minor extent.

Delhi soils are on dunes that have been leveled. They are very deep and somewhat excessively drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and underlying material are coarse textured. The hazard of soil blowing is severe.

Veritas soils are on low fan terraces. They are 40 to 60 inches deep to a cemented hardpan and are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and subsoil are moderately coarse textured. The soils are subject to rare flooding.

Tinnin soils are on low fan terraces and alluvial fans. They are very deep and well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and underlying material are coarse textured. The hazard of soil blowing is severe. The soils are subject to rare flooding.

Minor in this unit are the Bisgani, Manteca, and Merritt soils and Urban land. Bisgani soils are poorly drained and are on the lower alluvial fans. Manteca soils are moderately deep to a cemented hardpan and are in landscape positions similar to those of the Veritas soils. Merritt soils are poorly drained and are on flood plains. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development. The major soils are suited to irrigated crops. Limitations include depth to the hardpan in the Veritas soils and a low available water capacity in the Delhi and Tinnin soils. The growth of deep-rooted crops is limited by the hardpan in the Veritas soils. The main hazard is soil blowing.

Where this unit is used for homesite development, the Veritas soils are limited by depth to the hardpan. Delhi soils are limited by rapid permeability. The main hazard in areas of the Tinnin and Veritas soils is rare flooding. The suitability of the Veritas soils for onsite sewage disposal can be improved by ripping the hardpan. In areas used for onsite sewage disposal, rapid permeability in the Delhi and Tinnin soils and in Veritas soils in which the hardpan has been ripped can result in contamination of the ground water. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

11. Archerdale-Cogna-Finrod

Moderately well drained and well drained, medium textured and moderately fine textured soils that are deep to a cemented hardpan or are very deep; on alluvial fans and low fan terraces

This map unit is on alluvial fans and low fan terraces along the Calaveras River in the central part of the county. The soils formed in alluvium derived from mixed rock sources.

This unit makes up about 6 percent of the survey area. It is about 37 percent Archerdale and similar soils, 30 percent Cogna and similar soils, 18 percent Finrod and similar soils, and 15 percent components of minor extent. The major components do not occur together in all of the delineations.

Archerdale soils are very deep and well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately fine textured, and the subsoil is fine textured. The shrink-swell potential is high. The soils are subject to rare flooding.

Cogna soils are very deep and well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is medium textured. The subsoil and underlying material are moderately fine textured and medium textured. The soils are subject to rare flooding.

Finrod soils are 40 to 60 inches deep to a cemented hardpan and are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is

moderately fine textured, and the subsoil is fine textured. The shrink-swell potential is high. The soils are subject to rare flooding.

Minor in this unit are the Boggiano, Columbia, Galt, Hicksville, Hollenbeck, and Vignolo soils. Boggiano soils are moderately well drained and moderately fine textured. They are in landscape positions similar to those of the major soils. Galt soils are moderately deep to a cemented hardpan and are fine textured. They are in the lower basins. Columbia soils are somewhat poorly drained and are adjacent to the major streams. Hicksville soils are occasionally flooded and are in dissected drainageways. Hollenbeck soils are moderately well drained and are in the lower basins. They are fine textured. Vignolo soils are moderately deep to a cemented hardpan. They are moderately well drained and are in the lowest positions on fan terraces.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development. The major soils are suited to irrigated crops. Limitations include slow permeability in the Archerdale and Finrod soils and depth to the hardpan in the Finrod soils. The growth of perennial, deep-rooted crops is limited by the hardpan.

Where this unit is used for homesite development, the Archerdale and Finrod soils are limited by low strength, slow permeability, and a high shrink-swell potential. Depth to the hardpan is a limitation in some areas. The main hazard is rare flooding. The restricted permeability should be considered when onsite sewage disposal systems are designed. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

12. Tokay-Acampo

Moderately well drained and well drained, moderately coarse textured soils that are deep to a cemented hardpan or are very deep; on low fan terraces

This map unit is on low fan terraces along the Mokelumne River in the northern part of the county. The soils formed in alluvium derived from granitic rock sources.

This unit makes up about 7 percent of the survey area. It is about 58 percent Tokay and similar soils, 26 percent Acampo and similar soils, and 16 percent components of minor extent.

Tokay soils are very deep and well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and subsoil are moderately coarse textured.

Acampo soils are 40 to 60 inches deep to a hardpan and are moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer and subsoil are moderately coarse textured.

Minor in this unit are the Columbia and Tujunga soils and Urban land. Columbia soils are somewhat poorly drained and are on flood plains. Tujunga soils are somewhat excessively drained and are on flood plains and in channel remnants. Urban land is covered by streets, parking lots, buildings, and other structures.

Areas of this unit are used mainly as irrigated cropland. A few areas are used for homesite development. The major soils are suited to irrigated crops. Limitations include depth to the hardpan in the Acampo soils. The growth of deep-rooted crops is limited by the hardpan.

Where this unit is used for homesite development, the main limitation is depth to the hardpan in the Acampo soils. The suitability for onsite sewage disposal can be improved by ripping the hardpan.

Nearly Level to Undulating Soils on Low Terraces

The soils in this group are in the northern and southeastern parts of the county. Elevation ranges from about 20 to 150 feet. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 60 degrees F. The average frost-free period is 250 to 275 days.

These soils are moderately deep to a cemented hardpan or are very deep. They are moderately well drained and well drained. The moderately deep soils have a moderately coarse textured or medium textured surface layer and have a claypan with a high shrink-swell potential. The claypan is underlain by a hardpan.

These soils are used mainly for livestock grazing, irrigated crops, or pasture. A few areas are used for homesite development.

Two map units are in this group. They make up about 7 percent of the survey area.

13. Madera

Moderately well drained, moderately coarse textured soils that are moderately deep to a cemented hardpan; on low terraces

This map unit is on low terraces in the southeastern part of the county. The soils formed in alluvium derived from granitic rock sources.

This unit makes up about 3 percent of the survey area. It is about 79 percent Madera and similar soils and 21 percent components of minor extent.

Madera soils have a slope of 0 to 5 percent. Typically, the surface layer is moderately coarse textured. The subsoil is a fine textured claypan, which is underlain by a hardpan at a depth of 20 to 40 inches.

The shrink-swell potential is high in the subsoil. The soils are subject to rare flooding.

Minor in this unit are the Alamo, Chuloak, Exeter, and Manteca soils. Alamo soils are poorly drained and are in dissected drainageways. Chuloak soils are very deep and are on alluvial fans on the highest parts of the landscape. Exeter and Manteca soils are moderately well drained and are on the slightly higher terraces.

Areas of this unit are used mainly for livestock grazing, irrigated crops, or pasture. A few areas are used for homesite development. The Madera soils are suited to the vegetation used for livestock grazing. Few limitations affect this use. The soils generally are suited to irrigated crops and pasture, but they are poorly suited to deep-rooted crops. Limitations include depth to the very slowly permeable claypan, depth to the hardpan, and a low available water capacity.

Where this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan, depth to the hardpan, a high shrink-swell potential, and low strength in the subsoil. The main hazard is rare flooding. Onsite sewage disposal is difficult because of the very slow permeability and the hardpan. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed. Dikes and channels that have outlets for floodwater can protect buildings from flooding.

14. San Joaquin-Bruella

Moderately well drained and well drained, moderately coarse textured and medium textured soils that are moderately deep to a cemented hardpan or are very deep; on low terraces

This map unit is on low terraces in the northern part of the county. The soils formed in old alluvium derived from granitic rock sources.

This unit makes up about 4 percent of the survey area. It is about 72 percent San Joaquin and similar soils, 21 percent Bruella and similar soils, and 7 percent components of minor extent. The major components do not occur together in all of the delineations.

San Joaquin soils are 20 to 40 inches deep to a cemented hardpan and are moderately well drained. Slope ranges from 0 to 8 percent. Typically, the surface layer is medium textured. The subsoil is a fine textured claypan in the upper part and a hardpan in the lower part. The shrink-swell potential is high in the subsoil.

Bruella soils are very deep and are well drained or moderately well drained. Slope ranges from 0 to 2 percent. Typically, the surface layer is moderately coarse textured, and the subsoil is moderately fine textured. In some areas dense, weakly cemented sediments are at a depth of 40 to 60 inches.

Minor in this unit are the Exeter and Kingdon soils. Exeter soils are moderately well drained and are in the same landscape position as the San Joaquin soils. Kingdon soils are very deep and moderately well drained and are on the slightly higher fan terraces.

Areas of this unit are used mainly for livestock grazing, irrigated crops, or pasture. A few areas are used for homesite development. The major soils are suited to the vegetation used for livestock grazing. Few limitations affect this use. The soils generally are suited to irrigated crops and pasture, but the San Joaquin soils are poorly suited to deep-rooted crops. Limitations include depth to the very slowly permeable claypan, depth to the hardpan, and a low or very low available water capacity in areas of the San Joaquin soils and slow permeability in the hard substratum in some areas of the Bruella soils.

Where this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan, depth to the hardpan, the high shrink-swell potential, and low strength in the subsoil in areas of the San Joaquin soils and moderately slow or slow permeability in areas of the Bruella soils. Onsite sewage disposal is difficult on the San Joaquin soils because of the very slow permeability and the hardpan. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed.

Nearly Level to Steep Soils on Dissected Terraces, Fan Terraces, High Terraces, and Hills

The soils in this group are primarily in the eastern part of the county. A few small areas are at the base of the Coast Range in the southwestern part of the county. Some of the soils are on the highest terraces in the county. Elevation ranges from about 80 feet to about 500 feet. The average annual precipitation is 9 to 17 inches, and the average annual air temperature is 60 to 61 degrees F. The average frost-free period is 250 to 275 days.

These soils are shallow, moderately deep, or deep to a cemented hardpan or are shallow or very deep. They are moderately well drained and well drained. The surface layer is moderately coarse textured, moderately fine textured, or gravelly and medium textured. Most of the soils have a restrictive layer, such as a fine textured subsoil, claypan, or hardpan or weakly cemented sediments, or are shallow to bedrock.

These soils are used mainly for livestock grazing or wildlife habitat. A few areas are used for homesite development, dryland grain crops, or irrigated pasture.

Four map units are in this group. They make up about 12 percent of the survey area.

15. Carbona-Pleito

Well drained, moderately fine textured soils that are very deep; on dissected terraces

This map unit is on uplifted, dissected terraces along the base of the Coast Range in the southwestern part of the county. The soils formed in alluvium derived from mixed rock sources.

This unit makes up less than 1 percent of the survey area. It is about 76 percent Carbona and similar soils, 21 percent Pleito and similar soils, and 3 percent components of minor extent.

Carbona soils have a slope of 2 to 8 percent. Typically, the surface layer and subsoil are moderately fine textured. The soils are calcareous between depths of 25 and 60 inches. The shrink-swell potential is high.

Pleito soils have a slope of 2 to 8 percent. Typically, the surface layer and underlying material are moderately fine textured.

Minor in this unit are the Reiff soils and Xerofluvents. Reiff soils are medium textured. They are on the lower alluvial fans. Xerofluvents are occasionally flooded and are in dissected drainageways.

Areas of this unit are used mainly for livestock grazing or wildlife habitat. A few areas are used for dryland grain crops. If irrigation water is available, the unit can be used for irrigated crops. The major soils are suited to the vegetation used for livestock grazing. Few limitations affect this use. The soils are suited to dryland grain crops. The main limitation is low rainfall. The amount of precipitation is not sufficient for annual cropping. Water erosion is a hazard in the more sloping areas.

16. Cometa-San Joaquin-Rocklin

Moderately well drained, moderately coarse textured soils that are moderately deep to weakly cemented sediments or a cemented hardpan; on dissected terraces

This map unit is on dissected terraces in the eastern part of the county. The soils formed in old alluvium derived from granitic rock sources.

This unit makes up about 4 percent of the survey area. It is about 37 percent Cometa and similar soils, 30 percent San Joaquin and similar soils, 19 percent Rocklin and similar soils, and 14 percent components of minor extent.

Cometa soils are 24 to 40 inches deep to weakly cemented sediments. Slope ranges from 5 to 15 percent. Typically, the surface layer is moderately coarse textured. The subsoil is a fine textured claypan in the upper part and dense, weakly cemented sediments in the lower part. The shrink-swell potential is high in the subsoil. The hazard of water erosion is moderate.

San Joaquin soils are 20 to 40 inches deep to a cemented hardpan. Slope ranges from 0 to 8 percent. Typically, the surface layer is moderately coarse textured. The subsoil is a fine textured claypan in the upper part and a hardpan in the lower part. The shrink-swell potential is high in the subsoil.

Rocklin soils are 20 to 40 inches deep to a cemented hardpan. Slope ranges from 0 to 5 percent. Typically, the surface layer is moderately coarse textured. The subsoil is moderately coarse textured and moderately fine textured. The hazard of water erosion is moderate in some areas.

Minor in this unit are the Hicksville and Redding soils. Hicksville soils are very deep or deep. They are occasionally flooded and are in dissected drainageways. Redding soils are gravelly. They are on the higher terraces.

Areas of this unit are used mainly for livestock grazing or dryland grain crops. A few areas are used for homesite development, irrigated pasture, or vineyards. The major soils are suited to the vegetation used for livestock grazing. Few limitations affect this use. The soils are suited to dryland crops. The main limitation is low rainfall. Water erosion is a hazard in the more sloping areas. The amount of precipitation is not sufficient for annual cropping. The soils should be tilled on the contour or across the slope.

Where this unit is used for homesite development, the main limitation is depth to the claypan or hardpan. The Cometa and San Joaquin soils also are limited by a high shrink-swell potential, low strength, and very slow permeability. Onsite sewage disposal is difficult because of the very slow permeability in the Cometa and San Joaquin soils and the hardpan in the San Joaquin and Rocklin soils. Structural damage can result from the high shrink-swell potential and low strength. These limitations should be considered when foundations, buildings, and roads are designed.

Where this unit is used for irrigated pasture or vineyard crops, the main limitation is depth to the claypan or hardpan. The San Joaquin and Rocklin soils are limited by a low or very low available water capacity in some areas. The main hazard is water erosion in the more sloping areas. The soils should be tilled on the contour or across the slope.

17. Pentz-Pardee-Keyes

Moderately well drained and well drained, moderately coarse textured and gravelly medium textured soils that are shallow to sandstone, conglomerate, or a cemented hardpan; on hills and high terraces

This map unit is on hills and high terrace remnants in the eastern part of the county. The soils formed in material weathered from basic andesitic, tuffaceous sandstone and conglomerate.

This unit makes up about 4 percent of the survey area. It is about 47 percent Pentz and similar soils, 26 percent Pardee and similar soils, 17 percent Keyes and similar soils, and 10 percent components of minor extent. The major components do not occur together in all of the delineations.

Pentz soils are on hills. They are shallow and well drained. Slope ranges from 2 to 50 percent. Typically, the surface layer is moderately coarse textured. The subsoil is medium textured. It is underlain by moderately consolidated, basic andesitic sandstone at a depth of 10 to 20 inches. The hazard of water erosion is slight or moderate in most areas but ranges from slight to severe.

Pardee soils are on hills and on high terrace remnants and dissected terraces. They are shallow and well drained. Slope ranges from 0 to 15 percent. Typically, the surface layer is gravelly and medium textured. The subsoil is very gravelly and moderately fine textured. It is underlain by andesitic, tuffaceous conglomerate at a depth of 10 to 20 inches. The hazard of water erosion is slight or moderate.

Keyes soils are on hills. They are 10 to 20 inches deep to a cemented hardpan and are moderately well drained. Slope ranges from 2 to 15 percent. Typically, the surface layer is gravelly and medium textured. The subsoil is a gravelly and fine textured claypan in the upper part and a hardpan in the lower part. The hardpan is underlain by moderately consolidated, basic andesitic sandstone. The hazard of water erosion is slight or moderate.

Minor in this unit are the Hicksville and Hollenbeck soils, Lithic Xerorthents, and Pits, gravel. Hicksville soils are very deep or deep, are occasionally flooded, and are in dissected drainageways. Hollenbeck soils are very deep and are in the lower basins. Lithic Xerorthents are very shallow and are in the same landscape position as the Pentz soils. Pits are open excavations from which soil has been removed and in which other material that supports few or no plants has been exposed.

Areas of this unit are used mainly for livestock grazing. A few areas are used for homesite development. The major soils are suited to the vegetation used for livestock grazing. The limitations include a very low and low available water capacity and a shallow rooting depth. Some areas of the Pentz and Pardee soils are limited by the content of coarse fragments in the surface layer. In a few areas the hazard of water erosion is severe. These areas should be protected from overgrazing.

Where this unit is used for homesite development, the main limitation is the depth to bedrock. Onsite sewage disposal systems can fail because of the depth to bedrock and because of the seepage of effluent at points downslope. The depth to bedrock should be considered when the disposal systems are designed. The main hazard is water erosion in the steeper areas. Only the part of the site that is used for construction should be disturbed.

18. Redding-Yellowlark

Moderately well drained, gravelly medium textured soils that are moderately deep and deep to a cemented hardpan; mainly on fan terraces and high terraces

This map unit is mainly on fan terraces and high terraces in the eastern part of the county. The soils formed in gravelly alluvium derived from mixed rock sources.

This unit makes up about 4 percent of the survey area. It is about 71 percent Redding and similar soils, 12 percent Yellowlark and similar soils, and 17 percent components of minor extent.

Redding soils are on high terraces. They are 20 to 40 inches deep to a cemented hardpan. Slope ranges from 0 to 30 percent. Typically, the surface layer is gravelly and medium textured. The subsoil is a fine textured claypan in the upper part and a hardpan in the lower part. The shrink-swell potential is high in the subsoil. The hazard of water erosion is slight or moderate in most areas but ranges from slight to severe.

Yellowlark soils are on fan terraces. They are 45 to 60 inches deep to a cemented hardpan. Slope ranges from 0 to 5 percent. Typically, the surface layer is gravelly and medium textured. The upper part of the subsoil is gravelly and medium textured and gravelly and moderately fine textured. The next part is a gravelly and fine textured and moderately fine textured claypan. The lower part is a hardpan. The hazard of water erosion is slight or moderate.

Minor in this unit are the Hicksville, Kaseberg, Keyes, Pentz, and Peters soils. Keyes and Peters soils are shallow. They are at the base of the steeper slopes. Hicksville soils are occasionally flooded and are in dissected drainageways. Kaseberg soils are shallow

and are in areas of granitic alluvium on remnant hills. Pentz soils are shallow and are on the steeper shoulders of hills.

Areas of this unit are used mainly for livestock grazing. A few areas are used for irrigated pasture. The major soils are suited to the vegetation used for livestock grazing. The Redding soils are limited by a very low available water capacity in most areas. In a few areas of the steeper Redding soils, the hazard of water erosion is severe. These areas should be protected from overgrazing.

The major soils are suited to irrigated pasture. Limitations include depth to the very slowly permeable claypan, depth to the hardpan, and a very low available water capacity in areas of the Redding soils. The main hazard is water erosion in the steeper areas. The soils should be tilled on the contour or across the slope.

Rolling to Very Steep Soils on Uplifted, Dissected Terraces and Mountains

The soils in this group are in the highest positions in the county. They are in areas of the Coast Range in the southwestern part of the county. Elevation ranges from about 150 feet to 3,300 feet. The average annual precipitation is 9 to 18 inches, and the average annual air temperature is 60 degrees F. The average frost-free period is 200 to 270 days.

These soils are well drained. The soils on uplifted, dissected terraces are deep or very deep. The soils on mountains are very shallow to moderately deep over hard bedrock. The surface layer is moderately coarse textured, moderately fine textured, medium textured, or gravelly and medium textured. Most of the soils have a fine textured subsoil and a high shrink-swell potential.

These soils are used mainly for livestock grazing or for wildlife habitat.

Two map units are in this group. They make up about 7 percent of the survey area.

19. Calla-Carbona-Wisflat

Well drained, moderately coarse textured and moderately fine textured soils that are very shallow, shallow, deep, and very deep; on uplifted, dissected terraces and mountains

This map unit is in an area where tectonic uplift of terraces and the subsequent erosion and dissection have resulted in a landscape that consists mainly of hill slopes. It is in areas of the Coast Range in the southwestern part of the county. Deeply cut, narrow valleys extend through this unit and into the San Joaquin Valley.

This unit makes up about 4 percent of the survey area. It is about 25 percent Calla and similar soils, 24 percent Carbona and similar soils, 23 percent Wisflat and similar soils, and 28 percent components of minor extent.

Calla soils are on uplifted, dissected terraces. They are very deep. Slope ranges from 8 to 50 percent. Typically, the surface layer and subsoil are moderately fine textured. The soils are calcareous throughout. The hazard of water erosion is moderate or severe.

Carbona soils are on uplifted, dissected terraces. They are deep or very deep. Slope ranges from 8 to 50 percent. Typically, the surface layer is moderately fine textured. The underlying material is moderately fine textured and fine textured. The soils are calcareous below a depth of 25 inches. Bedrock is at a depth of 40 to 60 inches in some areas. The shrink-swell potential is high. The hazard of water erosion is moderate or severe.

Wisflat soils are on mountains. They are very shallow or shallow. Slope ranges from 30 to 75 percent. Typically, the surface layer and underlying material are moderately coarse textured. Sandstone bedrock is at a depth of 8 to 20 inches. The hazard of water erosion is severe or very severe.

Minor in this unit are the Alo, San Timoteo, and Vaquero soils, Xerofluvents, and Xerorthents. Alo, San Timoteo, and Vaquero soils are in the same landscape position as the Wisflat soils. Alo and Vaquero soils are moderately deep and are characterized by the formation of wide cracks that open and close seasonally. San Timoteo soils are moderately deep and somewhat excessively drained. Xerofluvents and Xerorthents are somewhat excessively drained, are occasionally flooded, and are in the lowest positions in arroyos and intermittent channels.

Areas of this unit are used mainly for livestock grazing or wildlife habitat. The major soils are suited to the vegetation used for livestock grazing. The Wisflat soils are limited by a very low available water capacity. Because of the moderate to very severe hazard of water erosion, the unit should be protected from overgrazing.

20. Gonzaga-Honker-Vallecitos

Well drained, medium textured and gravelly medium textured soils that are shallow and moderately deep; on mountains

This map unit is on mountains in an area where tectonic uplift and the subsequent erosion and dissection have resulted in a very rugged landscape. It

is in areas of the Coast Range in the southwestern part of the county. Deeply cut, narrow valleys extend through this unit. The soils formed in material weathered from sandstone and shale.

This unit makes up about 3 percent of the survey area. It is about 42 percent Gonzaga and similar soils, 39 percent Honker and similar soils, 18 percent Vallecitos and similar soils, and 1 percent components of minor extent.

Gonzaga soils are moderately deep. Slope ranges from 30 to 75 percent. Typically, the surface layer is medium textured, and the subsurface layer is moderately fine textured. The subsoil is a fine textured claypan. Hard shale bedrock is at a depth of 20 to 40 inches. The shrink-swell potential is high in the subsoil. The hazard of water erosion is severe or very severe.

Honker soils are moderately deep. Slope ranges from 30 to 75 percent. Typically, the surface layer is medium textured. The subsoil is a gravelly and fine textured claypan. Hard sandstone bedrock is at a depth of 20 to 40 inches. The shrink-swell potential is high in the subsoil. The hazard of water erosion is severe or very severe.

Vallecitos soils are shallow. Slope ranges from 30 to 75 percent. Typically, the surface layer is gravelly and medium textured. The subsoil is gravelly and moderately fine textured. Hard sandstone bedrock is at a depth of 10 to 20 inches. The shrink-swell potential is high in the subsoil. The hazard of water erosion is severe or very severe.

Minor in this unit are Xerofluvents and Xerorthents. These soils are subject to occasional flooding, are somewhat excessively drained, and are in the lowest positions in arroyos, in intermittent channels, and on alluvial fans.

Areas of this unit are used mainly for livestock grazing or wildlife habitat. The major soils are suited to the vegetation used for livestock grazing. Limitations include a very low or low available water capacity. Because of the severe or very severe hazard of water erosion, the unit should be protected from overgrazing.

Detailed Soil Map Units

The map units on the detailed soil maps published with this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the variability characteristic of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some included areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties or behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to precisely define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Stockton clay, 0 to 2 percent slopes, is a phase of the Stockton series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Kingile-Ryde complex, partially drained, 0 to 2 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such

areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

This survey area was mapped at one level of detail, but the minimum size allowed for the delineations differed, depending on anticipated long-term uses. Areas used for intensive agriculture have a 10-acre minimum delineation. Areas that are used less intensively, such as rangeland, and areas that are so intensively used that onsite investigation is needed, such as those used for urban development, have a 20-acre minimum delineation. Strongly contrasting soils in areas as small as 10 acres, however, were identified.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Soil Descriptions

101—Acampo sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 10 to 150 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is brown sandy loam about 19 inches thick. The upper part of the subsoil is pale brown and light yellowish brown sandy loam, which extends to a depth of 47 inches. The next part is an indurated hardpan, which extends to a depth of 49 inches. The lower part to a depth of 60 inches is a variegated brownish yellow and yellowish brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is fine sandy loam or loam.

Included in this unit are small areas of Devries and Tujunga soils in the slightly lower landscape positions and small areas of moderately coarse textured soils that have a moderately fine textured subsoil. Also included are small areas of Tokay soils in landscape positions similar to those of the Acampo soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Acampo soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is depth to the hardpan. General management considerations include the hazard of soil blowing. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitation is depth to the hardpan. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields.

This map unit is in capability units IIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

102—Alamo clay, 0 to 2 percent slopes. This poorly drained, nearly level soil is in basins and drainageways on old terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Meandering drainageways and closed depressions fill with water to form vernal pools. Elevation is 100 to 115 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is dark gray clay about 12 inches thick. The upper part of the subsoil is gray clay, which extends to a depth of 33 inches. The lower part to a depth of 60 inches is a pale brown and brown, indurated, silica-cemented hardpan. In some areas the surface layer is silty clay or silty clay loam.

Included in this unit are small areas of Madera, San Joaquin, and Redding soils on the slightly higher terraces. Also included are small areas of Alamo soils in vernal pools that pond in the winter. Included areas

make up about 15 percent of the total acreage.

Permeability is very slow in the Alamo soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Water is perched within a depth of 1 foot after periods of heavy rainfall or irrigation. Runoff is very slow. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated pasture, irrigated crops, or vineyards. A few areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated pasture. The main limitations are the low available water capacity and the high water table. Because the soil is droughty, applications of irrigation water should be light and frequent. A drainage system may be needed. Leveling helps to ensure a uniform application of water. Irrigation water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are the low available water capacity, the very slow permeability, and depth to the hardpan. Because the soil is droughty, applications of irrigation water should be light and frequent. Because of the very slow permeability, the applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Leveling helps to ensure a uniform application of water. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for livestock grazing, general management considerations include the clayey surface layer and saturated soil conditions following rainy periods. The vegetation consists mainly of soft chess, wild oat, and filaree. Trampling of the clayey surface layer by livestock when the soil is too wet reduces productivity. Grazing should be delayed until the soil is firm enough to withstand the trampling and the more desirable forage plants have had an opportunity to set seed.

This map unit is in capability units IIIw-3 (MLRA-17), irrigated, and IVw-3 (MLRA-17), nonirrigated. It is in vegetative soil group E.

103—Alo-Vaquero complex, 8 to 30 percent slopes. These strongly sloping to moderately steep soils are on mountains. The native vegetation is mainly annual grasses and forbs. Elevation is 800 to 1,100 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Alo clay and 40 percent Vaquero clay. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Alo and Vaquero soils that have slopes of 2 to 8 or 30 to 50 percent. The areas where slopes are 2 to 8 percent are on toe slopes, and the areas where slopes are 30 to 50 percent are on the slightly higher parts of the landscape. Also included are small areas of Calla soils on terraces and exposed bedrock in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Alo soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the surface layer is brown clay about 16 inches thick. The subsoil is dark yellowish brown clay about 18 inches thick. Pale brown and light yellowish brown shale bedrock is at a depth of 34 inches. In some areas the surface layer is silty clay.

Permeability is slow in the Alo soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 24 to 40 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe.

The Vaquero soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown clay about 21 inches thick. The subsoil also is grayish brown clay. It is about 4 inches thick. Light brownish gray and light olive brown sandstone bedrock is at a depth of 25 inches. The soil is calcareous between depths of 10 and 25 inches and saline-sodic below a depth of 20 inches. In some areas the surface layer is silty clay.

Permeability is slow in the Vaquero soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the clayey surface layer, excessive shrinking and

swelling, and the hazard of erosion. The characteristic plant community is mainly wild oat, soft chess, and filaree. Trampling of the clayey surface layer by livestock when the soils are too wet reduces productivity and increases the runoff rate. Fencing is difficult. Excessive shrinking and swelling of the soils can cause fenceposts to be tilted or removed from the ground. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion.

This map unit is in capability unit IVe-5 (MLRA-15), nonirrigated. It is in vegetative soil group G.

104—Alo-Vaquero complex, 30 to 50 percent slopes. These steep soils are on mountains. The native vegetation is mainly annual grasses and forbs. Elevation is 800 to 1,600 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Alo clay and 40 percent Vaquero clay. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Carbona soils on terraces and small areas of Vaquero soils that have slopes of 50 to 70 percent. The steeper Vaquero soils are on the slightly higher parts of the landscape. Also included are small areas of Wisflat, Arburua, and San Timoteo soils in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Alo soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the surface layer is brown clay about 16 inches thick. The subsoil is dark yellowish brown clay about 18 inches thick. Pale brown and light yellowish brown shale bedrock is at a depth of 34 inches. In some areas the surface layer is silty clay.

Permeability is slow in the Alo soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 24 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Vaquero soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown clay about 21 inches thick. The subsoil also is grayish brown clay. It is about 4 inches thick. Light brownish gray and light olive brown sandstone bedrock is at a depth of 25 inches. The soil is calcareous between depths of 10 and 25 inches and saline-sodic below a depth of 20 inches. In some areas the surface layer is silty clay.

Permeability is slow in the Vaquero soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include excessive shrinking and swelling and the severe hazard of erosion. The characteristic plant community is mainly wild oat, soft chess, and filaree. Fencing is difficult. Excessive shrinking and swelling of the soils can cause fenceposts to be tilted or removed from the ground. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. It is in vegetative soil group G.

105—Amador-Lithic Xerorthents complex, 2 to 15 percent slopes. These undulating to rolling soils are on hills. The native vegetation is mainly annual grasses and forbs. Elevation is 150 to 250 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Amador loam and 40 percent Lithic Xerorthents. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bellota soils on toe slopes, small areas of Pentz soils in convex positions near the top of the slopes, and areas of exposed bedrock in convex positions near the top of the slopes and along drainageways. Also included, on the slightly higher parts of the landscape, are small areas of soils that are similar to the Amador soil but have slopes of 15 to 30 percent. Included areas make up 15 percent of the total acreage.

The Amador soil is shallow and well drained. It formed in material weathered from hard, rhyolitic, tuffaceous sandstone. Typically, the surface layer is light gray loam about 4 inches thick. The subsoil is light brownish gray loam about 11 inches thick. White, hard, rhyolitic, tuffaceous sandstone bedrock is at a depth of 15 inches. In some areas the surface layer is sandy loam or cobbly loam.

Permeability is moderate in the Amador soil. Available water capacity is very low. The effective

rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

The Lithic Xerorthents are very shallow and are moderately well drained and well drained. They formed in material weathered from hard, rhyolitic, tuffaceous sandstone. Typically, 1 to 3 percent of the surface is covered with cobbles. The surface layer is light brownish gray gravelly loam about 3 inches thick. White, rhyolitic, tuffaceous sandstone bedrock is at a depth of 3 inches. In some areas the surface layer is gravelly sandy loam or loam.

Permeability is moderate in the Lithic Xerorthents. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 1 to 4 inches. Runoff is rapid, and the hazard of water erosion is moderate.

Most areas of this unit are used for livestock grazing. General management considerations include the very low available water capacity, the limited depth, and the hazard of erosion. The characteristic plant community on the Amador soil is soft chess, ripgut brome, foxtail fescue, and filaree. The Lithic Xerorthents support only a sparse stand of plants that are suitable for grazing. These plants are soft chess, toad rush, and hairgrass. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the limited depth to bedrock. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

106—Archerdale very fine sandy loam, 0 to 2 percent slopes, overwashed. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 60 to 90 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown very fine sandy loam about 18 inches thick. Below this is a buried surface layer of dark grayish brown clay loam about 20 inches thick. The subsoil to a depth of 60 inches is brown clay. In some areas the surface layer is fine sandy loam, silt loam, or clay loam.

Included in this unit are small areas of Columbia soils in the slightly lower landscape positions. Also included are small areas of Cogna, Finrod, and Hollenbeck soils in landscape positions similar to those of the Archerdale soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Archerdale soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability below the overwash layer. General management considerations include the hazard of soil blowing. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, low strength, and the slow permeability below the overwash. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

107—Archerdale clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on low fan terraces. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 40 to 130 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the

average frost-free period is about 270 days.

Typically, the upper 8 inches of the surface layer is dark grayish brown clay loam. The lower 16 inches of the surface layer and the subsoil to a depth of 60 inches are brown clay. In some areas the surface layer is clay or silty clay loam.

Included in this unit are small areas of Cogna, Finrod, Hollenbeck, and Vignolo soils. These soils are in landscape positions similar to those of the Archerdale soil. Also included, on the slightly higher parts of the landscape, are small areas of Archerdale soils that have slopes of 3 percent. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Archerdale soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, low strength, and the slow permeability. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

108—Arents, saline-sodic, 0 to 2 percent slopes. These somewhat poorly drained, nearly level soils are in areas on low alluvial fans or fan terraces where ripping, cutting, or filling has altered the landscape. They are moderately deep or deep to a hardpan or are very deep. They formed in alluvium derived from mixed rock sources. Mottles in the profile indicate somewhat poorly drained soils; however, drainage has been improved by levees and reclamation projects. Elevation is 20 to 30 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

The surface layer is grayish brown and brown sandy loam or loam about 10 inches thick. The upper 30 inches of the underlying material is light brownish gray, pale brown, and yellowish brown, mottled loam and clay loam. The next 10 inches is a weakly cemented to strongly cemented hardpan that has been disrupted by ripping. The lower part to a depth of 60 inches is stratified light brownish gray and grayish brown loamy sand and sandy loam. The soils are saline-sodic throughout. Fragments of the hardpan are common throughout the profile. Fragments of cemented material are on the surface and throughout the profile in some areas that have been subsoiled, deeply ripped, or backhoed.

Included in this unit are small areas of Manteca, Timor, and Bisgani soils and medium textured soils that do not have a hardpan and are not saline-sodic. The included soils are in landscape positions similar to those of the Arents. They make up about 15 percent of the total acreage.

Permeability is moderate or moderately slow in the Arents. Available water capacity is low or moderate. The effective rooting depth of the crops commonly grown in the county is limited by a perched water table at a depth of 3 to 5 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soils are subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the saline-sodic conditions and the high water table. The content of salts can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soils. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Intensive management is required to reduce the salinity and maintain productivity. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soils or regularly adding other organic material improves fertility,

minimizes crusting, and maintains the rate of water intake.

This unit is suited to irrigated pasture. The main limitations are the saline-sodic conditions and the high water table. The concentration of salts and sodicity in the surface layer limit the production of plants suitable for irrigated pasture. Leaching the salts from the surface layer is difficult because of the high water table. A drainage system and irrigation water management reduce the concentration of salts. Salt-tolerant species should be selected for planting. Irrigation water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soils from compaction.

This map unit is in capability units IIIw-6 (MLRA-17), irrigated, and IVw-6 (MLRA-17), nonirrigated. It is in vegetative soil group F.

109—Bisgani loamy coarse sand, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on low alluvial fans. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 20 to 35 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is gray loamy coarse sand about 11 inches thick. The underlying material to a depth of 60 inches is mottled light gray and light brownish gray loamy coarse sand. In some areas the surface layer is loamy sand.

Included in this unit are small areas of Grangeville, Manteca, and Veritas soils. Grangeville soils are in landscape positions similar to those of the Bisgani soil. Manteca and Veritas soils are in the slightly higher positions. Also included, in filled ponds or swamps, are small areas of soils that have a stratified moderately coarse textured to moderately fine textured substratum. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Bisgani soil. Available water capacity is low. The effective rooting depth of the crops commonly grown in the county is limited by a perched water table that has been lowered to a depth of 3.5 to 5.0 feet through drainage systems that require continual maintenance. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the low available water capacity, the rapid permeability, and the high water table. General management considerations include the severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. The main limitations are the low available water capacity and the high water table. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. A drainage system may be needed. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are the high water table and the rapid permeability. The rare flooding is a hazard. A drainage system is needed if roads or building foundations are constructed. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIw-4 (MLRA-17), irrigated, and IVw-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

110—Boggiano clay loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 45 to 150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown clay loam about 23 inches thick. The upper 25 inches of the subsoil is brown and light yellowish brown clay loam. The lower part to a depth of 60 inches is a light yellowish brown, strongly cemented or indurated hardpan. In some areas the surface layer is loam.

Included in this unit are small areas of Archerdale, Cogna, and Vignolo soils in landscape positions similar to those of the Boggiano soil. Also included are small areas of Columbia, Hollenbeck, and Stockton soils in the slightly lower positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Boggiano soil. Available water capacity is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is depth to the hardpan, which limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitation is depth to the hardpan. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

111—Bruella sandy loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on low terraces. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 70 to 120 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 18 inches thick. The upper 13 inches of the subsoil is brown sandy clay loam. The lower 36 inches is brown, strong brown, and light brown sandy clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of San Joaquin, Tokay, Kingdon, Jahant, and Devries soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Bruella soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, orchard, and vineyard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. On sites for septic tank absorption fields, this limitation can be overcome by increasing the size of the absorption field.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

112—Bruella sandy loam, hard substratum, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is on low terraces. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 70 to 120 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 8 inches thick. The upper part of the subsoil is dark brown and strong brown sandy clay loam about 34 inches thick. The lower part to a depth of 60 inches is strong brown, weakly cemented sandy clay loam. In

some areas the surface layer is loam.

Included in this unit are small areas of Rocklin, San Joaquin, Jahant, and Tokay soils in the slightly lower landscape positions. Also included are small areas of Bruella soils that do not have a hard substratum. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Bruella soil and slow in the hard substratum. Available water capacity is moderate. The effective rooting depth is 60 inches, but roots are restricted by the hard substratum at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be very briefly perched above the hard substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitations are the slow permeability and depth to the hard substratum. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hard substratum limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability and depth to the hard substratum. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hard substratum improves permeability and thus also improves the suitability of the soil for septic tank absorption fields.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

113—Calla clay loam, 2 to 8 percent slopes. This very deep, well drained, gently sloping and moderately sloping soil is on uplifted, dissected terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 300 to 500 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are light brownish gray clay loam about 11 inches thick. The next part of the subsoil is light gray, grayish brown, and light brownish gray clay loam about 18 inches thick. The lower part to a depth of 60 inches is white and light gray clay loam. The soil is calcareous throughout. In some areas the surface layer is loam.

Included in this unit are small areas of Carbona and Pleito soils in the slightly lower landscape positions. Also included, on the slightly higher parts of the landscape, are small areas of Calla soils that have slopes of 8 to 15 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Calla soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 0.5 inch per hour.

This unit is used for livestock grazing or dryland grain crops. It can be used for irrigated crops if irrigation water is available.

Where this unit is used for livestock grazing, general management considerations include the clay loam surface layer. The characteristic plant community is mainly soft chess, red brome, wild oat, and filaree. Trampling of the clay loam surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Few limitations affect the use of this unit for irrigated row, field, and orchard crops. General management considerations include the hazard of erosion. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability unit IVe-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

114—Calla-Carbona complex, 8 to 30 percent slopes. These strongly sloping to moderately steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,300 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Calla clay loam and 40 percent Carbona clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Wisflat soils in convex positions near the top of the slopes, exposed bedrock on ridges, and Arburua and San Timoteo soils on the slightly higher parts of the landscape. Also included are small areas of Calla and Carbona soils that are gravelly throughout. These soils are in landscape positions similar to those of the dominant Calla and Carbona soils in this unit or are in the slightly higher areas where slopes are 30 to 50 percent. Included areas make up about 15 percent of the total acreage.

The Calla soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer and the upper part of the subsoil are light brownish gray clay loam about 18 inches thick. The lower part of the subsoil to a depth of 60 inches is light yellowish brown and pale brown clay loam. The soil is calcareous throughout. In some areas the surface layer is loam or gravelly clay loam.

Permeability is moderately slow in the Calla soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

The Carbona soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate or severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the clay loam surface layer and the hazard of erosion. The characteristic plant community is mainly soft chess, red brome, wild oat, and filaree. Trampling of the clay loam surface layer by livestock when the soils are too wet reduces productivity and increases the runoff rate. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion.

This map unit is in capability unit IVe-1 (MLRA-17), nonirrigated. The Calla soil is in vegetative soil group A, and the Carbona soil is in vegetative soil group C.

115—Calla-Carbona complex, 30 to 50 percent slopes. These steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,300 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Calla clay loam and 35 percent Carbona clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Arburua, Wisflat, and San Timoteo soils on the slightly higher parts of the landscape and exposed bedrock on ridges. Also included are small areas of Carbona and Calla soils that are gravelly throughout. These soils are in landscape positions similar to those of the dominant Calla and Carbona soils in this unit or are in the slightly higher areas where slopes are 50 to 65 percent. Included areas make up about 15 percent of the total acreage.

The Calla soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer and the upper part of the subsoil are light brownish gray clay loam about 18 inches thick. The lower part of the subsoil to a depth of 60 inches is light yellowish brown and pale brown clay loam. The soil is calcareous throughout. In some areas the surface layer is loam or gravelly clay loam.

Permeability is moderately slow in the Calla soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

The Carbona soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include

the severe hazard of erosion. The characteristic plant community is mainly soft chess, red brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. The Calla soil is in vegetative soil group A, and the Carbona soil is in vegetative soil group C.

116—Calla-Pleito complex, 8 to 30 percent slopes. These strongly sloping to moderately steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 300 to 600 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 60 percent Calla clay loam and 25 percent Pleito clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Carbona soils in landscape positions similar to those of the Calla and Pleito soils and exposed bedrock in convex positions near the top of the slopes. Also included are small areas of Calla and Pleito soils that have slopes of 2 to 8 percent or 30 to 50 percent. The areas where slopes are 2 to 8 percent are on toe slopes, and the areas where slopes are 30 to 50 percent are on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

The Calla soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer and the upper part of the subsoil are light brownish gray clay loam about 11 inches thick. The next part of the subsoil is light gray, grayish brown, and light brownish gray clay loam about 18 inches thick. The lower part to a depth of 60 inches is white and light gray clay loam. The soil is calcareous throughout. In some areas the surface layer is loam, gravelly loam, or gravelly clay loam.

Permeability is moderately slow in the Calla soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe.

The Pleito soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown and dark grayish brown clay loam about 16 inches thick. The subsoil and the underlying material to a depth of 60 inches are grayish brown and brown clay loam. In some areas the surface layer is gravelly clay loam or loam.

Permeability is moderately slow in the Pleito soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the clay loam surface layer and the hazard of erosion. The characteristic plant community is mainly soft chess, red brome, wild oat, and filaree. Trampling of the clay loam surface layer by livestock when the soils are too wet reduces productivity and increases the runoff rate. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion.

This map unit is in capability unit IVe-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

117—Capay clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is in intermountain basins. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Elevation is 600 to 800 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark grayish brown clay loam about 6 inches thick. The upper 14 inches of the subsoil is very dark grayish brown and dark grayish brown clay. The lower part to a depth of 60 inches is dark grayish brown silty clay loam and clay loam. The soil is calcareous between depths of 6 and 60 inches. It has fine strata of silty clay loam and clay loam below a depth of 20 inches. In some areas the surface layer is silty clay.

Included in this unit are small areas of Pleito soils in the slightly lower landscape positions and Carbona soils that have slopes of 2 to 5 percent and are on the slightly higher parts of the landscape. Also included, in drainageways, are small areas of fine textured soils that are occasionally flooded and are saline-sodic throughout. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

This unit is used for livestock grazing or wildlife

habitat. General management considerations include the clay loam surface layer and saturated soil conditions following rainy periods. The characteristic plant community is mainly soft chess, filaree, and wild oat. Trampling of the clay loam surface layer by livestock when the soil is too wet reduces productivity. Grazing should be delayed until the soil is firm enough to withstand the trampling and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This map unit is in capability unit IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group A.

118—Capay clay, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is in interfan basins. It formed in alluvium derived from mixed rock sources. Elevation is 30 to 200 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark grayish brown clay about 20 inches thick. The subsoil to a depth of 60 inches is grayish brown, dark grayish brown, dark brown, and pale brown clay. The soil is calcareous below a depth of 20 inches. In some areas the surface layer is silty clay.

Included in this unit are small areas of Stomar and Vernalis soils in the slightly higher landscape positions and Willows soils in the slightly lower positions. Also included are small areas of fine textured soils that have a perched water table at a depth of 48 inches and may be saline-sodic in some part. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability, low strength, and the high shrink-swell potential. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

This map unit is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

119—Capay clay, 2 to 5 percent slopes. This very deep, moderately well drained, gently sloping soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 100 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark grayish brown clay about 20 inches thick. The subsoil to a depth of 60 inches is grayish brown, dark grayish brown, dark brown, and pale brown clay. The soil is calcareous below a depth of 20 inches. In some areas the surface layer is silty clay.

Included in this unit are small areas of Carbona and Calla soils in the slightly higher landscape positions and Stomar soils in the slightly lower positions. Also included, on toe slopes, are small areas of Capay soils that have slopes of less than 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour.

Most areas of this unit are used for dryland grain or for livestock grazing. A few areas are used for irrigated crops.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season.

General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Where this unit is used for livestock grazing, general management considerations include the clayey surface layer and excessive shrinking and swelling. The characteristic plant community is mainly soft chess, wild oat, and filaree. Trampling of the clayey surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate. Fencing is difficult. Excessive shrinking and swelling of the soil can cause fenceposts to be tilted or removed from the ground.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. General management considerations include the hazard of erosion. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIe-5 (MLRA-17), irrigated, and IVe-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

120—Capay clay, saline-sodic, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is in interfan basins. It formed in alluvium derived from mixed rock sources. Elevation is 25 to 45 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark grayish brown clay about 20 inches thick. The upper 24 inches of the subsoil also is grayish brown and dark grayish brown clay. The lower part to a depth of 60 inches is dark brown and pale brown silty clay loam and clay loam. The soil is saline-sodic throughout and is calcareous below a depth of 20 inches. In some areas the surface layer is silty clay.

Included in this unit are small areas of Columbia and Willows soils in the slightly lower landscape positions. Also included are small areas of fine textured soils that are not saline-sodic or do not have a perched water table. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth of the crops commonly grown in the county is limited by a perched water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the saline-sodic conditions, the high water table, and the slow permeability. The content of salts can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soil. Intensive management is required to reduce the salinity and maintain productivity. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability, the high shrink-swell potential, low strength, the high water table, and the saline-sodic conditions. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. Salt-tolerant species should be selected for planting.

This map unit is in capability units IIw-6 (MLRA-17), irrigated, and IVw-6 (MLRA-17), nonirrigated. It is in vegetative soil group F.

121—Capay clay, wet, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is in interfan basins. It formed in alluvium derived from mixed rock sources. It has a high water table as a result of the application of irrigation water. Drainage systems that require continual maintenance have been used to lower the water table. Elevation is 25 to 140 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark grayish brown clay about 20 inches thick. The upper 24 inches of the subsoil is grayish brown, dark grayish brown, and dark brown clay. The lower part to a depth of 60 inches is pale brown silty clay loam and clay loam. The soil is calcareous below a depth of 20 inches. In some areas the surface layer is silty clay.

Included in this unit are small areas of El Solyo, Stomar, and Vernalis soils on the slightly higher parts of the landscape. Also included are small areas of fine textured soils that are saline-sodic in some part or that do not have a perched water table. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth of the crops commonly grown in the county is limited by a perched water table at a depth of 4 to 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the high water table and the slow permeability. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Tile drainage can lower the water table if a suitable outlet is available. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Because of the restricted permeability, the applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability, the high shrink-swell potential, low strength, and the high water table. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. The slow permeability can be overcome by increasing the size of the absorption field. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed.

This map unit is in capability units IIw-5 (MLRA-17), irrigated, and IVw-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

122—Capay-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is in interfan basins. Elevation is 30 to 200 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Capay clay and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of El Solyo, Stomar, and Vernalis soils on the slightly higher parts of the landscape. Also included are small areas of soils that have been altered by construction activities and fine textured soils that have a perched water table at a depth of 48 inches. Included areas make up about 15 percent of the total acreage.

The Capay soil is very deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown and dark grayish brown clay about 20 inches thick. The subsoil to a depth of 60 inches is grayish brown, dark grayish brown, and dark brown clay. In some areas the surface layer is silty clay.

Permeability is slow in the Capay soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of the Capay soil.

Most areas of this unit are used for urban development. A few areas are used for irrigated crops or orchards.

Where the Capay soil is used for urban development, the main limitations are the slow permeability, low strength, and the high shrink-swell potential. On sites

for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

The Capay soil is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The Capay soil is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C. The Urban land is not assigned a capability classification or a vegetative soil group.

123—Carbona clay loam, 2 to 8 percent slopes. This very deep, well drained, gently sloping and moderately sloping soil is on uplifted, dissected terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 150 to 500 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam. The soil is calcareous between depths of 25 and 60 inches. In some areas the surface layer is clay, gravelly clay, or gravelly clay loam.

Included in this unit are small areas of Capay and El Solyo soils in the slightly lower landscape positions. Also included, on the slightly higher parts of the landscape, are small areas of Carbona and Pleito soils that have slopes of 8 to 15 percent. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for livestock grazing. A few areas are used for dryland grain crops. If irrigation water is available, the unit can be used for irrigated crops.

Where this unit is used for livestock grazing, general management considerations include the clay loam surface layer. The characteristic plant community is mainly soft chess, filaree, and wild oat. Trampling of the clay loam surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Where this unit is used for irrigated row, field, or orchard crops, the main limitation is the slow permeability. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIe-5 (MLRA-17), irrigated, and IVe-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

124—Carbona-Orognen complex, 15 to 30 percent slopes. These moderately steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,300 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Carbona clay loam and 40 percent Orognen gravelly clay loam. The components of

this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Calla soils in landscape positions similar to those of the Carbona and Orognen soils and small areas of soils that are very deep, are very gravelly and medium textured, have accumulations of cobbles and stones on the surface, and are in dissected drainageways. Also included are small areas of Carbona and Orognen soils that have slopes of 8 to 15 percent or 30 to 50 percent. The areas where slopes are 8 to 15 percent are on toe slopes, and the areas where slopes are 30 to 50 percent are on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

The Carbona soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam. In some areas the surface layer is gravelly clay loam.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate or severe.

The Orognen soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown gravelly clay loam about 11 inches thick. The upper 19 inches of the subsoil is reddish brown gravelly clay. The lower part to a depth of 60 inches is brown and strong brown clay. In some areas the surface layer is gravelly loam.

Permeability is very slow in the Orognen soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the clay loam surface layer and the hazard of erosion. The characteristic plant community is mainly soft chess, filaree, and wild oat. Trampling of the clay loam surface layer by livestock when the soils are too wet reduces productivity and increases the runoff rate. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion.

This map unit is in capability unit IVe-1 (MLRA-17), nonirrigated. The Carbona soil is in vegetative soil group C, and the Orognen soil is in vegetative soil group D.

125—Carbona-Orognen complex, 30 to 50 percent slopes. These steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,300 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Carbona clay loam and 40 percent Orognen gravelly clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Calla soils in landscape positions similar to those of the Carbona and Orognen soils and small areas of soils that are very deep, are very gravelly and medium textured, have accumulations of cobbles and stones on the surface, and are in dissected drainageways. Also included are small areas of Orognen and Carbona soils that have slopes of 50 to 65 percent or 15 to 30 percent. The areas where slopes are 50 to 65 percent are on the slightly higher parts of the landscape, and the areas where slopes are 15 to 30 percent are on the slightly lower parts. Included areas make up about 15 percent of the total acreage.

The Carbona soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam. In some areas the surface layer is gravelly clay loam.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

The Orognen soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown gravelly clay loam about 11 inches thick. The upper 19 inches of the subsoil is reddish brown gravelly clay. The lower part to a depth of 60 inches is brown and strong brown clay. In some areas the surface layer is gravelly loam.

Permeability is very slow in the Orognen soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion. The characteristic plant community is mainly soft chess, filaree, and wild oat. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. The Carbona soil is in vegetative soil group C, and the Orognen soil is in vegetative soil group D.

126—Carbona complex, 15 to 50 percent slopes. These moderately steep and steep soils are on uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,500 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Carbona clay loam and 40 percent Carbona clay loam that has a bedrock substratum. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Wisflat soils in convex positions near the top of the slopes, exposed bedrock on ridges, and Arburua and San Timoteo soils on the slightly higher parts of the landscape. Also included are small areas of Carbona and Calla soils that have slopes of 8 to 15 percent or 50 to 65 percent. The areas where slopes are 8 to 15 percent are on toe slopes, and the areas where slopes are 50 to 65 percent are in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

The Carbona soil that has no bedrock substratum is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 6 inches of the surface layer is dark gray clay loam. The lower 19 inches is dark grayish brown clay. The upper 11 inches of the subsoil is pale brown clay loam. The lower part to a depth of 62 inches is light yellowish brown clay loam. In some areas the surface layer is clay.

Permeability is slow in the Carbona soil that has no bedrock substratum. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe.

The Carbona clay loam that has a bedrock substratum is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark grayish brown and grayish brown clay loam about 19 inches thick. The subsoil extends to a depth of 57 inches. It is grayish brown clay loam. Soft sandstone is below a depth of 57 inches. In some areas the surface layer is clay.

Permeability is slow in the Carbona soil that has a bedrock substratum. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is limited by the bedrock at a depth of 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion. The characteristic plant community is mainly soft chess, filaree, and wild oat. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. It is in vegetative soil group C.

127—Chuloak coarse sandy loam, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is on low alluvial fans. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a moderately well drained soil; however, drainage has been improved by reclamation projects. Elevation is 70 to 100 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is grayish brown coarse sandy loam about 19 inches thick. The subsoil is brown sandy clay loam about 25 inches thick. The upper 11 inches of the substratum is pale brown, mottled fine sandy loam. The lower part to a depth of 64 inches is pale brown loamy coarse sand. In some areas the surface layer is loamy coarse sand.

Included in this unit are small areas of Delhi, Manteca, Veritas, and Tinnin soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Chuloak soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet, but water may be very briefly perched after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is well suited to irrigated row, field, and orchard crops. General management considerations include the hazard of soil blowing. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. On sites for septic tank absorption fields, the restricted permeability can be overcome by increasing the size of the absorption field.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

128—Cogna fine sandy loam, 0 to 2 percent slopes, overwashed. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 70 to 150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown fine sandy loam about 18 inches thick. Below this is a buried surface layer of dark grayish brown loam about 20 inches thick. The subsoil and the underlying material to a depth of 60 inches are dark grayish brown loam and silt loam. In some areas the surface layer is loam or silt loam.

Included in this unit are small areas of Archerdale soils in landscape positions similar to those of the Cogna soil and Columbia soils in the slightly lower positions. Also included are small areas of Cogna soils that have moderately coarse textured overwash layers up to 35 inches thick. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Cogna soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, and orchard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, general management considerations include the hazard of rare flooding. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

129—Cogna loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on low fan terraces. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 40 to 130 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown and dark brown loam about 25 inches thick. The subsoil and the underlying material to a depth of 64 inches are brown clay loam and pale brown and brown loam. In some areas the surface layer is clay loam or silt loam.

Included in this unit are small areas of Archerdale, Boggiano, and Vignolo soils in landscape positions similar to those of the Cogna soil. Also included are small areas of Columbia soils in the slightly lower positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Cogna soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, and orchard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, general

management considerations include the hazard of rare flooding. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

130—Columbia fine sandy loam, drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches is stratified light gray, brown, pale brown, and yellowish brown, mottled silt loam, fine sandy loam, and loamy fine sand. In some areas the surface layer is loam.

Included in this unit are small areas of Dello, Egbert, Grangeville, Guard, and Merritt soils in landscape positions similar to those of the Columbia soil and Cogna soils on the slightly higher parts of the landscape. Also included are small areas of Columbia soils that have moderately fine textured overwash. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. The water table has been lowered to a depth of 6 feet or more through drainage systems, but water may be perched above the stratified substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. It has few limitations. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Maintaining crop residue on or near the surface helps to prevent excessive runoff, reduces the hazard of soil blowing, and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, general management considerations include the hazard of rare flooding. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-2 (MLRA-17), irrigated, and IVs-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

131—Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by reclamation projects. Elevation is 10 to 30 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches is stratified light brownish gray and brown, mottled sandy loam and fine sandy loam. In some areas the surface layer is loam or silty clay loam.

Included in this unit are small areas of Dello, Grangeville, and Merritt soils in landscape positions similar to those of the Columbia soil. Also included are small areas of Columbia soils that have a surface layer of sand or a buried substratum of fine textured material below a depth of 30 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 5 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to occasional, brief or long periods of flooding from December through April.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is the high water

table. The occasional flooding is a hazard. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and if a drainage system is installed. The risk of flooding can be reduced by levees and diversions. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff, reduces the hazard of soil blowing, and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, the main limitation is the high water table. The occasional flooding is a hazard. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

132—Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. The landscape is channeled by intermittent drainageways. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by reclamation projects. Elevation is 10 to 55 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches is stratified light gray, brown, yellowish brown, and light brownish gray, mottled silt loam, fine sandy loam, and sand. In some areas the surface layer is loam.

Included in this unit are small areas of Dello and Merritt soils in landscape positions similar to those of the Columbia soil. Also included are small areas of soils that have a surface layer of sand or a buried substratum of moderately fine textured or fine textured material below a depth of 30 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Columbia soil. Available water capacity is moderate. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table at a depth of 3 to 5 feet. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to frequent, brief or long periods of flooding from December through April. Channeling and deposition are common along streambanks.

Most areas are used for recreational development or wildlife habitat. A few areas have been converted to irrigated cropland. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for recreational development, general management considerations include the hazards of flooding and soil blowing. Protection from flooding is needed. A drainage system is needed in areas used for paths and trails. Areas used for recreation can be protected from soil blowing and dust by a good plant cover.

Where this unit is used for irrigated row or field crops, the main limitation is the high water table. General management considerations include the hazard of frequent flooding and the channeled landscape. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed. The channeled landscape may require deep cuts that will expose the stratified substratum. Maintaining crop residue on or near the surface helps to prevent excessive runoff, reduces the hazard of soil blowing, and helps to maintain the rate of water intake and the organic matter content.

This map unit is in capability units IIIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

133—Columbia fine sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 10 to 20 feet. The average annual

precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown fine sandy loam about 20 inches thick. The upper 28 inches of the underlying material is grayish brown and light brownish gray, mottled fine sandy loam. The lower part to a depth of 60 inches is dark gray, mottled clay. In some areas the surface layer is loam.

Included in this unit are small areas of Dello, Grangeville, and Merritt soils in landscape positions similar to those of the Columbia soil. Also included are small areas of Columbia soils that have coarse textured layers below the clayey substratum. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the upper part of the Columbia soil and slow in the clayey substratum. Available water capacity is moderate. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 5 feet through drainage systems that require continual maintenance. The effective rooting depth also is limited by the clayey substratum at a depth of 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the high water table and the clayey substratum. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff, reduces the hazard of soil blowing, and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, the main limitations are the clayey substratum and the high water table. The rare flooding is a hazard. Septic tank absorption fields do not function properly during rainy periods because of wetness and slow permeability in the substratum. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-3 (MLRA-17), irrigated, and IVw-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

134—Cometa sandy loam, 2 to 5 percent slopes. This moderately well drained, undulating soil is on low, dissected terraces. It is moderately deep to dense, weakly cemented sediments. It formed in old alluvium derived from granitic rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 100 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is brown sandy loam about 22 inches thick. The upper part of the subsoil is a claypan of brown sandy clay about 14 inches thick. The lower part to a depth of 60 inches is brown, dense, weakly cemented sandy loam and sandy clay loam. In some areas the surface layer is coarse sandy loam.

Included in this unit are small areas of Montpellier soils in landscape positions similar to those of the Cometa soil and Redding soils on the slightly higher parts of the landscape. Also included are small areas of Rocklin and San Joaquin soils in the slightly lower landscape positions and Cometa soils that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Cometa soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the dense, weakly cemented sediments at a depth of 24 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 17 to 25 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the claypan or underlying sediments after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing or for dryland grain crops. A few areas are used for irrigated orchards or vineyards or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess,

ripgut brome, wild oat, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Limiting tillage during seedbed preparation and during the application of weed-control measures helps to prevent excessive runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated orchard and vineyard crops. The main limitations are depth to the claypan and depth to the dense, weakly cemented sediments. General management considerations include the hazard of erosion. The claypan and the dense, weakly cemented sediments limit the suitability for deep-rooted crops. Where feasible, deep ripping of these restrictive layers helps to overcome these limitations. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are depth to the claypan or to dense, weakly cemented sediments; the high shrink-swell potential; the very slow permeability; and low strength. General management considerations include the hazard of erosion. Cuts needed to provide essentially level building sites can expose the claypan or dense subsoil. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability units IIIe-3 (MLRA-17), irrigated, and IVe-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

135—Corning-Redding complex, 2 to 8 percent slopes. These undulating and gently rolling soils are on the convex side slopes of terraces, commonly on the upper part of the slopes. The native vegetation is mainly annual grasses and forbs. Elevation is 140 to 270 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Corning gravelly loam and 40 percent Redding gravelly loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Redding soils that have slopes of 0 to 2 percent and are on toe slopes, Yellowlark soils in the slightly lower landscape positions, and gravelly soils that have a claypan and a hardpan at a depth of 40 to 60 inches. The gravelly soils are in landscape positions similar to those of the dominant Corning and Redding soils. Also included are Corning and Redding soils that have slopes of 8 to 20 percent and small areas of soils that are similar to the Corning soil but are underlain by consolidated sediments at a depth of 30 to 60 inches. Included areas make up about 15 percent of the total acreage.

The Corning soil is very deep and moderately well drained. It formed in weakly consolidated alluvium derived from mixed but dominantly granitic rock sources. Typically, the surface layer is light brown, yellowish red, and light brown gravelly loam about 21 inches thick. The upper 15 inches of the subsoil is a claypan of reddish brown and yellowish red clay. The lower part to a depth of 60 inches is reddish yellow and light brown clay loam and loam. In some areas the surface layer is loam, sandy loam, or cobbly loam.

Permeability is very slow in the Corning soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is 60 inches or more, but roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 20 to 40 inches. Water is very briefly perched above the claypan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

The Redding soil is moderately deep to a hardpan and is moderately well drained. It formed in weakly consolidated alluvium derived from mixed but dominantly granitic rock sources. Typically, the surface layer is reddish yellow gravelly loam about 4 inches thick. The next 11 inches also is reddish yellow gravelly loam. The upper 10 inches of the subsoil is a claypan of reddish brown clay and clay loam. The lower part to a

depth of 60 inches is a pink and reddish yellow, indurated hardpan. In some areas the surface layer is loam, gravelly sandy loam, or cobbly loam.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is very briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing. A few areas are used for irrigated vineyards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the very low available water capacity in the Redding soil and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. The very low available water capacity limits the production of desirable forage plants. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

Where this unit is used for irrigated vineyard crops, the main limitations are depth to the claypan and the very low available water capacity. The Redding soil also is limited by depth to the hardpan. General management considerations include the hazard of erosion. Subsoiling increases the effective rooting depth of the Corning soil. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because these soils are droughty, applications of irrigation water should be light and frequent. All tillage should be on the contour or across the slope. If the soils are plowed in the fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soils or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

136—Corning-Redding complex, 8 to 15 percent slopes. These rolling soils are on the convex side slopes of terraces. Cobbles cover 3 to 15 percent of the surface. The native vegetation is mainly annual grasses and forbs. Elevation is 130 to 290 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Corning cobbly loam and 40 percent Redding cobbly loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Redding soils that have slopes of 0 to 5 percent and are on toe slopes, Yellowlark soils in the slightly lower landscape positions, and claypan soils that have a gravelly surface layer and have a hardpan at a depth of 40 to 60 inches. The claypan soils are in landscape positions similar to those of the dominant Corning and Redding soils. Also included are small areas of soils that are similar to the Corning soil but are underlain by consolidated sediments at a depth of 30 to 60 inches or have a claypan at a depth of 20 to 40 inches and small areas of Corning and Redding soils that have slopes of 15 to 20 percent. The steeper Corning and Redding soils are on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

The Corning soil is very deep and moderately well drained. It formed in weakly consolidated alluvium derived from mixed but dominantly granitic rock sources. Typically, the surface layer is light brown, yellowish red, and light brown cobbly loam about 12 inches thick. The upper 13 inches of the subsoil is a claypan of reddish brown and yellowish red clay. The lower part to a depth of 67 inches is reddish yellow and light brown clay loam and loam. In some areas the surface layer is gravelly loam or gravelly sandy loam.

Permeability is very slow in the Corning soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is 60 inches or more, but roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is very briefly perched above the claypan after periods of heavy rainfall or irrigation. Runoff is medium or rapid, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

The Redding soil is moderately deep to a hardpan and is moderately well drained. It formed in weakly consolidated alluvium derived from mixed but dominantly granitic rock sources. Typically, the surface layer is reddish yellow cobbly loam about 4 inches thick. The next 11 inches is reddish yellow and

yellowish red gravelly loam. The upper 10 inches of the subsoil is a claypan of reddish brown clay and clay loam. The lower part to a depth of 60 inches is a pink and reddish yellow, indurated hardpan. In some areas the surface layer is gravelly sandy loam or gravelly loam.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Depth to the water table is more than 6 feet. Runoff is medium or rapid, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing. A few areas are used for irrigated vineyards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the very low available water capacity in the Redding soil and the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. The very low available water capacity limits the production of desirable forage plants. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

Where this unit is used for irrigated vineyard crops, the main limitations are depth to the claypan, the slope, the cobbles on the surface, and the very low available water capacity. The Redding soil also is limited by depth to the hardpan. General management considerations include the hazard of erosion. Subsoiling increases the effective rooting depth of the Corning soil. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. All tillage should be on the contour or across the slope. If the soils are plowed in the fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Annual cultivation should be avoided on the steeper slopes. The cobbles on the surface cause rapid wear of tillage equipment. Because the Redding soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soils or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

137—Cortina gravelly sandy loam, 0 to 5 percent slopes. This very deep, somewhat excessively drained, nearly level and gently sloping soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 100 to 400 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown gravelly sandy loam about 18 inches thick. The underlying material to a depth of 60 inches is pale brown, stratified very gravelly sandy loam and very gravelly loamy sand. In some areas the surface layer is gravelly loam or gravelly clay loam.

Included in this unit are small areas of Cortina soils that have slopes of 5 to 8 percent and Vernalis and Zacharias soils on the slightly higher parts of the landscape. Also included are areas of Xerofluvents and Xerorthents in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Cortina soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing. A few areas are used for irrigated crops or for dryland grain crops.

Where this unit is used for livestock grazing, general management considerations include the low available water capacity. The characteristic plant community is mainly red brome, soft chess, and filaree. The low available water capacity limits the production of desirable forage plants.

Where this unit is used for dryland grain crops, the main limitations are low rainfall during the growing season and the low available water capacity. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. The high content of gravel in this soil reduces the amount of moisture available for plant growth.

Coarse fragments on the surface cause rapid wear of tillage equipment. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the high content of gravel and the low available water capacity. General management considerations include the hazard of erosion. The high content of gravel reduces the amount of moisture available for plant growth. Coarse fragments on the surface cause rapid wear of tillage equipment. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and IVs-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

138—Cosumnes silty clay loam, drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on low flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 25 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown silty clay loam about 7 inches thick. The upper 14 inches of the underlying material is pale brown, mottled silty clay loam. The next 26 inches is grayish brown, mottled clay. The lower part to a depth of 63 inches is brown and pale brown, mottled clay. In some areas the surface layer is silt loam.

Included in this unit are small areas of Columbia and Sailboat soils and small areas of Cosumnes soils that have a water table below a depth of 48 inches. Also included are small areas of fine textured soils that have a hardpan below a depth of 48 inches. All of the included soils are in landscape positions similar to the dominant Cosumnes soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet, but water may be briefly perched above the substratum after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This map unit is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

139—Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, somewhat poorly drained, nearly level soil is on low flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 25 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown silty clay loam about 7 inches thick. The upper 14 inches of the underlying material is pale brown, mottled silty clay loam. The next 26 inches is grayish brown, mottled clay. The lower part to a depth of 63 inches is brown and pale brown, mottled clay. In some areas the surface layer is silt loam.

Included in this unit are small areas of Columbia and Sailboat soils, areas of Cosumnes soils that have a

water table below a depth of 48 inches, and small areas of fine textured soils that have a hardpan below a depth of 48 inches. All of these included soils are in landscape positions similar to those of the dominant Cosumnes soil. Also included are small areas of San Joaquin soils on the slightly higher terraces. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Cosumnes soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet, but water may be briefly perched above the substratum after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to occasional, brief or long periods of flooding from December through April.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the slow permeability. The occasional flooding is a hazard. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. The risk of flooding can be reduced by levees and diversions. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. The occasional flooding is a hazard. It can impair the grazing system. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This map unit is in capability units IIw-5 (MLRA-17), irrigated, and IVw-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

140—Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained, nearly level soil is on high flood plains. It formed in alluvium derived from mixed rock sources. Elevation is 80 to 165 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown silt loam about 23 inches thick. The upper 13 inches of the underlying material is dark brown silt loam. The lower part to a depth of 69 inches is stratified, dark brown silty clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of Reiff soils on the slightly higher parts of the landscape, Sailboat soils on the slightly lower parts, and San Joaquin soils on the slightly higher terraces. Also included, in landscape positions similar to those of the Coyotecreek soil, are small areas of soils that are gravelly and moderately fine textured or that have moderately coarse textured overwash. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Coyotecreek soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.7 inch per hour. The soil is subject to occasional, very brief or brief periods of flooding from December through April.

Most areas are used for irrigated crops, orchards, or vineyards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The occasional flooding is a hazard. The risk of flooding can be reduced by levees and diversions. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

141—Delhi fine sand, 0 to 5 percent slopes. This very deep, somewhat excessively drained, nearly level and gently sloping soil is on dunes. It formed in wind-modified alluvium derived from granitic rock sources. In most areas slopes originally were 2 to 7 percent prior to extensive land leveling. Elevation is 30 to 110 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown fine sand about 10 inches thick. The underlying material to a depth of 60 inches is brown and yellowish brown fine sand. In some areas the surface layer is loamy sand or loamy coarse sand.

Included in this unit are small areas of Tinnin and Veritas soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Delhi soil. Available water

capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is very severe.

Most areas of this unit are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is the low available water capacity. General management considerations include the very severe hazard of soil blowing. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitation is the rapid permeability in the substratum. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

142—Delhi loamy sand, 0 to 2 percent slopes. This very deep, somewhat excessively drained, nearly level soil is on dunes. It formed in wind-modified alluvium derived from granitic rock sources. Elevation is 25 to 135 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and light brownish gray loamy sand about 16 inches thick. The upper 10 inches of the underlying material is grayish brown loamy sand. The lower part to a depth of 60 inches is pale brown sand. In some areas the surface layer is loamy fine sand or fine sand.

Included in this unit are small areas of Honcut, Tinnin, and Veritas soils in the slightly lower landscape positions. Also included, on the slightly higher parts of the landscape, are small areas of Delhi soils that have slopes of 2 to 5 percent. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Delhi soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe.

Most areas of this unit are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is the low available water capacity. General management considerations include the severe hazard of soil blowing. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitation is the rapid permeability in the substratum. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

143—Delhi-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is on dunes. Elevation is 25 to 135 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Delhi loamy sand and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Honcut, Tinnin, and Veritas soils in the slightly lower landscape positions. Also included are small areas of soils that have been altered by construction activities. Included areas make up about 15 percent of the total acreage.

The Delhi soil is very deep and somewhat excessively drained. It formed in wind-modified alluvium derived from granitic rock sources. Typically, the surface layer is grayish brown and light brownish gray loamy sand about 16 inches thick. The upper 10 inches of the underlying material is grayish brown loamy sand. The lower part to a depth of 60 inches is pale brown sand. In some areas the surface layer is loamy fine sand or fine sand.

Permeability is rapid in the Delhi soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Delhi loamy sand.

Most areas of this unit are used for urban development. A few areas are used for irrigated crops, orchards, or vineyards.

Where the Delhi soil is used for urban development, the main limitation is the rapid permeability in the substratum. Community sewage systems are needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies.

The Delhi soil is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is the low available water capacity. General management considerations include the severe hazard of soil blowing. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

The Delhi soil is in capability units IIIs-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B. The Urban land is not assigned a capability classification or a vegetative soil group.

144—Dello sand, partially drained, 0 to 2 percent slopes, occasionally flooded. This very deep, very poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 30 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is pale brown, mottled sand about 20 inches thick. The underlying material to a depth of 60 inches is very pale brown, mottled sand. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Columbia soils in landscape positions similar to those of the Dello soil and Fluvaquents in the slightly lower positions. Also included are small areas of Dello soils that have a stratified medium textured to fine textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Dello soil. Available water capacity is low. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 4 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is very severe. The soil is subject to occasional, long periods of flooding from November through March. Channeling and deposition are common along streambanks.

Most areas are used for wildlife habitat or recreational development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for recreational development, general management considerations include the hazard of occasional flooding and the very severe hazard of soil blowing. Protection from flooding is needed. A drainage system is needed in areas used for paths and trails. Areas used for recreation can be protected from soil blowing and dust by a good plant cover.

Where this unit is used for irrigated row or field crops, the main limitations are the low available water capacity and the high water table. General management considerations include the hazard of occasional flooding and the very severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Tile drainage can lower the water table if a suitable outlet is available. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed.

The risk of flooding can be reduced by levees and diversions. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This map unit is in capability units IIIw-4 (MLRA-17), irrigated, and IVw-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

145—Dello loamy sand, drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 30 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is light yellowish brown loamy sand about 7 inches thick. The underlying material to a depth of 60 inches is pale brown and light gray, mottled sand. In some areas the surface layer is sandy loam or loamy fine sand.

Included in this unit are small areas of Columbia soils and small areas of Dello soils that have a stratified medium textured to fine textured substratum below a depth of 40 inches. Both of these included soils are in landscape positions similar to those of the dominant Dello soil. Also included, on the slightly higher parts of the landscape, are Egbert and Merritt soils and small areas of coarse textured soils that have a weakly cemented substratum below a depth of 36 inches. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Dello soil. Available water capacity is low. The effective rooting depth is more than 60 inches. Drainage systems that require continual maintenance have been used to lower the apparent water table to a depth of 6 feet or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the low available water capacity and the high water table. General management considerations include the severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This map unit is in capability units IIIw-4 (MLRA-17), irrigated, and IVw-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

146—Dello loamy sand, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains and old slough remnants. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 10 feet below sea level to 10 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown and brown loamy sand about 10 inches thick. The underlying material to a depth of 60 inches is light brownish gray, mottled fine sand and sand. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Devries, Egbert, Grangeville, Merritt, and Piper soils on the slightly higher parts of the landscape. Also included are small areas of Shima, Valdez, and Venice soils on the slightly lower parts. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Dello soil. Available water capacity is low. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table at a depth of 3 to 4 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the low available water capacity and the high water table. General management considerations include the severe hazard of soil blowing. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Because the soil is droughty, applications of irrigation

water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This map unit is in capability units IIIw-4 (MLRA-16), irrigated, and IVw-4 (MLRA-16), nonirrigated. It is in vegetative soil group B.

147—Dello sandy loam, clayey substratum, drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains and old slough remnants. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 30 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 16 inches thick. The underlying material is about 27 inches of white, mottled sand and loamy sand. Below this to a depth of 60 inches is a buried surface layer of gray, mottled silty clay and light brownish gray, mottled clay loam. In some areas the surface layer is fine sandy loam or coarse sand.

Included in this unit are small areas of Columbia soils in landscape positions similar to those of the Dello soil and Merritt and Egbert soils on the slightly higher parts of the landscape. Also included are small areas of Dello soils that have a moderately fine textured overwash. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the upper part of the Dello soil and slow in the clayey substratum. Available water capacity is moderate. The effective rooting depth is limited by a clayey substratum at a depth of 40 to 60 inches. Drainage systems that require continual maintenance have been used to lower the apparent water table to a depth of 5 feet or more, but water may be briefly perched above the clayey substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the slowly permeable substratum and the high water table. General management considerations include the hazard of soil blowing. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This map unit is in capability units IIIw-3 (MLRA-17), irrigated, and IVw-3 (MLRA-17), nonirrigated. It is in vegetative soil group B.

148—Dello clay loam, drained, 0 to 2 percent slopes, overwashed. This very deep, very poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 30 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown clay loam about 12 inches thick. The underlying material to a depth of 60 inches is mottled sand and fine sand. In some areas the surface layer is loam, sandy clay loam, or silty clay loam.

Included in this unit are small areas of Columbia soils in landscape positions similar to those of the Dello soil and Merritt and Egbert soils on the slightly higher parts of the landscape. Also included are small areas of Dello soils that have a stratified medium textured to fine textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Dello soil. Available water capacity is low. The effective rooting depth is more than 60 inches. Drainage systems that require continual maintenance have been used to lower the apparent water table to a depth of 5 to 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops.

The main limitations are the low available water capacity and the high water table. Because the soil is droughty, applications of irrigation water should be light and frequent. The water should be applied in amounts sufficient to wet the root zone but small enough to minimize the leaching of plant nutrients. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIIw-4 (MLRA-17), irrigated, and IVw-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

149—Devries sandy loam, drained, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is on basin rims. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 35 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown sandy loam about 13 inches thick. The upper part of the subsoil is light gray, mottled sandy loam about 15 inches thick. The lower part to a depth of 80 inches is a light gray, indurated hardpan. In some areas the surface layer is fine sandy loam or loam.

Included in this unit are small areas of Dello, Guard, and Rioblancho soils in the slightly lower landscape positions; Tujunga soils in old, leveled sloughs; and Acampo soils on the slightly higher parts of the landscape. Also included are a few areas where depth to a hardpan is as little as 15 inches, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Devries soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Drainage systems that require continual maintenance have been used to lower the apparent water table to a depth of 5 feet or more, but water may be perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are depth to the hardpan and the low available water capacity. General management considerations include the hazard of soil blowing. The hardpan limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because the soil is droughty, applications of irrigation water should be light and frequent. Careful applications are needed to prevent the buildup of a perched water table above the hardpan. A drainage system may be needed. Furrow, border, and sprinkler irrigation systems are suitable. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitation is depth to the hardpan. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability unit IVw-8 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group G.

150—Dumps. This map unit occurs as smoothed or uneven accumulations of refuse that cannot support plants unless major reclamation measures are applied. It is in scattered areas throughout the county.

Included in this unit are Pits and Xerorthents. Included areas make up about 10 percent of the total acreage.

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. This unit is poorly suited to most land uses.

This map unit is not assigned a capability classification or a vegetative soil group.

151—Dumps, tailings. This map unit occurs as smoothed or uneven accumulations of dredge tailings that can support only sparse stands of vegetation unless major reclamation measures are applied. It consists of primarily sandy and gravelly material deposited as tailings after most of the fine earth-material was removed during gold dredging operations. The unit is in scattered areas throughout the eastern portion of the county.

Included in this unit are Pits and Xerofluvents. Included areas make up about 10 percent of the total acreage.

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. Low areas along streambanks are subject to frequent, brief periods of flooding from December through April. Channels and deposition are common along streambanks. High areas are subject to flooding only during years of abnormally high precipitation. This unit is poorly suited to most land uses.

This map unit is not assigned a capability classification or a vegetative soil group.

152—Egbert mucky clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 10 feet above. The average annual precipitation is about 13 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 8 inches of the surface layer is gray mucky clay loam. The lower 11 inches is dark gray, mottled clay. The underlying material to a depth of 60 inches is variegated olive gray, gray, and dark gray clay and clay loam. In some areas the surface layer is silty clay.

Included in this unit are small areas of Peltier and Ryde soils on the slightly lower parts of the landscape near old channels or streams and Kingile and Rindge soils in the slightly lower landscape positions. Also included are small areas of Guard, Merritt, and Valdez soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the slow permeability and the high water table. General management considerations include the hazard of soil blowing. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are the slow permeability, the high water table, the high shrink-swell potential, and low strength. The rare flooding is a hazard. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. The slow permeability can be overcome by increasing the size of the absorption field. A drainage system is needed if roads or building foundations are constructed. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group C.

153—Egbert silty clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has

been improved by levees and reclamation projects. A few areas are dissected by intermittent sloughs that have been filled because of land leveling. Elevation is 5 feet below sea level to 10 feet above. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 8 inches of the surface layer is gray silty clay loam. The lower 11 inches is dark gray, mottled clay. The underlying material to a depth of 60 inches is variegated olive gray, gray, and dark gray clay and clay loam. In some areas the surface layer is silty clay.

Included in this unit are small areas of Columbia, Grangeville, Merritt, and Scribner soils in landscape positions similar to those of the Egbert soil. Also included are small areas of Stockton and Willows soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Egbert soil. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the slow permeability and the high water table. General management considerations include the hazard of soil blowing. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, the slow permeability, low strength, and the high water table. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. The slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group C.

154—Egbert silty clay loam, sandy substratum, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains adjacent to rivers and sloughs. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 15 feet above. The average annual precipitation is about 12 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 14 inches of the surface layer is gray silty clay loam. The lower part to a depth of 40 inches is black and dark grayish brown, mottled clay loam. The substratum to a depth of 60 inches is light gray, stratified fine sand, loamy fine sand, and loamy coarse sand. In some areas the surface layer is mucky clay loam.

Included in this unit are small areas of Dello soils in the slightly lower landscape positions. Also included are small areas of Grangeville, Merritt, and Ryde soils in landscape positions similar to those of the Egbert soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the upper part of the Egbert soil and rapid in the sandy substratum, which is at a depth of 40 to 60 inches. The available water capacity is high. The shrink-swell potential also is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table at a depth of 3 to 4 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas

are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the slow permeability and the high water table. General management considerations include the hazard of soil blowing. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Deep drainage ditches can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, low strength, the rapid permeability in the substratum, and the high water table. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group C.

155—Egbert-Urban land complex, partially drained, 0 to 2 percent slopes. This nearly level map unit is on flood plains. Elevation is sea level to 15 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Egbert silty clay loam and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Stockton, Jacktone, and Rioblancho soils on the slightly higher parts of the landscape. Also included are small areas of Egbert soils that have a water table below a depth of 5 feet. Included areas make up about 15 percent of the total acreage.

The Egbert soil is very deep and poorly drained. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Typically, the surface layer is gray silty clay loam about 6 inches thick. The next 25 inches is mottled gray and dark gray silty clay loam. The underlying material to a depth of 60 inches is olive gray clay loam. In some areas the surface layer is silty clay.

Permeability is slow in the Egbert soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Egbert silty clay loam.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Egbert soil is used for urban development, the main limitations are the high shrink-swell potential, low strength, the high water table, and the slow permeability. General management considerations include the hazard of rare flooding and the hazard of soil blowing. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. Houses, roads, and streets should be constructed above expected flood levels.

The Egbert soil is suited to irrigated row and field crops. The main limitations are the slow permeability and the high water table. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Areas adjacent to levees are subject

to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

The Egbert soil is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group C. The Urban land is not assigned a capability classification or a vegetative soil group.

156—El Solyo clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on low alluvial fans. It formed in alluvium derived from sedimentary rock sources. Elevation is 60 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown clay loam about 10 inches thick. The subsoil to a depth of 60 inches is brown and pale brown silty clay loam. The soil is calcareous between depths of 10 and 60 inches. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Stomar, Vernalis, and Zacharias soils on the slightly higher parts of the landscape. Also included, in landscape positions similar to those of the El Solyo soil, are small areas of soils that have a moderately fine textured surface layer and have a gravelly or very gravelly moderately fine textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the El Solyo soil. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development or for dryland grain crops.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability, low strength, and the high shrink-swell potential. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

157—Exeter sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 100 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are dark brown and brown sandy loam about 26 inches thick. The next part of the subsoil is brown sandy clay loam and loam about 7 inches thick. The lower part to a depth of 60 inches is a brown, indurated hardpan. In some areas the surface layer is loam.

Included in this unit are small areas of Kingdon and Acampo soils in the slightly lower landscape positions and Madera and San Joaquin soils on terraces. Also included are a few areas where depth to the hardpan is as little as 15 inches, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Exeter soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water

may be very briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or vineyards. A few areas are used for orchards or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the hardpan and the low available water capacity. The hardpan limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitation is depth to the hardpan. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

158—Finrod clay loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 35 to 120 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 8 inches of the surface layer is dark brown clay loam. The lower part of the surface layer and the upper part of the subsoil are dark brown and yellowish brown clay about 25 inches thick. The next part of the subsoil is variegated light yellowish brown, brown, and strong brown clay about 15 inches thick. The lower part to a depth of 60 inches is a variegated very pale brown and light yellowish brown, weakly cemented to indurated hardpan. In some areas the surface layer is clay or silty clay loam.

Included in this unit are small areas of Archerdale, Cogna, Hollenbeck, and Vignolo soils in landscape positions similar to those of the Finrod soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Archerdale soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be very briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, low strength, the slow permeability, and depth to the hardpan. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

159—Fluvaquents, 0 to 2 percent slopes, frequently flooded. These very deep, poorly and very poorly drained, nearly level soils are on low flood plains and interchannel bars and in tidal marshes on deltas. They formed in mineral sediments derived from mixed rock sources and in hydrophytic plant remains derived from reeds and tules. Elevation is 5 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is gray, mottled silty clay loam about 14 inches thick. The underlying material to a depth of 60 inches is stratified gray, dark gray, and olive, mottled fine sandy loam, silt loam, and silty clay loam. In some areas the surface layer is mucky loam or mucky clay loam.

Included in this unit are small areas of Columbia, Kingile, Peltier, and Ryde soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is slow to moderately rapid in the Fluvaquents. Available water capacity is low to high. The effective rooting depth is limited by an apparent water table at a depth of 6 to 24 inches throughout the year. Runoff is very slow, and the hazard of water erosion is slight. These soils are subject to frequent, long periods of flooding from November through April. Channeling and deposition are common along streambanks.

This unit is used mainly for wildlife habitat. It may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This map unit is in capability subclass VIIw (MLRA-16), nonirrigated. It is in vegetative soil group E.

160—Galt clay, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on basin rims and in basins. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark grayish brown clay about 25 inches thick. The upper 9 inches of the subsoil is dark grayish brown clay. The lower part to a depth of 60 inches is a variegated light yellowish brown, dark grayish brown, and white, weakly cemented hardpan. In some areas the surface layer is silty clay.

Included in this unit are small areas of Archerdale and Vignolo soils on the slightly higher parts of the landscape, Hollenbeck and Stockton soils in landscape positions similar to those of the Galt soil, and Peltier soils in the slightly lower landscape positions. Also included are small areas of Galt soils that have moderately coarse textured or moderately fine textured overburden and are on the slightly higher parts of the landscape and Galt soils that are highly calcareous or saline-sodic and are in landscape positions similar to those of the dominant Galt soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Galt soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water may be very briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the slow permeability, the low available water capacity, and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Because the soil is droughty, applications of irrigation water should be light and frequent. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, low strength, the slow permeability, and depth to the

hardpan. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

161—Galt clay, 2 to 5 percent slopes. This moderately well drained, gently sloping soil is on basin rims. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 110 to 140 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are grayish brown and dark grayish brown clay about 34 inches thick. The lower part of the subsoil to a depth of 60 inches is a dark grayish brown and white, weakly cemented hardpan. In some areas the surface layer is silty clay.

Included in this unit are small areas of Cometa and San Joaquin soils on terraces. Also included, on toe slopes, are small areas of Galt soils that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Galt soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is not subject to flooding.

Most areas are used for dryland grain crops. A few areas are used for livestock grazing or for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Where this unit is used for livestock grazing, general management considerations include excessive shrinking and swelling, the clayey surface layer, and saturated soil conditions in concave areas. The vegetation consists mainly of soft chess, annual ryegrass, and foxtail fescue. Fencing is difficult. Excessive shrinking and swelling of the soil can cause fenceposts to be tilted or removed from the ground. Trampling of the clayey surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate. Grazing should be delayed until the soil is firm enough to withstand the trampling and the more desirable forage plants have had an opportunity to set seed.

Where this unit is used for irrigated row, field, or orchard crops, the main limitations are the slow permeability, the low available water capacity, and depth to the hardpan. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Because the soil is droughty, the applications should be light and frequent. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIIe-8 (MLRA-17), irrigated, and IVe-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

162—Galt-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is on basin rims and in basins. Elevation is 20 to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Galt clay and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to

map them separately at the scale used.

Included in this unit are small areas of Hollenbeck and Stockton soils in landscape positions similar to those of the Galt soil. Also included, on the slightly higher parts of the landscape, are small areas of Galt soils that have moderately coarse textured or moderately fine textured overwash. Included areas make up about 15 percent of the total acreage.

The Galt soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is grayish brown and dark grayish brown clay about 25 inches thick. The upper 9 inches of the subsoil is dark grayish brown clay. The lower part to a depth of 60 inches is a variegated light yellowish brown, dark grayish brown, and white, weakly cemented hardpan. In some areas the surface layer is silty clay.

Permeability is slow in the Galt soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water may be very briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. In unprotected areas the soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Galt clay.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Galt soil is used for urban development, the main limitations are the high shrink-swell potential, low strength, the slow permeability, and depth to the hardpan. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

The Galt soil is suited to irrigated row and field crops. The main limitations are the slow permeability, the low available water capacity, and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Because the soil is droughty, the applications should be light and frequent. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The Galt soil is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G. The Urban land is not assigned a capability classification or a vegetative soil group.

163—Gonzaga-Franciscan complex, 30 to 50 percent slopes. These steep soils are on dominantly north-facing slopes on mountains. The native vegetation is mainly blue oak, Digger pine, annual grasses, forbs, and scattered perennial grasses. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 200 to 220 days.

This unit is 45 percent Gonzaga loam and 40 percent Franciscan loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Franciscan and Gonzaga soils that have slopes of more than 50 percent or less than 30 percent. These soils are in landscape positions similar to those of the dominant Gonzaga and Franciscan soils. Also included are small areas of exposed bedrock and Honker and Vallecitos soils in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Gonzaga soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the upper 5 inches of the surface layer is brown loam. The lower 5 inches is brown clay loam. The subsoil is a claypan of yellowish red clay about 19 inches thick. Hard shale bedrock is at a depth of 29 inches. In some areas the surface layer is clay loam or gravelly clay loam.

Permeability is very slow in the Gonzaga soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are

restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Franciscan soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown and brown loam about 13 inches thick. The subsoil is yellowish brown and brown clay loam about 23 inches thick. Hard sandstone bedrock is at a depth of 36 inches. In some areas the surface layer is gravelly loam.

Permeability is moderately slow in the Franciscan soil. Available water capacity is moderate. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion and the low available water capacity. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and minerslettuce and a sparse to medium overstory of blue oak and Digger pine. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Brush management improves areas of range that are producing woody shrubs at a level that decreases the extent of the preferred forage plants. If this unit is used as a source of firewood, the extent of the canopy cover will be reduced as a result of the low resprouting potential of blue oak. Because of the steep slopes, harvesting firewood is difficult. Minimizing the extent of surface disturbance during harvesting reduces the hazard of accelerated erosion.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. The Gonzaga soil is in vegetative soil group D, and the Franciscan soil is in vegetative soil group G.

164—Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes. These steep soils are on dominantly north-facing slopes on mountains. The native vegetation is mainly annual grasses, forbs, and blue oak. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 35 percent Gonzaga loam, 30 percent Honker loam, and 20 percent Franciscan loam. The Gonzaga and Franciscan soils are on the more northerly aspects, and the Honker soil is on knolls and the more southerly aspects. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Franciscan, Gonzaga, and Honker soils that have slopes of more than 50 percent or less than 30 percent. These soils are in landscape positions similar to those of the dominant Gonzaga, Honker, and Franciscan soils. Also included are small areas of exposed bedrock and eroded areas of Honker and Vallecitos soils in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Gonzaga soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the upper 5 inches of the surface layer is brown loam. The lower 5 inches is brown clay loam. The subsoil is a claypan of yellowish red clay about 19 inches thick. Hard shale bedrock is at a depth of 29 inches. In some areas the surface layer is clay loam or gravelly clay loam.

Permeability is very slow in the Gonzaga soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is a claypan of brown and strong brown gravelly clay about 28 inches thick. Hard sandstone bedrock is at a depth of 33 inches. In some areas the surface layer is clay loam, gravelly clay loam, or gravelly loam.

Permeability is very slow in the Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Franciscan soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown and brown loam about 13 inches thick. The subsoil is yellowish brown and brown clay loam about 23 inches thick. Hard sandstone bedrock is at a depth of 36 inches. In some areas the surface layer is gravelly loam, gravelly clay loam, or clay loam.

Permeability is moderately slow in the Franciscan soil. Available water capacity is moderate. The effective

rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion, the low available water capacity, and dense stands of chaparral or juniper in some areas. The characteristic plant community on the Gonzaga and Franciscan soils is mainly soft chess, ripgut brome, and wild oat and a scattered overstory of blue oak. That on the Honker soil is mainly soft chess, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The low available water capacity limits the production of desirable forage plants. Brush management improves areas of range that are producing woody shrubs at a level that decreases the extent of the preferred forage plants. Juniper competes for moisture and nutrients. On sites where the extent of juniper is increasing, forage production will decline regardless of the grazing management used.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. The Gonzaga and Honker soils are in vegetative soil group D, and the Franciscan soil is in vegetative soil group G.

165—Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes. These very steep soils are on dominantly north-facing slopes on mountains. The native vegetation is mainly annual grasses, forbs, and blue oak. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 35 percent Gonzaga loam, 30 percent Honker loam, and 20 percent Franciscan loam. The Franciscan and Gonzaga soils are on the more northerly aspects, and the Honker soil is on knolls and the more southerly aspects. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Franciscan, Gonzaga, and Honker soils that have slopes of more than 75 percent or less than 50 percent. These soils are in landscape positions similar to those of the dominant Gonzaga, Honker, and Franciscan soils. Also included are small areas of exposed bedrock and areas of eroded Honker and Vallecitos soils in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Gonzaga soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the upper 5 inches of the surface layer is brown loam. The lower 5 inches is brown clay loam. The subsoil is a claypan of yellowish red clay about 19 inches thick. Hard shale bedrock is at a depth of 29 inches. In some areas the surface layer is clay loam or gravelly clay loam.

Permeability is very slow in the Gonzaga soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is a claypan of brown and strong brown gravelly clay about 28 inches thick. Hard sandstone bedrock is at a depth of 33 inches. In some areas the surface layer is clay loam, gravelly clay loam, or gravelly loam.

Permeability is very slow in the Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Franciscan soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown and brown loam about 13 inches thick. The subsoil is yellowish brown and brown clay loam about 23 inches thick. Hard sandstone bedrock is at a depth of 36 inches. In some areas the surface layer is gravelly loam.

Permeability is moderately slow in the Franciscan soil. Available water capacity is moderate. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the very severe hazard of erosion, the slope, the low available water capacity, and dense stands of chaparral or juniper in some areas. The characteristic plant community on the Gonzaga and Franciscan soils is mainly soft chess, ripgut brome, and wild oat and a scattered overstory of blue oak. That on the Honker soil is mainly soft chess, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such

as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soils. The slope limits access by livestock and results in overgrazing of the less sloping areas. The low available water capacity limits the production of desirable forage plants. Brush management improves areas of range that are producing woody shrubs at a level that decreases the extent of the preferred forage plants. Juniper competes for moisture and nutrients. On sites where the extent of juniper is increasing, forage production will decline regardless of the grazing management used.

This map unit is in capability subclass VIIe (MLRA-15), nonirrigated. The Gonzaga and Honker soils are in vegetative soil group D, and the Franciscan soil is in vegetative soil group G.

166—Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 50 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown fine sandy loam about 20 inches thick. The underlying material to a depth of 60 inches is stratified white and gray, mottled loamy fine sand, silt loam, and fine sandy loam. In some areas the surface layer is sandy loam or loam.

Included in this unit are small areas of Columbia, Egbert, and Merritt soils in landscape positions similar to those of the Grangeville soil, small areas of Dello soils along old stream channels, and moderately coarse textured soils that are saline-sodic throughout and are in the slightly lower landscape positions. Also included are a few areas that are dissected by intermittent sloughs that have been filled as a result of land leveling. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Grangeville soil. Available water capacity is moderate. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, the main limitation is the high water table. The rare flooding is a hazard. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

167—Grangeville clay loam, partially drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from granitic rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 50 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown, mottled clay loam about 16 inches thick. The upper 16 inches of the underlying material is stratified, brown, mottled fine sandy loam and sandy loam. The lower part to a depth of 60 inches is gray, mottled fine sandy loam. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Columbia, Egbert, and Merritt soils in landscape positions similar to those of the Grangeville soil. Also included are a few areas that are dissected by intermittent sloughs that have been filled as a result of land leveling. Included

areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Grangeville soil. Available water capacity is moderate. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitation is the high water table. The rare flooding is a hazard. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

168—Guard clay loam, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on basin rims. It formed in alluvium derived from mixed rock sources. Elevation is 5 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray and gray, mottled clay loam about 15 inches thick. The underlying material to a depth of 72 inches is light gray and light olive gray, mottled clay loam. The soil is calcareous throughout and is weakly cemented with lime below a depth of 15 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Guard soils that have a perched water table below a depth of 5 feet. These soils are on the slightly higher parts of the landscape. Also included are small areas of Kingile and Ryde soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Guard soil. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by a perched water table at a depth of 1.5 to 3.0 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the high water table, depth to the weakly cemented substratum, and the slow permeability. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. The weakly cemented substratum limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group E.

169—Guard clay loam, drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on basin rims. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 25 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray and gray, mottled clay loam about 15 inches thick. The underlying material to a depth of 72 inches is light gray and light olive gray, mottled clay loam. The soil is calcareous

throughout and is weakly cemented with lime below a depth of 15 inches. In some areas the surface layer is loam or sandy clay loam.

Included in this unit are small areas of Guard soils that have a perched water table at a depth of 3 to 5 feet. These soils are in the slightly lower landscape positions. Also included are small areas of Hollenbeck, Stockton, Devries, and Rioblancho soils on the slightly higher parts of the landscape and Columbia, Grangeville, Ryde, and Scribner soils in landscape positions similar to those of the Guard soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Guard soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the apparent water table has been lowered to a depth of more than 5 feet through drainage systems that require continual maintenance, but water may be perched above the weakly cemented substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are depth to the weakly cemented substratum and the slow permeability. The weakly cemented substratum limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

170—Hicksville loam, 0 to 2 percent slopes, occasionally flooded. This very deep, moderately well drained, nearly level soil is on low stream terraces. It formed in alluvium derived from mixed rock sources. Slopes are plane and are incised by many shallow meandering drainageways. The native vegetation consists mainly of annual grasses and forbs. Elevation is 105 to 140 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown loam about 15 inches thick. The upper 21 inches of the subsoil is brown sandy clay loam. The lower part to a depth of 60 inches is brown sandy loam. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Yellowlark soils on the slightly higher parts of the landscape and soils that are similar to the Hicksville soil but have a subsoil that is gravelly and moderately fine textured or fine textured. Also included are areas of Pentz, Redding, and Rocklin soils on the higher terraces. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to an apparent water table is 5 to 6 feet. Runoff is very slow or slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The soil is subject to occasional, very brief periods of flooding from December through April. Streambank erosion occurs along many of the meandering drainageways.

Most areas are used for livestock grazing. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of occasional flooding and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. The grazing system may be impaired by the occasional flooding. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated row, field, vineyard, and orchard crops. The occasional flooding is a hazard. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed. The risk of flooding can be reduced by levees and diversions. Careful applications of irrigation water are needed to

prevent the buildup of a high water table. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

171—Hicksville loam, bedrock substratum, 2 to 5 percent slopes, occasionally flooded. This deep, moderately well drained, gently sloping soil is on low stream terraces. It formed in alluvium derived from mixed rock sources. The native vegetation consists mainly of annual grasses and forbs. Slopes are convex, and the landscape is characterized by hummocky microrelief. Deep, intermittent drainageways that have eroding banks are common. Elevation is 110 to 270 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown loam about 8 inches thick. The upper 18 inches of the subsoil is brown sandy clay loam. The lower 18 inches is stratified brown and light yellowish brown gravelly loamy sand to gravelly clay loam. Sandstone bedrock is at a depth of 44 inches. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Cometa, Redding, and Rocklin soils on the higher terraces and small areas of soils that are gravelly and medium textured. Also included, on toe slopes, are small areas of Hicksville soils that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is moderate. The effective rooting depth is limited by the bedrock at a depth of 40 to 60 inches. A perched water table is at a depth of 3 to 4 feet. The water moves laterally downslope in the winter. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The soil is subject to occasional, very brief periods of flooding from December through April. Streambank erosion occurs along intermittent drainageways.

Most areas are used for livestock grazing. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of occasional flooding and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. The grazing system may be impaired by the occasional flooding. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated row, field, vineyard, and orchard crops. The main limitation is the depth to bedrock. General management considerations include the hazards of occasional flooding and erosion. The bedrock substratum limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed. The risk of flooding can be reduced by levees and diversions. All tillage should be on the contour or across the slope. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

172—Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded. This very deep, moderately well drained, nearly level soil is on low stream terraces. It formed in alluvium derived from mixed rock sources. Slopes are plane and are incised by many shallow meandering drainageways. The native vegetation consists mainly of annual grasses and forbs. Elevation is 140 to 220 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown gravelly loam about 13 inches thick. The upper 23 inches of the subsoil is dark brown and brown gravelly clay loam and gravelly sandy clay loam. The lower part to a depth of 60 inches is light yellowish brown very gravelly sandy

clay loam and brown very gravelly sandy loam. In some areas the surface layer is loam.

Included in this unit are small areas of Yellowlark soils on the slightly higher parts of the landscape and soils that are similar to the Hicksville soil but have a subsoil that is very gravelly and moderately fine textured or gravelly and fine textured or moderately coarse textured. Also included are Redding and Rocklin soils on the higher terraces. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Hicksville soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Depth to an apparent water table is 5 to 6 feet. Runoff is very slow or slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The soil is subject to occasional, very brief periods of flooding from December through April. Streambank erosion occurs along many of the meandering drainageways.

Most areas are used for livestock grazing. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of occasional flooding and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. The grazing system may be impaired by the occasional flooding. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated row, field, vineyard, and orchard crops. General management considerations include the hazard of occasional flooding and the gravelly subsoil. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed. The risk of flooding can be reduced by levees and diversions. Leveling for irrigation may expose the gravelly subsoil. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

173—Hollenbeck silty clay, 0 to 2 percent slopes. This moderately well drained, nearly level soil is in interfan basins. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown silty clay about 10 inches thick. The upper 27 inches of the subsoil is brown and yellowish brown clay. The next 5 inches is grayish brown silty clay loam. The lower part to a depth of 60 inches is a variegated light yellowish brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is clay or clay loam.

Included in this unit are small areas of Archerdale, Cogna, and Vignolo soils on the slightly higher parts of the landscape, Stockton and Galt soils in landscape positions similar to those of the Hollenbeck soil, and Guard soils in the slightly lower landscape positions. Also included are small areas of Hollenbeck soils that are highly calcareous or saline-sodic throughout. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Hollenbeck soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and

damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, the slow permeability, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

174—Hollenbeck clay, 1 to 3 percent slopes. This moderately well drained, nearly level and gently sloping soil is in interfan basins. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Slopes are plane and are incised by many shallow meandering drainageways. The native vegetation is annual grasses and forbs. Elevation is 130 to 150 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown and brown clay about 32 inches thick. The upper 23 inches of the subsoil is dark grayish brown clay. The lower part to a depth of 60 inches is a dark grayish brown, strongly cemented hardpan. In some areas adjacent to drainageways, the surface layer is silty clay or fine sandy loam.

Included in this unit are small areas of Peters and Redding soils on the slightly higher parts of the landscape. Also included, in the lower positions, are small areas of Hollenbeck soils that are occasionally flooded. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Hollenbeck soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used as irrigated pasture or for livestock grazing. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated pasture. General management considerations include the hazard of erosion. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for livestock grazing, general management considerations include the clayey surface layer and excessive shrinking and swelling. The vegetation consists mainly of soft chess, wild oat, and filaree. Trampling of the clayey surface layer by livestock when the soil is too wet reduces productivity. Fencing is difficult. Excessive shrinking and swelling of the soil can cause fenceposts to be tilted or removed from the ground. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated row and field crops. The main limitations are the slow permeability and depth to the hardpan. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. All tillage should be on the contour or across the slope. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIe-5 (MLRA-17),

irrigated, and IVe-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

175—Honcut sandy loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from granitic rock sources. Elevation is 30 to 125 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 21 inches thick. The underlying material to a depth of 60 inches is brown and yellowish brown sandy loam. In some areas the surface layer is fine sandy loam, coarse sandy loam, or gravelly sandy loam.

Included in this unit are small areas of Chuloak, Delhi, Tinnin, and Veritas soils in landscape positions similar to those of the Honcut soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Honcut soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Most areas of this unit are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development.

This unit is well suited to irrigated row, field, orchard, and vineyard crops. General management considerations include the hazard of soil blowing. Furrow, border, and sprinkler irrigation systems are suitable. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

Few limitations affect the use of this unit for homesite development.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

176—Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes. These steep soils are on both south-facing and north-facing slopes on mountains. The native vegetation is mainly annual grasses, forbs, and blue oak. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 200 to 240 days.

This unit is 30 percent Honker loam, 30 percent Vallecitos gravelly loam, and 25 percent Gonzaga loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Honker, Gonzaga, and Vallecitos soils that have slopes of more than 50 or less than 30 percent and small areas of Franciscan soils. All of these included soils are in landscape positions similar to those of the dominant Honker, Vallecitos, and Gonzaga soils. Also included are areas of exposed bedrock and eroded Honker soils in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is a claypan of brown and strong brown gravelly clay about 28 inches thick. Hard sandstone bedrock is at a depth of 33 inches. In some areas the surface layer is gravelly loam, gravelly clay loam, or clay loam.

Permeability is very slow in the Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Vallecitos soil is shallow and well drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is pale brown and brown gravelly clay loam about 16 inches thick. Hard sandstone bedrock is at a depth of 20 inches. In some areas the surface layer is loam, clay loam, or gravelly clay loam.

Permeability is slow in the Vallecitos soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Gonzaga soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the upper 3 inches of the surface layer is grayish brown loam. The lower 4 inches is grayish brown clay loam. The subsoil is a claypan of reddish brown and light reddish brown clay about 27 inches thick. Hard shale bedrock is at a depth of 34 inches. In some areas the surface layer is gravelly loam or gravelly clay loam.

Permeability is very slow in the Gonzaga soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 4 to 20 inches. Runoff is

rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion, the very low or low available water capacity, and the limited depth of the Vallecitos soil. The characteristic plant community on the Honker and Vallecitos soils is mainly soft chess, wild oat, and filaree. That on the Gonzaga soil is mainly soft chess, ripgut brome, and wild oat and scattered blue oak. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very low or low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. The Honker and Gonzaga soils are in vegetative soil group D, and the Vallecitos soil is in vegetative soil group G.

177—Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes. These steep soils are on dominantly south-facing slopes on mountains. The native vegetation is mainly annual grasses, forbs, and chaparral. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 220 to 240 days.

This unit is 35 percent Honker loam, 30 percent Vallecitos gravelly loam, and 20 percent Honker gravelly loam, eroded. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Honker and Vallecitos soils that have slopes of more than 50 or less than 30 percent and small areas of Gonzaga and Franciscan soils. All of these included soils are in landscape positions similar to those of the dominant Honker and Vallecitos soils. Also included are small areas of exposed bedrock in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The uneroded Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is a claypan of brown and strong brown gravelly clay about 28 inches thick. Hard sandstone bedrock is at a depth of 33 inches. In some areas the surface layer is clay loam, gravelly clay loam, or gravelly loam.

Permeability is very slow in the uneroded Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Vallecitos soil is shallow and well drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is pale brown and brown gravelly clay loam about 16 inches thick. Hard sandstone bedrock is at a depth of 20 inches. In some areas the surface layer is loam, clay loam, or gravelly clay loam.

Permeability is slow in the Vallecitos soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The eroded Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray gravelly loam about 7 inches thick. The upper 11 inches of the subsoil is light brown gravelly clay loam. The lower 13 inches is a claypan of light red gravelly clay. Hard sandstone bedrock is at a depth of 31 inches. In some areas the surface layer is gravelly clay loam.

Permeability is very slow in the eroded Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 8 to 16 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion, the very low or low available water capacity, the limited depth of the Vallecitos soil, and dense stands of chaparral in moderately eroded areas. The characteristic plant community on the uneroded Honker and Vallecitos soils is mainly soft chess, wild oat, and filaree. That on the eroded Honker soil is mainly soft chess, red brome, and California sagebrush. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very low or low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock. Brush management improves areas of range that are

producing woody shrubs at a level that decreases the extent of the preferred forage plants.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. The uneroded and eroded Honker soils are in vegetative soil group D, and the Vallecitos soil is in vegetative soil group G.

178—Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes. These very steep soils are on dominantly south-facing slopes on mountains. The native vegetation is mainly annual grasses, forbs, and chaparral. Elevation is 800 to 3,300 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 220 to 240 days.

This unit is 35 percent Honker loam, 30 percent Vallecitos gravelly loam, and 20 percent Honker gravelly loam, eroded. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Honker and Vallecitos soils that have slopes of more than 75 or less than 50 percent and small areas of Gonzaga and Franciscan soils. All of these included soils are in landscape positions similar to those of the dominant Honker and Vallecitos soils. Also included are small areas of exposed bedrock in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

The uneroded Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam about 5 inches thick. The subsoil is a claypan of brown and strong brown gravelly clay about 28 inches thick. Hard sandstone bedrock is at a depth of 33 inches. In some areas the surface layer is clay loam, gravelly clay loam, or gravelly loam.

Permeability is very slow in the uneroded Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Vallecitos soil is shallow and well drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is pale brown and brown gravelly clay loam about 16 inches thick. Hard sandstone bedrock is at a depth of 20 inches. In some areas the surface layer is loam, gravelly clay loam, or clay loam.

Permeability is slow in the Vallecitos soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The eroded Honker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray gravelly loam about 7 inches thick. The upper 11 inches of the subsoil is light brown gravelly clay loam. The lower 13 inches is a claypan of light red gravelly clay. Hard sandstone bedrock is at a depth of 31 inches. In some areas the surface layer is gravelly clay loam.

Permeability is very slow in the eroded Honker soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 8 to 16 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the very severe hazard of erosion, the slope, the very low or low available water capacity, the limited depth of the Vallecitos soil, and dense stands of chaparral in moderately eroded areas. The characteristic plant community on the uneroded Honker and Vallecitos soils is mainly soft chess, wild oat, and filaree. That on the eroded Honker soil is mainly soft chess, red brome, and California sagebrush. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soils. The slope limits access by livestock and results in overgrazing of the less sloping areas. The very low or low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock. Brush management improves areas of range that are producing woody shrubs at a level that decreases the extent of the preferred forage plants.

This map unit is in capability subclass VIIe (MLRA-15), nonirrigated. The uneroded and eroded Honker soils are in vegetative soil group D, and the Vallecitos soil is in vegetative soil group G.

179—Itano silty clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains and deltas. It formed in

alluvium derived from granitic rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is light brownish gray silty clay loam about 15 inches thick. Below this is a buried surface layer of grayish brown, mottled silty clay loam about 19 inches thick. The underlying material to a depth of 60 inches is stratified, grayish brown, mottled silty clay loam. In some areas the surface layer is silt loam or mucky loam.

Included in this unit are small areas of Dello, Kingile, Ryde, and Valdez soils in landscape positions similar to those of the Itano soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Itano soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3.0 to 4.5 feet by pumping. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. Maintaining crop residue on or near the surface helps to prevent excessive runoff and increases the rate of water intake and the organic matter content. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group H.

180—Jacktone clay, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is in basins. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 5 to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray and dark gray clay about 22 inches thick. The upper 12 inches of the subsoil is dark gray clay and light gray clay loam. The next 3 inches is a light gray, strongly cemented to indurated hardpan. The next 9 inches is yellowish brown loam. The lower part to a depth of 60 inches is a yellowish brown, weakly cemented hardpan. In some areas the surface layer is silty clay or silty clay loam.

Included in this unit are small areas of Archerdale soils and small areas of Jacktone soils that have moderately coarse textured overwash. Both of these included soils are on the slightly higher parts of the landscape. Also included, in landscape positions similar to those of the dominant Jacktone soil, are small areas of Hollenbeck and Stockton soils and fine textured soils that are highly calcareous or saline-sodic. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Jacktone soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used as irrigated pasture or for urban development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the

restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for urban development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

181—Jacktone-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is in basins. Elevation is 10 to 40 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Jacktone clay and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Hollenbeck and Stockton soils in landscape positions similar to those of the Jacktone soil. Also included, on the slightly higher parts of the landscape, are small areas of Jacktone soils that have moderately coarse textured or moderately fine textured overwash. Included areas make up about 15 percent of the total acreage.

The Jacktone soil is moderately deep to a hardpan and is somewhat poorly drained. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Typically, the surface layer is very dark gray and dark gray clay about 22 inches thick. The upper 12 inches of the subsoil is dark gray clay and light gray clay loam. The next 3 inches is a light gray, strongly cemented to indurated hardpan. The next 9 inches is yellowish brown loam. The lower part to a depth of 60 inches is a yellowish brown, weakly cemented hardpan. In some areas the surface layer is silty clay or silty clay loam.

Permeability is slow in the Jacktone soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Jacktone clay.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Jacktone soil is used for urban development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

The Jacktone soil is suited to irrigated row, field, orchard, and vineyard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does

not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The Jacktone soil is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G. The Urban land is not assigned a capability classification or a vegetative soil group.

182—Jahant loam, 0 to 2 percent slopes. This well drained, nearly level soil is on low terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 20 to 100 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is grayish brown loam about 5 inches thick. The lower part of the surface layer and the upper part of the subsoil are dominantly pale brown and dark brown loam about 26 inches thick. The next 18 inches of the subsoil is a claypan of brown and dark brown clay loam and clay. The next 4 inches is a brown and dark brown, strongly cemented hardpan. The lower part of the subsoil to a depth of 60 inches is a light brown and brown, indurated hardpan. In some areas the surface layer is fine sandy loam or sandy loam.

Included in this unit are small areas of Bruella, Tokay, and Veritas soils on the slightly higher parts of the landscape. Also included are small areas of San Joaquin soils in landscape positions similar to those of the Jahant soil and Alamo and Madera soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Jahant soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Roots are limited to cracks and the faces of peds in the claypan, which is at a depth of 22 to 31 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development or livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitations are the very slow permeability in the lower part of the subsoil and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Careful applications are needed to prevent the buildup of a high water table. The hardpan limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan and the high shrink-swell potential of the clayey subsoil. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for building sites is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This map unit is in capability units IIIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

183—Jahant loam, 2 to 8 percent slopes. This well drained, undulating and gently rolling soil is on low terraces. It is deep to a hardpan. It formed in alluvium

derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 100 to 160 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is grayish brown loam about 5 inches thick. The lower part of the surface layer and the upper part of the subsoil are dominantly pale brown and dark brown loam about 26 inches thick. The next 18 inches of the subsoil is a claypan of brown and dark brown clay loam and clay. The next 4 inches is a brown and dark brown, strongly cemented hardpan. The lower part of the subsoil to a depth of 60 inches is a light brown and brown, indurated hardpan. In some areas the surface layer is fine sandy loam or sandy loam.

Included in this unit are small areas of Madera and San Joaquin soils in the slightly lower landscape positions. Also included, on toe slopes, are small areas of Jahant soils that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Jahant soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 22 to 31 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the claypan or hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas of this unit are used for livestock grazing. A few areas are used as irrigated pasture or for dryland grain crops.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods and the hazard of erosion in gently rolling areas. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

This unit is suited to irrigated pasture. General management considerations include the hazard of erosion. Seedbed preparation should be on the contour or across the slope where practical. Irrigation water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This map unit is in capability units IIIe-3 (MLRA-17), irrigated, and IVe-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

184—Kaseberg loamy sand, 5 to 15 percent slopes. This somewhat excessively drained, moderately sloping and strongly sloping soil is on dissected terraces. It is shallow to a hardpan. It formed in old alluvium derived from granitic rock sources. Slopes are convex. Surface relief is irregular at the base of some slopes. The native vegetation is mainly annual grasses, forbs, and blue oak. Elevation is 150 to 260 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost free season is about 270 days.

Typically, the surface layer is pale brown and light brown loamy sand about 10 inches thick. The upper part of the subsoil is light brown gravelly loamy sand about 6 inches thick. The lower part is a strong brown, indurated hardpan about 1 inch thick. The underlying material to a depth of 60 inches is very pale brown and light gray, dense, weakly cemented sandy loam, loam, or sandy clay loam. In some areas the surface layer is loamy fine sand or gravelly loamy sand.

Included in this unit are small areas of Redding and Rocklin soils on terraces. Also included, in landscape positions similar to those of the Kaseberg soil, are small areas of moderately deep or deep, coarse textured soils that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Kaseberg soil. Available water capacity is very low. The effective rooting depth is limited by the hardpan at a depth of 10 to 20 inches. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 3.0 inches per hour.

Most areas of this unit are used for livestock grazing. A few areas are used for irrigated vineyards.

Where this unit is used for livestock grazing, general management considerations include the limited depth, the very low available water capacity, and the hazard of erosion. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. Fencing is difficult because of the depth to bedrock. The very low available water capacity limits the production of desirable forage plants. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

Where this unit is used for irrigated vineyards, the main limitations are the very low available water capacity and the limited rooting depth. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. Growing permanent cover crops between the rows of vines helps to control runoff and erosion. Annual cultivation should be avoided on the steeper slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This map unit is in capability subclass VIIe (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group G.

185—Kaseberg fine sandy loam, 2 to 15 percent slopes. This well drained, undulating to rolling soil is on dissected terraces. It is shallow to a hardpan. It formed in material weathered from weakly consolidated or moderately consolidated sandstone. Slopes are concave and receive runoff from the higher areas. Hummocky microrelief is evident in some areas. The native vegetation is mainly annual grasses and forbs. Elevation is 150 to 270 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are light brownish gray, pale brown, and pinkish gray fine sandy loam about 17 inches thick. The lower part of the subsoil is a very pale brown hardpan about 3 inches thick. Light gray sandstone is at a depth of 20 inches. In some areas the surface layer is loamy sand, gravelly sandy loam, sandy loam, or loam.

Included in this unit are small areas of Yellowlark soils in drainageways and Pardee and Rocklin soils on the higher terraces. Also included are small areas of very shallow to deep, coarse textured soils in landscape positions similar to those of the Kaseberg soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Kaseberg soil. Available water capacity is very low. The effective rooting depth is limited by the hardpan, which is at a depth of 10 to 20 inches and is underlain by bedrock. Runoff is slow or medium, and the hazard of water erosion is moderate.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the limited depth, the very low available water capacity, and the hazard of erosion. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. Fencing is difficult because of the depth to bedrock. The very low available water capacity limits the production of desirable forage plants. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. It is in vegetative soil group G.

186—Kaseberg loam, 15 to 30 percent slopes. This well drained, moderately steep soil is on dissected terraces. It is shallow to a hardpan. It formed in material weathered from weakly consolidated or moderately consolidated siltstone. Slopes are convex. Areas are narrow and sinuous and descend from the adjacent high terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 140 to 270 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are light brownish gray and pale brown loam about 16 inches thick. The lower part of the subsoil is a light yellowish brown hardpan about 1 inch thick. Light yellowish brown siltstone is at a depth of 17 inches. In some areas the surface layer is gravelly sandy loam or sandy loam.

Included in this unit are small areas of Corning, Pardee, and Pentz soils on terraces. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Kaseberg soil.

Available water capacity is very low. The effective rooting depth is limited by the hardpan, which is at a depth of 10 to 20 inches and is underlain by bedrock. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for livestock grazing. General management considerations include the limited depth, the very low available water capacity, and the severe hazard of erosion. The characteristic plant community is mainly soft chess, wild oat, ripgut brome, and filaree. Fencing is difficult because of the depth to bedrock. The very low available water capacity limits the production of desirable forage plants. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. It is in vegetative soil group G.

187—Keyes-Bellota complex, 2 to 15 percent slopes. These undulating to rolling soils are on hills. The native vegetation is mainly annual grasses and forbs. Elevation is 140 to 300 feet. The average annual precipitation is about 16 inches, the average air temperature is about 60 degrees F, and the frost-free period is about 270 days.

This unit is 45 percent Keyes gravelly loam and 40 percent Bellota sandy loam. The Keyes soil is on complex slopes, and the Bellota soil is on concave slopes. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Hicksville and Yellowlark soils in drainageways, Pardee and Redding soils on terraces, Pentz soils in convex positions near the top of the slopes, and Peters soils in the slightly lower landscape positions. Also included are small areas of very shallow, moderately coarse textured soils in landscape positions similar to those of the Keyes and Bellota soils and small areas of soils that have clay at the surface. Included areas make up 15 percent of the total acreage.

The Keyes soil is shallow to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources and in material weathered from basic andesitic, tuffaceous sandstone. Typically, the surface layer is brown gravelly loam about 12 inches thick. The upper part of the subsoil is a claypan of brown gravelly clay about 7 inches thick. The lower part is a yellowish brown, strongly cemented hardpan about 15 inches thick. Light gray, weakly consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 34 inches. In some areas the surface layer is sandy loam, loam, or cobbly sandy loam.

Permeability is very slow in the Keyes soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan, which is at a depth of 10 to 20 inches and is underlain by bedrock. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 17 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

The Bellota soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources and in material weathered from basic andesitic, tuffaceous sandstone. Typically, the surface layer is light brownish gray and grayish brown sandy loam about 9 inches thick. The upper 14 inches of the subsoil is brown and dark brown gravelly and cobbly sandy clay loam. The next 12 inches is a claypan of dark grayish brown and brown clay. The lower 2 inches is a light gray hardpan. Pale brown, weakly consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 37 inches. In some areas the surface layer is sandy loam, gravelly loam, or cobbly sandy loam.

Permeability is very slow in the Bellota soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan, which is at a depth of 20 to 40 inches and is underlain by bedrock. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 12 to 30 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion in rolling areas, the very low or low available water capacity, saturated soil conditions in concave areas following rainy periods, and the limited depth of the Keyes soil. The characteristic plant community is mainly soft chess, wild oat, and filaree on the Keyes soil and soft chess, mouse barley, annual ryegrass, and filaree on the Bellota soil. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. The very low or low available water capacity limits the production of

desirable forage plants. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. The Keyes soil is in vegetative soil group G, and the Bellota soil is in vegetative soil group D.

188—Keyes-Redding complex, 2 to 8 percent slopes. These undulating and gently rolling soils are on high terraces and hills. The native vegetation is mainly annual grasses and forbs. Elevation is 125 to 200 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 45 percent Keyes gravelly loam and 40 percent Redding gravelly loam. The Redding soil is on concave or convex slopes, and the Keyes soil is on concave slopes. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bellota soils and small areas of Redding soils that have slopes of more than 8 percent. Both of these included soils are in landscape positions similar to those of the dominant Keyes and Redding soils. Also included are small areas of Pardee soils on terraces, Peters soils in the slightly lower landscape positions, and soils that have clay at the surface. Included areas make up 15 percent of the total acreage.

The Keyes soil is shallow to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources and in material weathered from basic andesitic, tuffaceous sandstone. Typically, the surface layer is grayish brown gravelly loam about 6 inches thick. The upper part of the subsoil is a claypan of brown gravelly clay about 7 inches thick. The lower part is a yellowish brown, moderately cemented hardpan about 21 inches thick. Light gray, weakly consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 34 inches. In some areas the surface layer is loam, cobbly loam, or gravelly sandy loam.

Permeability is very slow in the Keyes soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan, which is at a depth of 10 to 20 inches and is underlain by bedrock. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 6 to 17 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

The Redding soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is light brown, strong brown, and reddish yellow gravelly loam about 16 inches thick. The upper part of the subsoil is a claypan of reddish brown clay about 6 inches thick. The lower part to a depth of 60 inches is a reddish yellow, indurated hardpan. In some areas the surface layer is gravelly sandy loam, cobbly loam, or loam.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 16 to 36 inches. Water is briefly perched above the claypan after periods of heavy rainfall. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This unit is used mainly for livestock grazing. General management considerations include the hazard of erosion in rolling areas, the very low available water capacity, saturated soil conditions in concave areas following rainy periods, and the limited depth of the Keyes soil. The characteristic plant community is mainly soft chess, wild oat, and filaree on the Keyes soil and soft chess, ripgut brome, wild oat, and filaree on the Redding soil. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. The very low available water capacity limits the production of desirable forage plants. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. The Keyes soil is in vegetative soil group G, and the Redding soil is in vegetative soil group D.

189—Kingdon fine sandy loam, 0 to 2 percent slopes. This very deep, moderately well drained, nearly level soil is on low fan terraces. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled because of land leveling. Elevation is 10 to 150 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the upper 5 inches of the surface layer is brown fine sandy loam. The lower 9 inches is grayish brown and brown fine sandy loam. The upper 14 inches of the subsoil is brown and pale brown fine sandy loam. The lower 14 inches is pale brown and brown loam and fine sandy loam. The substratum to a depth of 61 inches is pale brown and light gray fine sandy loam and sandy loam. In some areas the surface layer is sandy loam or loam.

Included in this unit are small areas of Acampo, Devries, and Tujunga soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Kingdon soil, are small areas of Tokay soils and moderately coarse textured soils that have a moderately fine textured subsoil. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Kingdon soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated crops. General management considerations include the hazard of soil blowing. Furrow, border, and sprinkler irrigation systems are suitable. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

Few limitations affect the use of this unit for homesite development.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

190—Kingile muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in the underlying alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray and very dark brown muck about 17 inches thick. The underlying material to a depth of 61 inches is very dark grayish brown and dark gray, mottled silty clay and silty clay loam. In some areas the surface layer is mucky clay loam or mucky loam.

Included in this unit are small areas of Ryde and Valdez soils on the slightly higher parts of the landscape. Also included are small areas of Rindge and Shinkee soils in landscape positions similar to those of the Kingile soil. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Kingile soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability. General management considerations include the severe hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

191—Kingile-Ryde complex, partially drained, 0 to 2 percent slopes. These nearly level soils are on deltas. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Kingile muck and 35 percent Ryde clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Peltier, Rindge, and Shinkee soils in landscape positions similar to those of the Kingile and Ryde soils. Included areas make up about 15 percent of the total acreage.

The Kingile soil is very deep and very poorly drained. It formed in hydrophytic plant remains derived from reeds and tules and in the underlying alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Typically, the surface layer is dark gray and very dark brown muck about 17 inches thick. The underlying material to a depth of 61 inches is very dark grayish brown and dark gray, mottled silty clay and silty clay loam. In some areas the surface layer is mucky clay loam or mucky loam.

Permeability is slow in the Kingile soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

The Ryde soil is very deep and very poorly drained. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Typically, the surface layer is grayish brown and dark gray, mottled clay loam about 24 inches thick. Below this is a buried surface layer of very dark gray, mottled mucky clay loam about 8 inches thick. The underlying material to a depth of 63 inches is very dark gray and dark grayish brown, mottled silty clay loam. In some areas the surface layer is mucky clay loam or silty clay loam.

Permeability is moderately slow in the Ryde soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability. General management considerations include the hazard of soil blowing. Because these soils are subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the restricted permeability in the Kingile soil, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

192—Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes. These undulating to rolling soils are on ridges and plateaus in areas of volcanic flows. Stones and boulders cover 2 to 10 percent of the surface. Most are on the surface of the Lithic Xerorthents. The native vegetation is mainly annual grasses and forbs. Elevation is 150 to 450 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 60 percent Lithic Xerorthents and 25 percent Toomes loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Pentz soils and exposed bedrock. Also included are small areas of soils that are moderately deep and medium textured or are shallow and very cobbly and medium textured. The included areas are in landscape positions similar to those of the Lithic Xerorthents and the Toomes soil. Included areas make up 15 percent of the total acreage.

The Lithic Xerorthents are very shallow and are moderately well drained or well drained. They formed in material weathered from hard, andesitic tuff breccia. Typically, about 10 percent of the surface is covered with stones and boulders. The surface layer is grayish brown cobbly sandy loam about 3 inches thick. Light gray, hard, andesitic tuff breccia is at a depth of 3 inches. In some areas the surface layer is gravelly sandy loam or cobbly loam.

Permeability is moderate or moderately rapid in the Lithic Xerorthents. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 1 to 4 inches. Runoff is rapid, and the hazard of water erosion is moderate.

The Toomes soil is very shallow or shallow and is well drained. It formed in material weathered from hard, andesitic tuff breccia. Typically, about 2 percent of the surface is covered with stones. The surface layer and subsoil are pale brown and light brown loam about 15 inches thick. Light gray, hard, andesitic tuff breccia is at a depth of 15 inches. In some areas the surface layer is gravelly loam.

Permeability is moderate in the Toomes soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 4 to 20 inches. Runoff is medium, and the hazard of water erosion is slight or moderate.

This unit is used mainly for livestock grazing. General management considerations include the very low available water capacity, the limited depth, and the hazard of erosion. The Lithic Xerorthents support only a sparse stand of plants that are suitable for grazing, mainly soft chess, toad rush, and hairgrass. The characteristic plant community on the Toomes soil is soft chess, mouse barley, and filaree. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the limited depth to bedrock. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability subclass VIIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

193—Madera sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. In areas that have not been leveled, slopes are complex and the landscape is characterized by hummocky microrelief. The native vegetation is mainly annual grasses and forbs. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in many areas. Elevation is 60 to 150 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is grayish brown and brown sandy loam about 19 inches thick. The upper 4 inches of the subsoil is brown sandy clay loam. The next 6 inches is a claypan of light reddish brown clay. The lower part to a depth of 60 inches is a pale brown and brown, indurated, iron- and silica-cemented hardpan. In some areas the surface layer is fine sandy loam or loam.

Included in this unit are small areas of Alamo soils in drainageways, Exeter and Jahant soils in landscape positions similar to those of the Madera soil, and Veritas soils on the slightly higher parts of the landscape. Also included are small areas of Madera soils that have slopes of 2 to 5 percent and areas where depth to the hardpan is as little as 10 inches and most of the soil has been removed, altered, or exposed as a result of deep leveling cuts. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Madera soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 25 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is ponded in the small vernal pools, is very slow or ponded in the leveled areas, and is slow on the convex slopes. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soil is not subject to flooding.

Most areas are used for livestock grazing or for irrigated pasture, irrigated crops, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The

characteristic plant community is mainly soft chess, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This unit is suited to irrigated pasture. The main limitations are the complex slopes and the low available water capacity. Leveling helps to ensure a uniform application of water. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are the complex slopes, depth to the very slowly permeable claypan and hardpan, and the low available water capacity. Leveling helps to ensure a uniform application of water. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the clayey subsoil. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for building sites is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

194—Madera loam, 2 to 5 percent slopes. This moderately well drained, undulating soil is on dissected low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. Slopes occur as a complex of plane and convex side slopes and concave drainageways. The native vegetation is mainly annual grasses and forbs. Elevation is 60 to 150 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is brown loam about 10 inches thick. The upper part of the subsoil is a claypan of light reddish brown clay about 20 inches thick. The lower part to a depth of 60 inches is a brown and light brown, indurated, silica-cemented hardpan. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Exeter, Jahant, and San Joaquin soils in landscape positions similar to those of the Madera soil. Also included, on toe slopes, are small areas of Madera soils that have slopes of 0 to 2 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Madera soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 25 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.0 inch per hour. The soil is not subject to flooding.

Most areas are used for livestock grazing. A few areas are used for irrigated vineyards, for irrigated pasture, or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This unit is suited to irrigated vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan and the low available water capacity. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this

restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the clayey subsoil. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. The cuts needed to provide essentially level building sites can expose the claypan or hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

195—Madera-Alamo complex, leveled, 0 to 1 percent slopes. These nearly level soils are on low terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 60 to 150 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

This unit is 65 percent Madera sandy loam and 20 percent an Alamo soil that has overburden of sandy loam. The Alamo soil was originally in old drainageways prior to leveling. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Jahant and San Joaquin soils in landscape positions similar to those of the Madera and Alamo soils, shallow claypan soils, and soils that have been ripped or leveled and have remnants of claypan and hardpan material. Also included, on the slightly higher parts of the landscape, are small areas of Madera soils that have slopes of 1 to 2 percent. Included areas make up about 15 percent of the total acreage.

The Madera soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from granitic rock sources. Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The upper part of the subsoil is brown clay about 10 inches thick. The lower part to a depth of 60 inches is a brown and pale brown, indurated, silica-cemented hardpan. In some areas the surface layer is fine sandy loam or loam.

Permeability is very slow in the Madera soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 25 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is very slow or ponded in small vernal pools, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

The Alamo soil is moderately deep to a hardpan and is poorly drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is gray and brown sandy loam overburden derived from the adjacent Madera soil. It is about 12 inches thick. Below this is a buried surface layer of dark gray and dark grayish brown clay about 13 inches thick. The upper part of the subsoil is dark gray clay about 9 inches thick. The lower part to a depth of 60 inches is a brown and pale brown, indurated, silica-cemented hardpan. In some areas the surface layer is loam or clay loam.

Permeability is very slow in the Alamo soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the buried soil, which is at a depth of 12 to 20 inches. Water is perched within a depth of 12 inches after periods of heavy rainfall or irrigation. Runoff is very slow or ponded in small vernal pools, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soil is subject to rare flooding, which occurs

during years of abnormally high precipitation.

Most areas are used for irrigated pasture or irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated pasture. The main limitations are the low available water capacity and the high water table. Because these soils are droughty, applications of irrigation water should be light and frequent. A drainage system may be needed. Irrigation water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soils from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan, the high water table in the Alamo soil, and the low available water capacity. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A drainage system may be needed. Because these soils are droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soils or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high water table in the Alamo soil, the high shrink-swell potential, and low strength in the clayey subsoil. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Excavation for building sites is limited by the hardpan. The very slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soils to support a load.

This map unit is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. The Madera soil is in vegetative soil group D, and the Alamo soil is in vegetative soil group E.

196—Manteca fine sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. Elevation is 20 to 110 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown fine sandy loam about 11 inches thick. The upper part of the subsoil is grayish brown and light brownish gray fine sandy loam about 13 inches thick. The next part is a light gray, indurated hardpan, which extends to a depth of 35 inches. The lower part is a light gray, weakly cemented to strongly cemented hardpan, which extends to a depth of 54 inches. The underlying material to a depth of 74 inches is variegated light gray and white sandy loam. In some areas the surface layer is loam or clay loam.

Included in this unit are small areas of Tinnin and Veritas soils on the slightly higher parts of the landscape, small areas of Guard and Trahern soils on the slightly lower parts, and a few areas where depth to the hardpan is as little as 10 inches, mainly where deep leveling cuts have been made. Also included are some areas of soils that have been subsoiled or deeply ripped and have fragments of cemented material on the surface and throughout the profile. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Manteca soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water may be perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or vineyards. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the hardpan and the low available water capacity. General management considerations include the hazard of soil blowing. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation.

Because the soil is droughty, applications of irrigation water should be light and frequent. Careful applications are needed to prevent the buildup of a high water table. Furrow, border, and sprinkler irrigation systems are suitable. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitation is depth to the hardpan. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

197—Merritt silty clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 50 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark gray silty clay loam about 17 inches thick. The next 32 inches is light brownish gray, grayish brown, and gray silt loam and silty clay loam. The substratum to a depth of 60 inches is grayish brown fine sandy loam. In some areas the surface layer is loam or silt loam.

Included in this unit are small areas of Grangeville, Guard, and Ryde soils in landscape positions similar to those of the Merritt soil. Also included are small areas of Egbert soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Merritt soil. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

This unit is used mainly for irrigated row or field crops. It is also used for homesite development. It may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated crops. The main limitation is the high water table. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitation is the high water table. The rare flooding is a hazard. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

198—Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by reclamation projects. Elevation is 5 to 50 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown silty clay loam about 15 inches thick. The subsoil and the upper part of the substratum are mottled light brownish gray and dark gray silty clay loam about 27 inches thick. The lower part of the substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In some areas the surface layer is clay loam or loam.

Included in this unit are small areas of Dello soils in the slightly lower landscape positions and Grangeville soils in landscape positions similar to those of the Merritt soil. Also included are small areas of dominantly moderately fine textured and moderately coarse

textured channel dredge tailings. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Merritt soil. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. This soil is subject to occasional, long periods of flooding from December through March. Channeling and deposition are common along streambanks.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. The occasional flooding is a hazard. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Furrow, border, and sprinkler irrigation systems are suitable. Most climatically adapted crops can be grown if the soil is protected from flooding late in spring and early in summer and if a drainage system is installed. The risk of flooding can be reduced by levees and diversions. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

199—Montpellier sandy loam, 8 to 15 percent slopes. This moderately well drained, rolling soil is on dissected terraces. It is deep to dense, weakly cemented sediments. It formed in old alluvium derived from granitic rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs and scattered California white oak. Elevation is 100 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is light reddish brown and brown sandy loam about 18 inches thick. The upper part of the subsoil is light reddish brown sandy clay loam about 28 inches thick. The next part is reddish brown coarse sandy loam about 8 inches thick. The lower part to a depth of 60 inches is reddish brown, dense, weakly cemented sandy loam or coarse sandy loam. In some areas the surface layer is coarse sandy loam.

Included in this unit are small areas of Cometa, Redding, and Rocklin soils on terraces and small areas of coarse textured soils in convex positions near the top of the slopes. Also included, on toe slopes, are small areas of Montpellier soils that have slopes of 5 to 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Montpellier soil and very slow in the dense subsoil. Available water capacity is moderate. The effective rooting depth is more than 60 inches, but roots are restricted to cracks and the faces of peds in the dense subsoil, which is at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the dense subsoil or underlying sediments after periods of heavy rainfall or irrigation. Runoff is medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing or dryland grain crops. A few areas are used for irrigated orchards or vineyards or for homesite development.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Limiting tillage during seedbed preparation and during the application of weed control measures helps to control runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated orchard and vineyard crops. The main limitation is the depth to dense, weakly cemented sediments. General management considerations include the hazard of erosion. The dense, weakly cemented sediments limit the suitability for deep-rooted crops. Where feasible, deep ripping of

this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Annual cultivation should be avoided on the steeper slopes. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are the depth to dense, weakly cemented sediments and the moderately slow permeability. General management considerations include the hazard of erosion. The cuts needed to provide essentially level building sites can expose the dense subsoil. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability unit IVe-1 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group A.

200—Montpellier-Cometa complex, 5 to 8 percent slopes. These gently rolling soils are on dissected terraces. The native vegetation is mainly annual grasses and forbs and scattered California white oak. Elevation is 120 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is 260 to 275 days.

This unit is 50 percent Montpellier coarse sandy loam and 35 percent Cometa sandy loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Kaseberg, Ramoth, and Redding soils on terraces and Rocklin and San Joaquin soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

The Montpellier soil is deep to dense, weakly cemented sediments and is moderately well drained. It formed in old alluvium derived from granitic rock sources. Typically, the surface layer is brown and light reddish brown coarse sandy loam about 20 inches thick. The upper 23 inches of the subsoil is light reddish brown sandy clay loam. The next 12 inches is light reddish brown coarse sandy loam. The lower part to a depth of 60 inches is yellowish red and reddish yellow, dense, weakly cemented sandy loam. In some areas the surface layer is sandy loam.

Permeability is moderately slow in the upper part of the Montpellier soil and very slow in the dense subsoil. Available water capacity is moderate. The effective rooting depth is more than 60 inches but roots are restricted to cracks and the faces of peds in the dense subsoil, which is at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the dense subsoil or underlying sediments after periods of heavy rainfall or irrigation. Runoff is medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

The Cometa soil is moderately deep to dense, weakly cemented sediments and is moderately well drained. It formed in old alluvium derived from granitic rock sources. Typically, the surface layer is brown sandy loam about 22 inches thick. The upper part of the subsoil is a claypan of brown sandy clay about 14 inches thick. The lower part to a depth of 60 inches is brown, dense, weakly cemented sandy loam and sandy clay loam. In some areas the surface layer is coarse sandy loam.

Permeability is very slow in the Cometa soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the dense, weakly cemented sediments at a depth of 24 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 17 to 25 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the claypan or underlying sediments after periods of heavy rainfall or irrigation. Runoff is medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing or dryland grain crops. A few areas are used for irrigated orchards or vineyards or for homesite development.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

Where this unit is used for dryland grain crops, the

main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Limiting tillage during seedbed preparation and during the application of weed-control measures helps to control runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated orchard and vineyard crops. The main limitations are the very slow permeability and the depth to a claypan, a dense subsoil, and weakly cemented sediments. General management considerations include the hazard of erosion. Because of the restricted permeability in the Cometa soil, water applications should be regulated so that the water does not stand on the surface and damage the crops. The dense subsoil and weakly cemented sediments limit the suitability for deep-rooted crops. Where feasible, deep ripping of these restrictive layers improves the suitability. A tillage pan forms easily if these soils are tilled when wet. Chiseling or subsoiling breaks up the pan. All tillage should be on the contour or across the slope. If the soils are plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soils or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitations are depth to the claypan or dense subsoil, the high shrink-swell potential, the very slow permeability, and low strength. General management considerations include the hazard of erosion. The cuts needed to provide essentially level building sites can expose the claypan or dense subsoil. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soils to support a load. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. The Montpellier soil is in vegetative soil group A, and the Cometa soil is in vegetative soil group D.

201—Nord loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 50 to 70 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown loam about 25 inches thick. The underlying material to a depth of 60 inches is brown, yellowish brown, and pale brown loam and light yellowish brown fine sandy loam. In some areas the surface layer is silt loam.

Included in this unit are small areas of Delhi and Honcut soils on the slightly higher parts of the landscape and Merritt soils in the slightly lower positions. Also included, in landscape positions similar to those of the Nord soil, are small areas of moderately coarse textured soils that have a slightly brittle substratum below a depth of 40 inches and soils that are gravelly throughout. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Nord soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops, orchards, or vineyards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, orchard, and vineyard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain the rate of water intake and the organic matter content.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

202—Pardee gravelly loam, 0 to 3 percent slopes. This shallow, well drained, nearly level and gently sloping soil is on high terrace remnants. It formed in gravelly and cobbly alluvium derived from mixed sources and is underlain by andesitic, tuffaceous conglomerate. Slopes are plane or convex, and the landscape is characterized by hummocky microrelief. Gravel and cobbles cover 3 to 50 percent of the surface in small concave areas and commonly less than 3 percent of the surface in convex areas. The native

vegetation is mainly annual grasses and forbs. Elevation is 250 to 380 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is yellowish red gravelly loam about 9 inches thick. The subsoil is reddish brown and yellowish red very gravelly clay loam about 9 inches thick. Light gray and brown, andesitic, tuffaceous conglomerate is at a depth of 18 inches. In some areas the surface layer is loam, cobbly loam, or very cobbly loam.

Included in this unit are small areas of Redding and Toomes soils on terraces and soils that are very gravelly and moderately fine textured, have a hardpan at a depth of 10 to 30 inches, and are in landscape positions similar to those of the Pardee soil. Also included are small areas of soils that are gravelly and medium textured and have a hardpan at a depth of 12 to 36 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Pardee soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the very low available water capacity, the limited depth, the number of coarse fragments on the surface in concave areas, and saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, wild oat, foxtail fescue, and filaree. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This map unit is in capability subclass VIs (MLRA-17), nonirrigated. It is in vegetative soil group G.

203—Pardee cobbly loam, 3 to 15 percent slopes. This shallow, well drained, undulating to rolling soil is on hills. It formed in cobbly and gravelly alluvium derived from mixed sources and is underlain by andesitic, tuffaceous conglomerate. Slopes are convex, and the landscape is characterized by hummocky microrelief. Gravel and cobbles cover 15 to 50 percent of the surface in small concave areas and commonly 3 to 15 percent of the surface in convex areas. The native vegetation is mainly annual grasses and forbs. Elevation is 160 to 350 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is yellowish red cobbly loam about 9 inches thick. The subsoil is reddish brown and yellowish red very gravelly clay loam about 9 inches thick. Light gray and brown, andesitic, tuffaceous conglomerate is at a depth of 18 inches. In some areas the surface layer is loam, gravelly loam, or very cobbly loam.

Included in this unit are small areas of Keyes, Pentz, Redding, and Toomes soils on terraces and Lithic Xerorthents in convex positions. Also included, in landscape positions similar to those of the dominant Pardee soil, are small areas of soils that are very gravelly and medium textured and have a hardpan at a depth of 10 to 20 inches and small areas of Pardee soils that have slopes of 0 to 3 or 15 to 25 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Pardee soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight or moderate.

This unit is used mainly for livestock grazing. General management considerations include the very low available water capacity, the limited depth, the number of coarse fragments on the surface, and the hazard of erosion. The characteristic plant community is mainly soft chess, wild oat, foxtail fescue, and filaree. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

This map unit is in capability subclass VIe (MLRA-17), nonirrigated. It is in vegetative soil group G.

204—Peltier mucky clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains and deltas. It formed in hydrophytic plant remains derived from reeds and tules and alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 20 feet above. The average annual precipitation

is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 22 inches of the surface layer is gray and dark gray mucky clay loam. The lower 2 inches is brown and very dark gray silty clay. The subsoil is very dark gray and grayish brown, mottled mucky clay loam about 21 inches thick. The underlying material to a depth of 60 inches is olive gray, mottled clay. In some areas the surface layer is silty clay loam or silty clay.

Included in this unit are small areas of Kingile soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the dominant Peltier soil, are small areas of Ryde and Valdez soils and small areas of Peltier soils that have an organic substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Peltier soil. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-5 (MLRA-16), irrigated, and IVw-5 (MLRA-16), nonirrigated. It is in vegetative soil group E.

205—Peltier mucky clay loam, organic substratum, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains and deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 22 inches of the surface layer is gray mucky clay loam. The lower 2 inches is brown and very dark gray silty clay. The subsoil is black and very dark gray, mottled mucky clay loam about 20 inches thick. The substratum to a depth of 60 inches is dark brown mucky peat. In some areas the surface layer is silty clay loam or silty clay.

Included in this unit are small areas of Egbert and Ryde soils in landscape positions similar to those of the Peltier soil and Rindge soils in the slightly lower landscape positions. Also included are small areas of moderately fine textured soils that have an organic substratum below a depth of 24 inches. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the upper part of the Peltier soil and rapid in the organic substratum, which is at a depth of 40 to 60 inches. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability. General management

considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-5 (MLRA-16), irrigated, and IVw-5 (MLRA-16), nonirrigated. It is in vegetative soil group E.

206—Pentz sandy loam, 2 to 15 percent slopes. This shallow, well drained, undulating to rolling soil is on hills. It formed in material weathered from basic andesitic, tuffaceous sandstone. The native vegetation is mainly annual grasses and forbs. Elevation is 135 to 300 feet. The average precipitation is about 16 inches, the average annual air temperature is 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown and light yellowish brown loam about 11 inches thick. Light gray, moderately consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 15 inches. In some areas the surface layer is fine sandy loam, gravelly sandy loam, or loam.

Included in this unit are small areas of Alamo soils in drainageways; Bellota, Pardee, and Redding soils on terraces; Peters soils in the slightly lower landscape positions; and Lithic Xerorthents in convex positions near the top of the slopes. Also included are small areas of deep or very deep, moderately fine textured soils on concave toe slopes. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion, the limited depth, and the very low available water capacity. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Fencing is difficult because of the depth to bedrock. The very low available water capacity limits the production of desirable forage plants.

If this unit is used for homesite development, the main limitation is the depth to bedrock. General management considerations include the hazard of erosion. The cuts needed to provide essentially level building sites can expose the bedrock. Because of the depth to bedrock, the size of septic tank absorption fields should be increased or specially designed sewage disposal systems should be used. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability subclass VIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

207—Pentz sandy loam, 15 to 50 percent slopes. This shallow, well drained, moderately steep and steep soil is on hills. It formed in material weathered from basic andesitic, tuffaceous sandstone. Slopes are convex. Areas are narrow and sinuous and descend from the adjacent high terraces. Strongly consolidated strata crop out as bands across the slopes in some areas. The native vegetation is mainly annual grasses and forbs and includes blue oak in most areas. Elevation is 170 to 360 feet. The average annual precipitation is about 17 inches. The average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown and light yellowish brown loam about 11 inches thick. Light gray, andesitic, tuffaceous sandstone bedrock is at a depth of 15 inches. In some areas the surface layer is loam, gravelly loam, or gravelly sandy loam.

Included in this unit are small areas of Bellota and Keyes soils at the base of the slopes and Pardee and Redding soils on high terrace remnants. Also included are small areas of Lithic Xerorthents and exposed

bedrock in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for livestock grazing. General management considerations include the very low available water capacity, the limited depth, and the severe hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, and filaree. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

If this unit is used as a source of firewood, the canopy cover will be reduced as a result of the low resprouting potential of blue oak. Because of the moderately steep and steep slopes, harvesting the firewood is difficult. Minimizing the extent of surface disturbance during harvesting reduces the hazard of accelerated erosion.

This map unit is capability subclass VIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

208—Pentz cobbly sandy loam, 5 to 8 percent slopes. This shallow, well drained, gently rolling soil is on hills. It formed in material weathered from basic andesitic, tuffaceous sandstone. The native vegetation is mainly annual grasses and forbs. Elevation is 135 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown cobbly sandy loam about 8 inches thick. The subsoil is brown cobbly sandy loam about 5 inches thick. Light gray, moderately consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 13 inches. In some areas the surface layer is gravelly sandy loam.

Included in this unit are small areas of Alamo soils in drainageways; small areas of Pardee and Redding soils on terraces; small areas of Peters soils in the slightly lower landscape positions; and, on toe slopes, small areas of Pentz soils that have slopes of 2 to 5 percent. Also included are small areas of Lithic Xerorthents in convex positions near the top of the slopes. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion, the very low available water capacity, the limited depth, and the content of cobbles in the surface layer. The characteristic plant community is mainly soft chess, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very low available water capacity limits the production of desirable forage plants. Fencing is difficult because of the depth to bedrock.

If this unit is used for homesite development, the main limitation is the depth to bedrock. General management considerations include the hazard of erosion. The cuts needed to provide essentially level building sites can expose the bedrock. Because of the depth to bedrock, the size of absorption fields should be increased or specially designed sewage disposal systems should be used. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability subclass VIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

209—Pentz-Bellota complex, 2 to 15 percent slopes. These undulating to rolling soils are on hills. They are commonly in concave areas at the base of steeper slopes. Most areas receive runoff from the higher adjacent areas. The native vegetation is mainly annual grasses and forbs. Elevation is 170 to 340 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 55 percent Pentz loam and 30 percent Bellota loam. The Pentz soil is on concave or convex slopes, and the Bellota soil is on concave slopes. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Hicksville and Yellowlark soils in drainageways, Kaseberg and Pardee

soils on terraces, Keyes soils in landscape positions similar to those of the Pentz and Bellota soils, and Peters soils in the slightly lower positions. Also included are small areas of soils that have clay at the surface and, near Bear Creek, small areas of moderately fine textured soils that have a hardpan and formed in material weathered from granitic sediments. Included areas make up 15 percent of the total acreage.

The Pentz soil is shallow and well drained. It formed in material weathered from basic andesitic, tuffaceous sandstone. Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is dark brown loam about 7 inches thick. Light yellowish brown, weakly consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 14 inches. In some areas the surface layer is sandy loam, gravelly loam, or cobbly loam.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

The Bellota soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources and in material weathered from basic andesitic, tuffaceous sandstone. Typically, the surface layer is grayish brown loam about 17 inches thick. The upper part of the subsoil is brown gravelly clay loam about 4 inches thick. The next part is a claypan of dark grayish brown clay about 15 inches thick. The lower part is a light grayish brown hardpan about 1 inch thick. Light gray, moderately consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 37 inches. In some areas the surface layer is sandy loam, gravelly loam, or cobbly loam.

Permeability is very slow in the Bellota soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan, which is at a depth of 20 to 40 inches and is underlain by bedrock. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 12 to 30 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the very low or low available water capacity, saturated soil conditions in concave areas following rainy periods, the hazard of erosion in rolling areas, and the limited depth of the Pentz soil. The characteristic plant community is mainly soft chess, ripgut brome, and filaree on the Pentz soil and soft chess, mouse barley, annual ryegrass, and filaree on the Bellota soil. The very low or low available water capacity limits the production of desirable forage plants. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIe (MLRA-18), nonirrigated. The Pentz soil is in vegetative soil group G, the Bellota soil is in vegetative soil group D.

210—Pentz-Redding complex, 2 to 15 percent slopes. These undulating to rolling soils are on hills and the side slopes of high terraces. Slopes are convex. The native vegetation is mainly annual grasses and forbs. Elevation is 135 to 300 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 55 percent Pentz gravelly sandy loam and 30 percent Redding gravelly sandy loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Redding soils that have slopes of 0 to 2 percent. These soils are on toe slopes. Also included are small areas of Lithic Xerorthents in convex positions near the top of the slopes and Hicksville soils in drainageways. Included areas make up about 15 percent of the total acreage.

The Pentz soil is shallow and well drained. It formed in material weathered from consolidated sediments derived from basic andesitic rock sources. Typically, the surface layer is grayish brown gravelly sandy loam about 10 inches thick. The subsoil is yellowish brown gravelly sandy loam about 4 inches thick. Light gray, moderately consolidated, basic andesitic, tuffaceous sandstone bedrock is at a depth of 14 inches. In some areas the surface layer is sandy loam, loam, or gravelly loam.

Permeability is moderately rapid in the Pentz soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

The Redding soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is reddish yellow gravelly sandy loam about 20 inches thick. The upper part of the subsoil is a claypan of reddish brown gravelly clay about 15 inches thick. The lower part to a depth of 60 inches is a pink and reddish yellow, indurated hardpan. In some areas the surface layer is loam, sandy loam, or gravelly loam.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the very low available water capacity, saturated soil conditions in concave areas following rainy periods, the hazard of erosion in rolling areas, and the limited depth of the Pentz soil. The characteristic plant community is mainly soft chess, wild oat, and filaree on the Pentz soil and soft chess, foxtail fescue, mouse barley, and filaree on the Redding soil. The very low available water capacity limits the production of desirable forage plants. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIe (MLRA-18), nonirrigated. The Pentz soil is in vegetative soil group G, and the Redding soil is in vegetative soil group D.

211—Pescadero clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level, saline-sodic soil is in basins. It formed in alluvium derived from sedimentary rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 40 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown clay loam about 10 inches thick. The subsoil is gray, mottled silty clay about 32 inches thick. The substratum to a depth of 60 inches is gray, mottled silty clay loam. The soil is calcareous and saline-sodic throughout. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Capay soils on the slightly higher parts of the landscape, Egbert and Merritt soils on the slightly lower parts, and Willows soils in landscape positions similar to those of the Pescadero soil. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Pescadero soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 6 feet through drainage systems that require continual maintenance. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the saline-sodic conditions, the high water table, and the very slow permeability. The content of salts can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soil. Intensive management is required to reduce the salinity and maintain productivity. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the very slow permeability, the high shrink-swell potential, low strength, the high water table, and the saline-sodic conditions. The rare flooding is a hazard. The very slow permeability and the high water

table increase the possibility that septic tank absorption fields will not function properly. The very slow permeability can be overcome by increasing the size of the absorption field. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIw-6 (MLRA-17), irrigated, and IVw-6 (MLRA-17), nonirrigated. It is in vegetative soil group F.

212—Peters clay, 2 to 8 percent slopes. This shallow, well drained, gently sloping and moderately sloping soil is on hills. It formed in material weathered from andesitic, tuffaceous sandstone. The native vegetation is mainly annual grasses and forbs. Elevation is 135 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is very dark gray clay about 5 inches thick. The lower part is very dark brown clay about 10 inches thick. White sandstone bedrock is at a depth of 15 inches. In some areas the surface layer is gravelly or cobbly clay.

Included in this unit are small areas of Alamo soils in drainageways and Pentz and Redding soils on terraces. Also included are small areas of fine textured soils that have bedrock at a depth of more than 20 inches or in which gravel and cobbles cover 10 to 35 percent of the surface. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Peters soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

Most areas are used for livestock grazing. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the limited depth, the clayey surface layer, and the very low available water capacity. The characteristic plant community is mainly soft chess, wild oat, and filaree. Fencing is difficult because of the depth to bedrock. Trampling of the clayey surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate. The very low available water capacity limits the production of desirable forage plants.

If this unit is used for homesite development, the main limitations are the depth to bedrock, the high shrink-swell potential, the slow permeability, and low strength. General management considerations include the hazard of erosion. The cuts needed to provide essentially level building sites can expose the bedrock. Because of the depth to bedrock, the size of septic tank absorption fields should be increased or specially designed sewage disposal systems should be used. The slow permeability can be overcome by increasing the size of the absorption field. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability subclass, VIe (MLRA-18), nonirrigated. It is in vegetative soil group G.

213—Piper sandy loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on natural levees and deltas. It formed in mixed alluvium derived from granitic rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown and brown, mottled sandy loam about 15 inches thick. The subsoil is light brownish gray, mottled, weakly cemented sandy loam about 24 inches thick. The underlying material to a depth of 60 inches is light brownish gray, mottled loamy sand. The soil is calcareous throughout. In some areas the surface layer is mucky loam.

Included in this unit are small areas of Ryde, Rindge, Shima, and Valdez soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Piper soil. Available water capacity is low. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 5 feet by pumping. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare

flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the low available water capacity, the high water table, and the weakly cemented subsoil. General management considerations include the hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. The weakly cemented subsoil reduces the yield of deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Subirrigation, furrow, border, and sprinkler systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability unit IVw-4 (MLRA-16), irrigated and nonirrigated. It is in vegetative soil group B.

214—Pits, gravel. These are open excavations from which soil and the underlying material have been removed and other material that supports few or no plants have been exposed. The pits are in scattered areas throughout the county.

Included in this unit are small areas of Dumps and Xerorthents. Included areas make up about 15 percent of the total acreage.

Soil properties, such as permeability, drainage, runoff, effective rooting depth, and available water capacity, vary from one area to another. This unit is poorly suited to most land uses.

This map unit is not assigned a capability classification or a vegetative soil group.

215—Pleito clay loam, 2 to 8 percent slopes. This very deep, well drained, gently sloping and moderately sloping soil is on dissected terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 150 to 600 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown clay loam about 16 inches thick. The subsoil and the underlying material to a depth of 60 inches are grayish brown and brown clay loam. In some areas the surface layer is gravelly clay loam, gravelly loam, or loam.

Included in this unit are small areas of Carbona and Calla soils in landscape positions similar to those of the Pleito soil. Also included are small areas of Pleito soils that have slopes of 0 to 2 or 8 to 15 percent. The areas where slopes are 0 to 2 percent are in drainageways, and the areas where slopes are 8 to 15 percent are on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Pleito soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for livestock grazing. A few areas are used for dryland grain crops. If irrigation water is available, the unit can be used for irrigated crops.

Where this unit is used for livestock grazing, general management considerations include the clay loam surface layer. The characteristic plant community is mainly soft chess, red brome, wild oat, and filaree. Trampling of the clay loam surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Where this unit is used for irrigated row, field, or orchard crops, general management considerations include the hazard of erosion. All tillage should be on the contour or across the slope. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIe-1 (MLRA-17),

irrigated, and IVe-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

216—Ramoth sandy loam, 5 to 8 percent slopes. This very deep, well drained, moderately sloping soil is on dissected terraces. It formed in alluvium derived from granitic rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs and scattered oaks. Elevation is 100 to 190 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is pale brown and light brown sandy loam about 14 inches thick. The upper 18 inches of the subsoil is light brown sandy loam. The lower 22 inches is reddish yellow, strong brown, and light brown sandy clay loam. The substratum to a depth of 60 inches is strong brown coarse sandy loam. In some areas the surface layer is coarse sandy loam.

Included in this unit are small areas of Cometa, Kaseberg, and Montpellier soils on the slightly higher terraces; small areas of Rocklin soils in the slightly lower landscape positions; small areas of moderately coarse textured soils that are deep to a hardpan and are in landscape positions similar to those of the Ramoth soil; and small areas of Ramoth soils that have slopes of 8 to 30 percent and are on the slightly higher parts of the landscape. Also included, on toe slopes, are small areas of moderately coarse textured soils that have a thick, moderately fine textured subsoil and have slopes of 0 to 5 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Ramoth soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing or dryland grain crops. A few areas are used for irrigated vineyards or for homesite development.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

This unit is suited to irrigated vineyards. General management considerations include the hazard of erosion. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. General management considerations include the hazard of erosion. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. The cuts needed to provide essentially level building sites can expose the dense subsoil. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability units IIIe-1 (MLRA-17), irrigated, and IVe-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

217—Ramoth sandy loam, 8 to 15 percent slopes. This very deep, well drained, strongly sloping soil is on dissected terraces. It formed in alluvium derived from granitic rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs and scattered oaks. Elevation is 150 to 180 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is pale brown and light brown sandy loam about 14 inches thick. The upper 18 inches of the subsoil is light brown sandy loam. The lower 22 inches is reddish yellow, strong brown, and light brown sandy clay loam. The substratum to a depth of 60 inches is strong brown coarse sandy loam. In some areas the surface layer is loamy coarse sand or coarse sandy loam.

Included in this unit are small areas of Cometa, Kaseberg, and Montpellier soils on the slightly higher terraces and small areas of moderately coarse textured soils that are deep to a hardpan and are in landscape positions similar to those of the Ramoth soil. Also included, on the slightly higher parts of the landscape, are small areas of Ramoth soils that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Ramoth soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing or dryland grain crops. A few areas are used for irrigated vineyards.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Limiting tillage during seedbed preparation and during the application of weed-control measures helps to control runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated vineyards. General management considerations include the hazard of erosion. Annual cultivation should be avoided on the steeper slopes. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This map unit is in capability unit IVe-1 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group A.

218—Ramoth sandy loam, 15 to 30 percent slopes. This very deep, well drained, moderately steep soil is on dissected terraces. It formed in alluvium derived from granitic rock sources. A few gullies have formed. The native vegetation is mainly annual grasses and forbs and scattered oaks. Elevation is 100 to 190 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is pale brown and light brown sandy loam about 14 inches thick. The upper 18 inches of the subsoil is light brown sandy loam. The lower 22 inches is reddish yellow, strong brown, and light brown sandy clay loam. The substratum to a depth of 60 inches is strong brown coarse sandy loam. In some areas the surface layer is loamy coarse sand or coarse sandy loam.

Included in this unit are small areas of Kingdon and Tokay soils in the slightly lower landscape positions; small areas of Cometa, Kaseberg, and Montpellier soils on the slightly higher terraces; and small areas of moderately coarse textured soils that are deep to a hardpan and are in landscape positions similar to those of the Ramoth soil. Also included, on toe slopes, are small areas of Ramoth soils that have slopes of 5 to 15 percent. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Ramoth soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used mainly for livestock grazing. General management considerations include the severe hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This map unit is in capability unit IVe-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

219—Redding loam, 0 to 3 percent slopes. This moderately well drained, nearly level and gently sloping soil is on high terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Slopes are complex, and the landscape is characterized by hummocky microrelief. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in many areas. Elevation is 130 to 300 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the upper part of the surface layer is light brown loam about 6 inches thick. The lower part is yellowish red loam about 21 inches thick. The upper part of the subsoil is a claypan of yellowish red clay about 3 inches thick. The lower part to a depth of 60

inches is a reddish yellow, indurated, silica-cemented hardpan. In some areas the surface layer is gravelly or cobbly loam.

Included in this unit are areas of Yellowlark soils in drainageways and shallow, medium textured soils that have a claypan at a depth of 10 to 15 inches and are in landscape positions similar to those of the Redding soil. Also included, on the slightly higher parts of the landscape, are small areas of Redding soils that have slopes of 3 to 5 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Redding soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 20 to 36 inches. Water is briefly perched above the claypan after periods of heavy rainfall or irrigation. Runoff generally is very slow or slow but is ponded in the small vernal pools. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used for livestock grazing. A few areas are used as irrigated pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods and the low available water capacity. The characteristic plant community is mainly soft chess, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The low available water capacity limits the production of desirable forage plants. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

Where this unit is used as irrigated pasture, the main limitation is the low available water capacity. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This map unit is in capability units IIIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

220—Redding gravelly loam, 2 to 8 percent slopes. This moderately well drained, undulating and gently rolling soil is on high terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Slopes are complex, and the landscape is characterized by hummocky microrelief. Elevation is 130 to 300 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is strong brown gravelly loam about 7 inches thick. The lower part is reddish yellow gravelly loam about 9 inches thick. The upper part of the subsoil is a claypan of reddish brown clay about 6 inches thick. The lower part to a depth of 60 inches is a reddish yellow and yellowish red, indurated hardpan. In some areas the surface layer is gravelly sandy loam, cobbly loam, or loam.

Included in this unit are small areas of Bellota and Pardee soils on terraces and shallow, medium textured soils that have a claypan at a depth of 10 to 15 inches and are in landscape positions similar to the Redding soil. Also included are small areas of Alamo and Yellowlark soils in drainageways, Pentz soils on the slightly higher terraces, Peters soils in the slightly lower landscape positions, and Redding soils that have slopes of 8 to 30 percent and are on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 16 to 22 inches. Water is briefly perched above the claypan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing. A few areas are used as irrigated pasture or for dryland grain crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods, the

hazard of erosion, and the very low available water capacity. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. The very low available water capacity limits the production of desirable forage plants.

This unit is suited to irrigated pasture. The main limitation is the very low available water capacity. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Limiting tillage during seedbed preparation and during the application of weed-control measures helps to control runoff and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

221—Redding gravelly loam, 8 to 30 percent slopes. This moderately well drained, rolling to moderately steep soil is on dissected high terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Slopes are complex, and the landscape is characterized by hummocky microrelief. Elevation is 130 to 350 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the upper part of the surface layer is strong brown gravelly loam about 7 inches thick. The lower part is reddish yellow gravelly loam about 9 inches thick. The upper part of the subsoil is a claypan of reddish brown clay about 6 inches thick. The lower part to a depth of 60 inches is a reddish yellow and yellowish red, indurated hardpan. In some areas the surface layer is gravelly sandy loam, cobbly loam, or loam.

Included in this unit are small areas of Bellota and Pardee soils on terraces and shallow, medium textured soils that have a claypan at a depth of 10 to 15 inches and are in landscape positions similar to those of the Redding soil. Also included are small areas of Alamo and Yellowlark soils in drainageways, Pentz soils on the slightly higher terraces, Peters soils in the slightly lower landscape positions, and Redding soils that have slopes of 2 to 8 percent and are on toe slopes. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Redding soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 16 to 22 inches. Water is briefly perched above the claypan after periods of heavy rainfall. Runoff is medium or rapid, and the hazard of water erosion is moderate or severe.

Most areas are used for livestock grazing. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include the hazard of erosion and the very low available water capacity. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very low available water capacity limits the production of desirable forage plants.

This map unit is in capability unit IVe-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

222—Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded. This very deep, well drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Elevation is 80 to 165 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown fine sandy loam about 9 inches thick. The upper 47 inches of the underlying material is brown and pale brown, stratified loamy sand and sandy loam. The lower part to a depth

of 63 inches is brown loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Coyotecreek soils in landscape positions similar to those of the Reiff soil and San Joaquin soils on the slightly higher terraces. Also included are small areas of soils that are gravelly and moderately coarse textured and are on complex slopes resulting from channeling and deposition in drainageways. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Reiff soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to occasional, very brief or brief periods of flooding from December through April.

Most areas are used for dryland grain crops. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. The occasional flooding is a hazard. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. The risk of flooding can be reduced by levees and diversions. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain tilth and the organic matter content.

This unit is suited to irrigated row and field crops. The occasional flooding is a hazard. The risk of flooding can be reduced by levees and diversions. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain the rate of water intake and the organic matter content.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

223—Reiff loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 50 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown loam about 7 inches thick. The upper 48 inches of the underlying material is brown and grayish brown, stratified fine sandy loam, loamy sand, and loamy fine sand. The lower part to a depth of 60 inches is pale brown loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Capay, Stomar, and Zacharias soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Reiff soil, are small areas of moderately coarse textured soils that have a surface layer of gravelly or cobbly sandy loam and moderately coarse textured soils that have medium textured or moderately fine textured layers below a depth of 30 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Reiff soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for dryland grain crops or for homesite development.

This unit is suited to irrigated row, field, and orchard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain the rate of water intake and the organic matter content.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, general management considerations include the rare flooding. Roads and streets should be located above expected flood levels.

This map unit is in capability units IIs-0 (MLRA-17), irrigated, and IVs-0 (MLRA-17), nonirrigated. It is in vegetative soil group A.

224—Rindge mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water

table alter the drainage of this soil. Elevation is 20 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray mucky silt loam about 12 inches thick. The underlying material to a depth of 60 inches is black and very dark brown mucky peat. In some areas the surface layer is mucky loam or muck.

Included in this unit are small areas of Kingile and Venice soils in landscape positions similar to those of the Rindge soil. Also included are small areas of Peltier and Ryde soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Rindge soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

225—Rindge muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 20 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray muck about 13 inches thick. The underlying material to a depth of 60 inches is very dark brown and very dark gray mucky peat. In some areas the surface layer is mucky clay loam or mucky loam.

Included in this unit are small areas of Kingile and Venice soils in landscape positions similar to those of the Rindge soil. Also included are small areas of Peltier and Ryde soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Rindge soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the severe hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by

properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

226—Rioblancho clay loam, drained, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is on basin rims. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is sea level to 30 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer and the upper part of the subsoil are gray, mottled clay loam about 16 inches thick. The next 12 inches of the subsoil is variegated light gray and very pale brown, mottled clay loam. The next 11 inches is variegated very pale brown and light yellowish brown, mottled sandy loam. The lower part to a depth of 80 inches is a variegated light gray and light yellowish brown, strongly cemented hardpan. The soil is calcareous below a depth of 7 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Guard and Ryde soils in the slightly lower landscape positions and Stockton and Devries soils in the slightly higher positions. Also included, in landscape positions similar to those of the Rioblancho soil, are small areas of Columbia soils, moderately fine textured soils that have a hardpan below a depth of 40 inches, and soils that do not have a hardpan within a depth of 60 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Rioblancho soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. The water table has been lowered to a depth of more than 6 feet through drainage systems that require continual maintenance, but water may be perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is depth to the hardpan, which limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are depth to the hardpan, the moderately slow permeability, and low strength. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. The moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIw-8 (MLRA-17), irrigated, and IVw-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

227—Rioblancho-Urban land complex, drained, 0 to 2 percent slopes. This nearly level map unit is on basin rims. Elevation is 5 to 25 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Rioblancho clay loam and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Egbert soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Rioblancho soil, are small areas of Stockton and Jacktone soils and small areas of moderately fine textured soils that have a hardpan below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

The Rioblancho soil is moderately deep to a hardpan and is somewhat poorly drained. It formed in alluvium derived from mixed rock sources. Mottles in the profile

indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Typically, the surface layer and the upper part of the subsoil are gray, mottled clay loam about 16 inches thick. The next 12 inches of the subsoil is variegated light gray and very pale brown, mottled clay loam. The next 11 inches is variegated very pale brown and light yellowish brown, mottled sandy loam. The lower part to a depth of 80 inches is a variegated light gray and light yellowish brown, strongly cemented hardpan. The soil is calcareous below a depth of 7 inches. In some areas the surface layer is loam.

Permeability is moderately slow in the Rioblancho soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. The water table has been lowered to a depth of more than 6 feet through drainage systems that require continual maintenance, but water may be perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Rioblancho clay loam.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Rioblancho soil is used for urban development, the main limitations are depth to the hardpan, the moderately slow permeability, and low strength. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. The moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

The Rioblancho soil is suited to irrigated row and field crops. The main limitation is depth to the hardpan, which limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The Rioblancho soil is in capability units IIIw-8 (MLRA-17), irrigated, and IVw-8 (MLRA-17), nonirrigated. It is in vegetative soil group G. The Urban land is not assigned a capability classification or a vegetative soil group.

228—Rocklin sandy loam, 2 to 5 percent slopes. This moderately well drained, undulating soil is on dissected terraces. It is moderately deep to a hardpan. It formed in old alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. Slopes occur as a complex of plane and convex side slopes and concave drainageways. Elevation is 80 to 300 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer and the upper part of the subsoil are pale brown and light brown sandy loam about 25 inches thick. The next 11 inches of the subsoil is light brown sandy clay loam. The lower part is a light brown, indurated hardpan about 4 inches thick. The underlying material to a depth of 60 inches is reddish yellow, dense, weakly cemented sandy loam. In some areas the surface layer is loam.

Included in this unit are small areas of Cometa, Montpellier, and Redding soils on the slightly higher terraces, San Joaquin soils on the slightly lower terraces, and moderately coarse textured soils that have a hardpan at a depth of less than 20 inches and are in landscape positions similar to those of the Rocklin soil. Also included are small areas of Rocklin soils that have slopes of 0 to 2 percent or 5 to 15 percent. The areas where slopes are 0 to 2 percent are on toe slopes, and the areas where slopes are 5 to 15 percent are on narrow embankments. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Rocklin soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Water is briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for livestock grazing or dryland grain crops. A few areas are used for irrigated vineyards, irrigated pasture, or homesite development.

Where this unit is used for livestock grazing, general

management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, wild oat, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated vineyard crops. The main limitations are depth to the hardpan and the low available water capacity. General management considerations include the hazard of erosion. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

If this unit is used for homesite development, the main limitation is depth to the hardpan. General management considerations include the hazard of erosion. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for roads and buildings increases the hazard of erosion.

This map unit is in capability units IIIe-8 (MLRA-17), irrigated, and IVe-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

229—Rocklin fine sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on dissected terraces that have been leveled. It is moderately deep to a hardpan. It formed in old alluvium derived from granitic rock sources. In most areas slopes originally were 2 to 5 percent before extensive land leveling. Elevation is 80 to 250 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer and the upper part of the subsoil are pale brown and light brown fine sandy loam about 25 inches thick. The next 11 inches of the subsoil is light brown sandy clay loam. The lower part is a light brown, indurated hardpan about 4 inches thick. The underlying material to a depth of 60 inches is reddish yellow, dense, weakly cemented sandy loam. In some areas the surface layer is loam.

Included in this unit are small areas of Bruella and San Joaquin soils on terraces and Hicksville soils in drainageways. Also included, in landscape positions similar to those of the dominant Rocklin soil, are moderately coarse textured soils that have a hardpan at a depth less than 20 inches, small areas of Rocklin soils that have slopes of 2 to 5 percent, and moderately coarse textured soils that have a hardpan at a depth of more than 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Rocklin soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Water is briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas of this unit are used for irrigated crops, irrigated pasture, or homesite development.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the hardpan and the low available water capacity. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, sprinkler, and drip irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitation is depth to the hardpan. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

230—Ryde clay loam, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains and deltas. It formed in hydrophytic plant remains and in alluvium derived from mixed rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark gray, mottled clay loam about 24 inches thick. The underlying material to a depth of 63 inches is very dark gray and dark grayish brown, stratified mucky clay loam, silty clay loam, and muck. In some areas the surface layer is mucky clay loam or silty clay loam.

Included in this unit are small areas of Egbert, Guard, and Peltier soils in landscape positions similar to those of the Ryde soil and Scribner soils on the slightly higher parts of the landscape. Also included are small areas of Itano, Kingile, and Rindge soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Ryde soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group E.

231—Ryde silty clay loam, organic substratum, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains and deltas. It formed in hydrophytic plant remains and in alluvium derived from mixed rock sources. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark gray, mottled silty clay loam about 24 inches thick. The upper 16 inches of the underlying material is very dark gray and dark grayish brown, mottled silty clay loam. The lower part to a depth of 60 inches is black mucky peat. In some areas the surface layer is mucky clay loam or mucky silty clay loam.

Included in this unit are small areas of Kingile, Rindge, Venice, and Webile soils in the slightly lower landscape positions. Also included are small areas of moderately fine textured soils that have an organic substratum at a depth of 30 to 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Ryde soil and rapid in the organic substratum.

Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. Depth to the organic substratum ranges from 40 to 60 inches. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group E.

232—Ryde clay loam, sandy substratum, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on flood plains and deltas. It formed in alluvium derived from mixed rock sources and in hydrophytic plant remains. Mottles in the profile indicate a very poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown and dark gray, mottled clay loam about 24 inches thick. The upper 16 inches of the underlying material is dark gray and grayish brown, mottled silty clay loam. The lower part to a depth of 60 inches is light gray, stratified loamy fine sand and loamy sand. In some areas the surface layer is mucky clay loam or silty clay loam.

Included in this unit are small areas of Egbert, Merritt, Piper, and Valdez soils; Ryde soils that have stratified medium textured or moderately fine textured material below a depth of 40 inches; and moderately fine textured soils that have a coarse textured substratum at a depth of 30 to 40 inches. All of these included soils are in landscape positions similar to those of the dominant Ryde soil. Also included are Dello and Kingile soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Ryde soil and rapid in the sandy substratum. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. Depth to the sandy substratum ranges from 40 to 60 inches. The soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-2 (MLRA-16),

irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group E.

233—Ryde-Peltier complex, partially drained, 0 to 2 percent slopes. These nearly level soils are on flood plains and deltas. Levees, drainage ditches, and pumping of the water table alter the drainage of these soils. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Ryde clay loam and 35 percent Peltier mucky clay loam. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Scribner soils on the slightly higher parts of the landscape and Rindge and Venice soils on the slightly lower parts. Also included, in landscape positions similar to those of the Ryde and Peltier soils, are small areas of Valdez soils and small areas of moderately fine textured or fine textured soils that have an organic or coarse textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

The Ryde soil is very deep and very poorly drained. It formed in alluvium derived from mixed rock sources and in hydrophytic plant remains. Typically, the surface layer is grayish brown and dark gray, mottled clay loam about 24 inches thick. The underlying material to a depth of 63 inches is very dark gray and dark grayish brown, mottled mucky clay loam and silty clay loam. In some areas the surface layer is mucky clay loam or silty clay loam.

Permeability is moderately slow in the Ryde soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

The Peltier soil is very deep and poorly drained. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Typically, the upper 22 inches of the surface layer is gray and dark gray mucky clay loam. The lower 2 inches is brown and very dark gray silty clay. The subsoil is very dark gray and grayish brown, mottled mucky clay loam about 21 inches thick. The underlying material to a depth of 60 inches is olive gray, mottled clay. In some areas the surface layer is silty clay loam or silty clay.

Permeability is slow in the Peltier soil. Available water capacity is high or very high. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability in the Peltier soil. General management considerations include the hazard of soil blowing. Because these soils are subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the slow permeability in the Peltier soil, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group E.

234—Sailboat silt loam, drained, 0 to 2 percent slopes. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 10 feet. The average annual

precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper 15 inches of the underlying material is stratified gray, grayish brown, and brown, mottled clay loam. The lower part to a depth of 61 inches is dark gray, pale brown, and brown, mottled silty clay loam. In some areas the surface layer is loam or sandy loam.

Included in this unit are small areas of Columbia, Cosumnes, Egbert, and Scribner soils in landscape positions similar to those of the Sailboat soil and Tokay soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Sailboat soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet, but water may be perched above the stratified substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.7 inch per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, and vineyard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and increases the rate of water intake and the organic matter content.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and low strength. The rare flooding is a hazard. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

235—Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded. This very deep, somewhat poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 10 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper 15 inches of the underlying material is stratified gray, grayish brown, and brown, mottled clay loam. The lower part to a depth of 61 inches is dark gray, pale brown, and brown, mottled silty clay loam. In some areas the surface layer is loam or sandy loam.

Included in this unit are small areas of Columbia, Cosumnes, Egbert, and Scribner soils in landscape positions similar to those of the Sailboat soil and Tokay soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Sailboat soil. Available water capacity is very high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet, but water may be perched above the stratified substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.7 inch per hour. The hazard of soil blowing is slight. The soil is subject to occasional, brief periods of flooding from December through April.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and vineyard crops. The main hazard is the occasional flooding. The risk of flooding can be reduced by levees and diversions. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and increases the rate of water intake and the organic matter content.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and low strength. The occasional flooding is a hazard. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Dikes and channels that have outlets for floodwater can protect buildings and onsite sewage disposal systems from flooding.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

236—San Joaquin sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. Slopes are complex, and the landscape is characterized by hummocky microrelief, depressions, minor drainageways, and areas that have been leveled. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in many areas. Elevation is 20 to 150 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is brown sandy loam about 13 inches thick. The upper part of the subsoil is a claypan of brown clay about 7 inches thick. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is fine sandy loam, loam, or gravelly sandy loam.

Included in this unit are small areas of Bruella and Rocklin soils on the slightly higher terraces, Jahant soils in landscape positions similar to those of the San Joaquin soil, and Madera soils on the slightly higher parts of the landscape. Also included are small areas of San Joaquin soils that have slopes of 2 to 5 percent and are on the slightly higher parts of the landscape, areas that have as much as 20 inches of overburden, and areas where most of the soil horizons have been removed or altered or fragments of hardpan and claypan materials are within 10 inches of the surface as a result of land leveling. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is ponded in the small vernal pools, is very slow or ponded in leveled areas, and is slow on the convex slopes. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing or for irrigated pasture, irrigated crops, or vineyards. A few areas are used for dryland grain crops or homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This unit is suited to irrigated pasture. The main limitations are the complex slopes and the very low available water capacity. Leveling helps to ensure a uniform application of water. Because the soil is droughty, the applications should be light and frequent. The water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are the complex slopes, depth to the very slowly permeable claypan and hardpan, and the very low available water capacity. Leveling helps to ensure a uniform application of water. Because of the restricted permeability, the applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and maintains the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for

annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the claypan. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for buildings is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

237—San Joaquin sandy loam, 2 to 5 percent slopes. This moderately well drained, undulating soil is on dissected terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. Slopes occur as a complex of plane and convex side slopes and concave drainageways. Elevation is 20 to 150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The upper part of the subsoil is a claypan of brown clay about 10 inches thick. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Bruella and Rocklin soils on the slightly higher terraces, Jahant soils in landscape positions similar to those of the San Joaquin soil, Madera soils in the slightly lower positions, and San Joaquin soils that have slopes of 0 to 2 or 8 to 15 percent. The areas where slopes are 0 to 2 percent are on toe slopes, and the areas where slopes are 8 to 15 percent are on narrow embankments. Also included are small areas of Redding soils that have slopes of 2 to 8 percent and are on the slightly higher terraces and moderately coarse textured soils that have a hardpan at a depth of 12 to 20 inches and are in landscape positions similar to those of the San Joaquin soil. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Available water capacity is very low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is slight or moderate. The rate of water intake in irrigated areas is 1.5 inches per hour.

Most areas are used for livestock grazing. A few areas are used for irrigated vineyards, irrigated pasture, or dryland grain crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods and the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion.

This unit is suited to irrigated vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan and the very low available water capacity. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. All tillage should be on the contour or across the slope. If the soil is plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Returning crop residue to the soil or regularly adding other organic

material improves fertility, minimizes crusting, and maintains the rate of water intake.

This unit is suited to irrigated pasture. The main limitation is the very low available water capacity. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

238—San Joaquin loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. The landscape is characterized by a complex of gently sloping hummocks and depressions, minor drainageways, and areas that have been leveled. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in many areas. Elevation is 20 to 100 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer and the upper part of the subsoil are brown loam about 16 inches thick. The next part of the subsoil is a claypan of brown clay about 10 inches thick. The lower part to a depth of 60 inches is a brown, light brown, and strong brown, indurated hardpan. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Hollenbeck and Galt soils in the slightly lower landscape positions, moderately coarse textured soils that have a hardpan at a depth of 12 to 20 inches and are in landscape positions similar to those of the San Joaquin soil, and San Joaquin soils that have slopes of 2 to 5 percent and are on the slightly higher parts of the landscape. Also included are areas that have as much as 20 inches of overburden and areas where most of the soil horizons have been removed or altered as a result of land leveling. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is ponded in the small vernal pools, is very slow or ponded in the leveled areas, and is slow on the convex slopes. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used for livestock grazing or for irrigated pasture, irrigated crops, or vineyards. A few areas are used for dryland grain crops or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This unit is suited to irrigated pasture. The main limitations are the complex slopes and the low available water capacity. Leveling helps to ensure a uniform application of water. Because the soil is droughty, the applications should be light and frequent. The water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are the complex slopes, depth to the very slowly permeable claypan and hardpan, and the low available water capacity. Leveling helps to ensure a uniform application of water. Because of the restricted permeability, the applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan.

Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the claypan. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for buildings is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

239—San Joaquin loam, 2 to 8 percent slopes, eroded. This moderately well drained, undulating and gently rolling soil is on dissected low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. Slopes are complex. They occur as plane and convex side slopes and concave drainageways. Elevation is 20 to 100 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer and the upper part of the subsoil are brown loam about 16 inches thick. The next part of the subsoil is a claypan of brown clay about 10 inches thick. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer has been removed by erosion.

Included in this unit are small areas of Jahant and Bruella soils on terraces and moderately coarse textured soils that have a hardpan at a depth of 10 to 20 inches. Also included are small areas of San Joaquin soils that have slopes of 0 to 2 or 8 to 15 percent. The areas where slopes are 8 to 15 percent are on narrow embankments. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is slow or medium, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used for livestock grazing. A few areas are used for irrigated vineyards, irrigated pasture, or dryland grain crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods and the hazard of erosion. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This unit is suited to irrigated vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan and the low available water capacity. General management considerations include the hazard of erosion. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff,

and minimize the risk of erosion. All tillage should be on the contour or across the slope. If the soils are plowed in fall, runoff and erosion can be controlled by applying fertilizer and seeding a cover crop. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. General management considerations include the hazard of erosion. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This map unit is in capability unit IVe-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

240—San Joaquin loam, thick surface, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from granitic rock sources. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in many areas. Elevation is 20 to 110 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

Typically, the surface layer is pinkish gray loam about 12 inches thick. The upper 14 inches of the subsoil is brown sandy clay loam. The next 9 inches is a claypan of brown clay. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is fine sandy loam or sandy loam.

Included in this unit are small areas of Bruella and Exeter soils on terraces. Also included are small areas of San Joaquin soils that have slopes of 2 to 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the San Joaquin soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 20 to 30 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is ponded in the small vernal pools, is very slow or ponded in the leveled areas, and is slow on the convex slopes. The hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used for livestock grazing or for irrigated pasture, irrigated crops, or vineyards. A few areas are used for dryland grain crops or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, ripgut brome, foxtail fescue, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed.

This unit is suited to irrigated pasture. The main limitation is the complex slopes. Leveling helps to ensure a uniform application of water. The water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are the complex slopes and depth to the very slowly permeable claypan and hardpan. Leveling helps to ensure a uniform application of water. Because of the restricted permeability, the applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the

main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the claypan. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for buildings is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability units IIIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

241—San Joaquin complex, 0 to 1 percent slopes. These nearly level soils are on low terraces. The native vegetation is mainly annual grasses, forbs, and scattered California white oak. Elevation is 20 to 110 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

This unit is 45 percent San Joaquin loam and 40 percent San Joaquin loam, thick surface. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Exeter and Rocklin soils on adjacent terraces. Also included, in landscape positions similar to those of the San Joaquin soils, are small areas of moderately coarse textured soils that have a hardpan at a depth of 10 to 20 inches and moderately coarse textured soils that have been ripped and have remnants of claypan and hardpan material. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil that does not have a thick surface layer is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from granitic rock sources. Typically, the surface layer and the upper part of the subsoil are brown loam about 16 inches thick. The next 10 inches of the subsoil is a claypan of brown clay. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is fine sandy loam or sandy loam.

Permeability is very slow in the San Joaquin soil that does not have a thick surface layer. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

The San Joaquin soil that has a thick surface layer is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from granitic rock sources. Typically, the surface layer is pinkish gray loam about 12 inches thick. The upper 14 inches of the subsoil is brown sandy clay loam. The next 9 inches is brown clay. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is fine sandy loam or sandy loam.

Permeability is very slow in the San Joaquin soil that has a thick surface layer. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 20 to 30 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall or irrigation. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Most areas are used as irrigated pasture. A few areas are used for homesite development or for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity in some areas. Because of droughtiness, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soils from compaction.

If this unit is used for homesite development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the claypan. On sites for septic tank

absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability for septic tank absorption fields. Excavation for buildings is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soils to support a load.

This unit is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan and the low available water capacity in some areas. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if these soils are tilled when wet. Chiseling or subsoiling breaks up the pan. Because of droughtiness, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soils or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D.

242—San Joaquin-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is on low terraces. Elevation is 20 to 110 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 275 days.

This unit is 50 percent San Joaquin loam and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Kingdon and Tokay soils on the slightly higher parts of the landscape. Also included, in landscape positions similar to the San Joaquin soil, are small areas of moderately coarse textured soils that have a hardpan at a depth of 10 to 20 inches and moderately coarse textured soils that have been ripped and have remnants of claypan and hardpan material. Included areas make up about 15 percent of the total acreage.

The San Joaquin soil is moderately deep to a hardpan and is moderately well drained. It formed in alluvium derived from granitic rock sources. Typically, the surface layer and the upper part of the subsoil are brown loam about 16 inches thick. The next 10 inches of the subsoil is a claypan of brown clay. The lower part to a depth of 60 inches is a brown and light brown, indurated hardpan. In some areas the surface layer is silt loam.

Permeability is very slow in the San Joaquin soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 10 to 20 inches. Water is briefly perched above the claypan and hardpan after periods of heavy rainfall. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.0 inch per hour.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of San Joaquin loam.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the San Joaquin soil is used for urban development, the main limitations are depth to the very slowly permeable claypan and hardpan, the high shrink-swell potential, and low strength in the claypan. On sites for septic tank absorption fields, the very slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Excavation for buildings is limited by the hardpan. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

The San Joaquin soil is suited to irrigated row, field, and vineyard crops. The main limitations are depth to the very slowly permeable claypan and hardpan and the low available water capacity. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Because the soil is droughty, applications of irrigation water should

be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The San Joaquin soil is in capability unit IVs-3 (MLRA-17), irrigated and nonirrigated. It is in vegetative soil group D. The Urban land is not assigned a capability classification or a vegetative soil group.

243—Scribner clay loam, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 10 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray, mottled clay loam about 24 inches thick. The underlying material to a depth of 62 inches is stratified light olive gray, dark gray, and gray, mottled silty clay loam and loam. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Egbert, Grangeville, Guard, and Merritt soils in landscape positions similar to those of the Scribner soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Scribner soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 5 feet through drainage systems that require continual maintenance. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. General management considerations include the hazard of soil blowing. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are subsidence, low strength, the moderately slow permeability, and the high water table. The rare flooding is a hazard. Properly designing buildings and roads can offset the limited ability of the soil to support a load. The moderately slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

244—Scribner clay loam, sandy substratum, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 feet below sea level to 10 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray, mottled clay loam about 25 inches thick. The upper 19 inches of the underlying material is light olive gray and light gray, mottled silty clay loam and clay loam. The lower part to a depth of 60 inches is stratified olive gray and light olive gray, mottled fine sand, sand, and loamy sand. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Dello soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the dominant Scribner soil, are small areas of Egbert, Grangeville, and Merritt soils and small areas of Scribner soils that have a medium textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Scribner soil and rapid in the sandy substratum. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 5 feet through drainage systems that require continual maintenance. This soil is

subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. General management considerations include the hazard of soil blowing. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Deep drainage ditches can lower the water table if a suitable outlet is available. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitations are subsidence, low strength, the high water table, and the rapid permeability in the sandy substratum. The rare flooding is a hazard. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

245—Scribner-Urban land complex, partially drained, 0 to 2 percent slopes. This nearly level map unit is on flood plains. Elevation is near sea level to 10 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Scribner clay loam and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Stockton and Rioblancho soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the dominant Scribner soil, are small areas of Egbert soils and small areas of Scribner soils that have been more extensively drained or that have a coarse textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

The Scribner soil is very deep and poorly drained. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Typically, the surface layer is grayish brown and dark gray, mottled clay loam about 24 inches thick. The underlying material to a depth of 60 inches is stratified dark gray, mottled silt loam, clay loam, and silty clay loam. In some areas the surface layer is mucky clay loam or silty clay loam.

Permeability is moderately slow in the Scribner soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 3 to 5 feet through drainage systems that require continual maintenance. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Scribner clay loam.

Most areas are used for urban development. A few areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Scribner soil is used for urban development, the main limitations are subsidence, low strength, the moderately slow permeability, and the high water table. The rare flooding is a hazard. Properly designing buildings and roads can offset the limited ability of the soil to support a load. The moderately slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This unit is suited to irrigated row and field crops. The main limitation is the high water table. General management considerations include the hazard of soil

blowing. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

The Scribner soil is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A. The Urban land is not assigned a capability classification or a vegetative soil group.

246—Shima muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in the highly decomposed remains of reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray muck about 21 inches thick. The upper 2 inches of the underlying material is very dark gray, mottled mucky clay loam. The lower part to a depth of 60 inches is light brownish gray and light yellowish brown, mottled loamy sand. In some areas the surface layer is mucky loam or mucky clay loam.

Included in this unit are small areas of Kingile and Rindge soils and small areas of organic soils that have a weakly cemented, moderately coarse textured substratum or a moderately fine textured substratum. All of these included soils are in landscape positions similar to the Shima soil. They make up about 15 percent of the total acreage.

Permeability is moderate in the upper part of the Shima soil and very rapid in the mineral lower part. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the severe hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

247—Shinkee muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in the highly decomposed remains of reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray muck about 22 inches thick. The upper 4 inches of the underlying material is dark grayish brown, mottled mucky clay loam. The lower part to a depth of 60 inches is grayish brown, mottled fine sandy loam. In some areas the surface layer is mucky loam.

Included in this unit are small areas of Kingile, Rindge, and Shima soils and small areas of organic soils that have a fine textured substratum. All of these included soils are in landscape positions similar to those of the Shinkee soil. They make up about 15 percent of the total acreage.

Permeability is moderately slow in the Shinkee soil. Available water capacity is very high. The effective

rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the severe hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

248—Stockton fine sandy loam, 0 to 2 percent slopes, overwashed. This somewhat poorly drained, nearly level soil is in basins. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 70 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown fine sandy loam about 16 inches thick. It is underlain by a buried surface layer of dark gray clay about 37 inches thick. The next 5 inches is light brownish gray and grayish brown clay loam. Below this to a depth of 60 inches is a variegated dark grayish brown and brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is silty clay loam or loam.

Included in this unit are small areas of Archerdale and Cogna soils on the slightly higher parts of the landscape and Hollenbeck soils in landscape positions similar to those of the Stockton soil. Also included are small areas of Stockton soils that are fine textured throughout. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Stockton soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the

limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group C.

249—Stockton silty clay loam, 0 to 2 percent slopes, overwashed. This somewhat poorly drained, nearly level soil is in basins. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 70 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown silty clay loam about 12 inches thick. Below this is a buried surface layer of dark gray clay about 22 inches thick. The upper part of the subsoil is grayish brown and light brownish gray clay loam about 13 inches thick. The lower part to a depth of 60 inches is a brown and light brownish gray, weakly cemented to strongly cemented hardpan. In some areas the surface layer is clay loam or loam.

Included in this unit are small areas of Archerdale and Cogna soils on the slightly higher parts of the landscape and Hollenbeck soils on the slightly lower parts. Also included are small areas of Stockton soils that are fine textured throughout and small areas of soils that have a hardpan at a depth of 30 to 40 inches, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Stockton soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and increases the rate of water intake and the organic matter content.

If this unit is used for homesite development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

250—Stockton clay, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is in basins. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is sea level to 100 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark gray clay about 29 inches thick. The upper 8 inches of the subsoil also is dark gray clay. The next 5 inches is light brownish gray and grayish brown clay loam. The lower part to a depth of 60 inches is a variegated dark grayish brown and dark brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is silty clay, silty clay loam, or clay loam.

Included in this unit are small areas of Archerdale and Vignolo soils on the slightly higher parts of the landscape; Galt and Jacktone soils in landscape positions similar to those of the Stockton soil; and

Egbert, Guard, and Rioblancho soils in the slightly lower positions. Also included are small areas of Stockton soils that are highly calcareous or saline-sodic throughout. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Stockton soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used as irrigated pasture or for urban development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for urban development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C.

251—Stockton-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is in basins. Elevation is 10 to 40 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Stockton clay and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Galt soils in landscape positions similar to those of the Stockton soil and Egbert and Ryde soils in the slightly lower positions. Also included are small areas of soils that have been altered by construction activities and Stockton soils that have moderately coarse textured or moderately fine textured overwash or that have a hardpan at a depth of 30 to 40 inches as a result of leveling. Included areas make up about 15 percent of the total acreage.

The Stockton soil is deep to a hardpan and is somewhat poorly drained. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Typically, the surface layer is dark gray clay about 29 inches thick. The upper 8 inches of the subsoil also is dark gray clay. The next 5 inches is mixed light brownish gray and grayish brown clay loam. The lower part to a depth of 60 inches is a variegated dark grayish brown and dark brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is silty clay, silty clay loam, or clay loam.

Permeability is slow in the Stockton soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 5 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other

structures. The soil material under the impervious surface is similar to that of Stockton clay.

Most areas are used for urban development. A few areas are used for irrigated crops or orchards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where the Stockton soil is used for urban development, the main limitations are the high shrink-swell potential, the slow permeability, depth to the hardpan, and low strength. The rare flooding is a hazard. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and depth to the hardpan. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Furrow, border, and sprinkler irrigation systems are suitable. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

The Stockton soil is in capability units IIs-5 (MLRA-17), irrigated, and IVs-5 (MLRA-17), nonirrigated. It is in vegetative soil group C. The Urban land is not assigned a capability classification or a vegetative soil group.

252—Stomar clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from sedimentary rock sources. Elevation is 40 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown clay loam about 17 inches thick. The upper 30 inches of the subsoil is brown clay loam and clay. The lower part to a depth of 60 inches is yellowish brown clay loam. The soil is calcareous below a depth of 17 inches. In some areas the surface layer is silty clay loam or loam.

Included in this unit are small areas of Capay, El Solyo, Pescadero, and Willows soils and small areas of moderately fine textured soils that have a water table at a depth of 48 to 60 inches. All of these included soils are in the slightly lower landscape positions. They make up about 15 percent of the total acreage.

Permeability is slow in the Stomar soil. Available water capacity is very high. The shrink-swell potential is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas are used for irrigated crops or orchards. A few areas are used for dryland grain crops or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the slow permeability. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are the slow permeability, the high shrink-swell potential, and low strength. On sites for septic tank absorption fields, the slow permeability can be overcome by increasing the size of the absorption field, backfilling the trench with sandy material, and installing long absorption lines. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

253—Stomar clay loam, wet, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from sedimentary rock sources. It has a high water table as a result of the application of irrigation water. Drainage systems that require continual maintenance have lowered the water table. Elevation is 40 to 150 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown clay loam about 17 inches thick. The upper 30 inches of the subsoil is brown clay loam and clay. The lower part to a depth of 60 inches is yellowish brown clay loam. The soil is calcareous below a depth of 17 inches. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Capay, Pescadero, and Willows soils in the slightly lower landscape positions. Also included, on the slightly higher parts of the landscape, are small areas of moderately fine textured soils that do not have a high water table. Included areas make up about 15 percent of the total acreage.

Permeability is slow in the Stomar soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are the slow permeability and the high water table. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Careful applications are needed to prevent the buildup of a high water table. A drainage system may be needed. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the slow permeability, the high shrink-swell potential, low strength, and the high water table. The slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. The slow permeability can be overcome by increasing the size of the absorption field. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed.

This map unit is in capability units IIw-3 (MLRA-17), irrigated, and IVw-3 (MLRA-17), nonirrigated. It is in vegetative soil group A.

254—Timor loamy sand, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 20 to 40 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 14 inches of the surface layer is grayish brown loamy sand. The lower 17 inches of the surface layer and the upper 25 inches of the subsoil are grayish brown and brown loamy sand. The lower part of the subsoil to a depth of 60 inches is a light gray, strongly cemented to indurated hardpan. In some areas the surface layer is loamy coarse sand or sandy loam.

Included in this unit are small areas of Bisgani and Grangeville soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Timor soil, are Veritas and Tinnin soils and small areas of coarse textured soils that have moderately fine textured layers above the hardpan. Depth to the cemented hardpan is as little as 30 inches in a few included areas, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Timor soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or irrigated pasture. A few areas are used for homesite

development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the low available water capacity and depth to the hardpan. General management considerations include the severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. The main limitation is the low available water capacity. Because the soil is droughty, applications of irrigation water should be light and frequent. The water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are depth to the hardpan and the rapid permeability. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

255—Tinnin loamy coarse sand, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from granitic rock sources. Elevation is 20 to 70 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown loamy coarse sand about 28 inches thick. The upper 25 inches of the underlying material is brown, mottled loamy coarse sand. The lower part to a depth of 75 inches is pale brown, mottled loamy coarse sand. In some areas the surface layer is loamy fine sand or sandy loam.

Included in this unit are small areas of Delhi and Honcut soils on the slightly higher parts of the landscape and Manteca and Veritas soils on the slightly lower parts. Also included, in landscape positions similar to those of the Tinnin soil, are small areas of Timor soils and coarse textured soils that have a medium textured substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Tinnin soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe.

Most areas of this unit are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is the low available water capacity. General management considerations include the severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

If this unit is used for homesite development, the main limitation is the rapid permeability. Community sewage systems may be needed because seepage from onsite sewage disposal systems can result in the contamination of water supplies.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

256—Tokay fine sandy loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on low fan terraces. It formed in alluvium derived from granitic rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 10 to 125 feet. The average

annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is grayish brown fine sandy loam about 19 inches thick. The subsoil is grayish brown, brown, and pale brown fine sandy loam about 26 inches thick. The substratum to a depth of 60 inches is pale brown fine sandy loam.

Included in this unit are small areas of Devries and Tujunga soils in the slightly lower landscape positions. Also included are small areas of Acampo and Kingdon soils in landscape positions similar to those of the Tokay soil. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Tokay soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated crops. General management considerations include the hazard of soil blowing. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

Few limitations affect the use of this unit for homesite development.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

257—Tokay-Urban land complex, 0 to 2 percent slopes. This nearly level map unit is on low fan terraces. Elevation is 20 to 100 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

This unit is 50 percent Tokay fine sandy loam and 35 percent Urban land. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Columbia, Devries, and Tujunga soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Tokay soil, are small areas of Acampo soils and soils that have been altered by construction activities. Included areas make up about 15 percent of the total acreage.

The Tokay soil is very deep and well drained. It formed in alluvium derived from granitic rock sources. Typically, the surface layer is grayish brown fine sandy loam about 19 inches thick. The subsoil is grayish brown, brown, and pale brown fine sandy loam about 26 inches thick. The substratum to a depth of 60 inches is pale brown fine sandy loam.

Permeability is moderately rapid in the Tokay soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate.

Urban land consists of areas covered by roads, driveways, sidewalks, parking lots, buildings, and other structures. The soil material under the impervious surface is similar to that of Tokay fine sandy loam.

Most areas are used for urban development. A few areas are used for irrigated crops, orchards, or vineyards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Few limitations affect the use of the Tokay soil for urban development.

The Tokay soil is well suited to irrigated crops. General management considerations include the hazard of soil blowing. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

The Tokay soil is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A. The Urban land is not assigned a capability classification or a vegetative soil group.

258—Trahern clay loam, partially drained, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is on low terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a somewhat poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 20 to 40 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is grayish brown and gray, mottled clay loam about 14 inches thick. The upper 14 inches of the subsoil is light brownish gray,

gray, and pale brown clay. The next 10 inches is pale brown silty clay loam and light grayish brown, mottled clay loam. The lower part to a depth of 60 inches is a light brownish gray, indurated to strongly cemented hardpan. The soil is saline-sodic throughout. In some areas the surface layer is loam or silty clay loam.

Included in this unit are small areas of Manteca, Veritas, and Tinnin soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Trahern soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by the hardpan at a depth of 20 to 40 inches and by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are the saline-sodic conditions, the very slow permeability, depth to the hardpan, and the high water table. The content of salts can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soil. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Careful applications are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Intensive management is required to reduce the salinity and maintain productivity. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. The main limitations are the saline-sodic conditions. The concentration of salts and sodicity in the surface layer limit the production of plants suitable for irrigated pasture. Leaching the salts from the surface layer is difficult because of the high water table. A drainage system and irrigation water management reduce the concentration of salts. Salt-tolerant species should be selected for planting. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This map unit is in capability units IIIw-6 (MLRA-17), irrigated, and IVw-6 (MLRA-17), nonirrigated. It is in vegetative soil group F.

259—Tujunga loamy sand, 0 to 2 percent slopes. This very deep, somewhat excessively drained, nearly level soil is on flood plains and elongated channel remnants. It formed in alluvium derived from granitic rock sources. Elevation is 40 to 70 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown loamy sand about 22 inches thick. The underlying material to a depth of 67 inches is pale brown loamy sand. In some areas the surface layer is loamy coarse sand.

Included in this unit are small areas of Honcut, Tokay, and Veritas soils on the slightly higher parts of the landscape. Also included, in landscape positions similar to the Tujunga soil, are small areas of Columbia soils and soils that are gravelly and coarse textured. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Tujunga soil. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 3.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the low available water capacity. General management considerations include the severe hazard of soil blowing. Because the soil is droughty, applications of irrigation water should be light and frequent. The high percentage of sand in the soil reduces the amount of moisture available for plant growth. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly

managing all crop residue and by minimizing tillage.

This map unit is in capability units IIIs-4 (MLRA-17), irrigated, and VIe-4 (MLRA-17), nonirrigated. It is in vegetative soil group B.

260—Urban land. This map unit consists of closely built-up areas in cities. Streets, parking lots, buildings, and other structures cover more than 85 percent of the surface. The landscape has been so altered by urban works that identification of the soils is not feasible.

This map unit is not assigned a capability classification or a vegetative soil group.

261—Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level soil is on flood plains and deltas. It formed in alluvium derived from mixed rock sources and in the hydrophytic plant remains of reeds and tules. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 15 feet below sea level to 5 feet above. The average annual precipitation is about 15 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is light brownish gray, mottled silt loam about 14 inches thick. The lower part of the surface layer and the upper part of the underlying material are light brownish gray, mottled silt loam and silty clay loam about 26 inches thick. The lower 10 inches of the underlying material is dark gray mucky silt loam. Below this part to a depth of 60 inches is black mucky peat. In some areas the surface layer is silty clay loam or mucky loam.

Included in this unit are small areas of Itano, Peltier, Piper, and Ryde soils in landscape positions similar to those of the Valdez soil. Also included are small areas of Kingile, Rindge, and Shinkee soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Valdez soil and rapid in the organic substratum. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.7 inch per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. Levees should be checked periodically, and a proper maintenance program should be developed. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and increases the rate of water intake and the organic matter content.

This map unit is in capability units IIIw-2 (MLRA-16), irrigated, and IVw-2 (MLRA-16), nonirrigated. It is in vegetative soil group E.

262—Vaquero-Carbona complex, 8 to 30 percent slopes. These strongly sloping and moderately steep soils are on mountains and on the side slopes of uplifted, dissected terraces. The native vegetation is mainly annual grasses and forbs. Elevation is 400 to 1,100 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Vaquero clay and 35 percent Carbona clay. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Calla soils on terraces and Wisflat soils and exposed bedrock in convex positions near the top of the slopes. Also included are small areas of very deep, medium textured soils on old alluvial fans; areas of soils dissected by deep gullies; and severely eroded, shallow, medium textured soils in landscape positions similar to those of the Vaquero and Carbona soils. Included areas make up about 15 percent of the total acreage.

The Vaquero soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown clay about 21 inches thick. The subsoil is grayish brown clay about 4 inches thick. Light brownish gray and light

olive brown sandstone bedrock is at a depth of 25 inches. The soil is calcareous between depths of 10 and 25 inches and is saline-sodic below a depth of 20 inches. In some areas the surface layer is silty clay.

Permeability is slow in the Vaquero soil. Available water capacity is low. The shrink-swell potential is high. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is moderate or severe.

The Carbona soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the upper 18 inches of the surface layer is grayish brown clay. The lower 12 inches is brown clay. The subsoil to a depth of 60 inches is pale brown clay loam. In some areas the surface layer is clay loam.

Permeability is slow in the Carbona soil. Available water capacity is high. The shrink-swell potential also is high. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate or severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the hazard of erosion, the clayey surface layer, and excessive shrinking and swelling. The characteristic plant community is mainly wild oat, soft chess, and filaree. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Trampling of the clayey surface layer by livestock when the soils are too wet reduces productivity and increases the runoff rate. Fencing is difficult. Excessive shrinking and swelling of the soils can cause fenceposts to be tilted or removed from the ground.

This map unit is in capability subclass VIe (MLRA-15), nonirrigated. The Vaquero soil is in vegetative soil group G, and the Carbona soil is in vegetative soil group C.

263—Venice mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 20 feet below sea level to sea level. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark grayish brown mucky silt loam about 15 inches thick. The underlying material to a depth of 60 inches is black and very dark brown mucky peat. In some areas the surface layer is mucky loam or mucky clay loam.

Included in this unit are small areas of Peltier and Ryde soils on the slightly higher parts of the landscape. Also included are small areas of Rindge soils in landscape positions similar to those of the Venice soil. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Venice soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

264—Venice muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the

drainage of this soil. Elevation is 20 feet below sea level to sea level. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray muck about 12 inches thick. The underlying material to a depth of 60 inches is black mucky peat. In some areas the surface layer is mucky peat.

Included in this unit are small areas of Peltier and Ryde soils on the slightly higher parts of the landscape. Also included are small areas of Rindge soils in landscape positions similar to those of the Venice soil. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the Venice soil. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 4.0 inches per hour. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence and the high water table. General management considerations include the hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

265—Veritas sandy loam, partially drained, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a soil that formed in ponded areas; however, drainage has been improved by levees and reclamation projects. Elevation is 20 to 40 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is gray sandy loam about 19 inches thick. The upper part of the subsoil is gray and light brownish gray, mottled sandy loam about 25 inches thick. The lower part to a depth of 60 inches is a gray, strongly cemented to indurated hardpan. In some areas the surface layer is fine sandy loam or loamy sand.

Included in this unit are small areas of Manteca soils in landscape positions similar to those of the Veritas soil and Tinnin soils on the slightly higher parts of the landscape. Also included, in the slightly lower landscape positions, are small areas of Trahern soils and small areas of moderately coarse textured soils that are saline-sodic throughout. Depth to the cemented hardpan is as little as 30 inches in a few included areas, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Veritas soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches and by a perched water table that has been lowered to a depth of 4 to 5 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are depth to the hardpan and the high water table. General management considerations include the hazard of soil blowing. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up

the pan. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitations are depth to the hardpan and the high water table. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. The high water table increases the possibility that septic tank absorption fields will not function properly. Roads and streets should be constructed above expected flood levels.

This map unit is in capability units IIw-8 (MLRA-17), irrigated, and IVw-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

266—Veritas fine sandy loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Elevation is 20 to 75 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown fine sandy loam about 15 inches thick. The subsoil is pale brown and light brownish gray fine sandy loam about 39 inches thick. The lower part to a depth of 70 inches is a variegated light gray and white, weakly cemented to strongly cemented hardpan. In some areas the surface layer is sandy loam or loam.

Included in this unit are small areas of Bisgani and Grangeville soils and small areas of Veritas soils that have a moderately fine textured surface layer. All of these included soils are in the slightly lower landscape positions. Also included are small areas of Jahant and Madera soils on terraces; Tinnin soils on the slightly higher parts of the landscape; and, in landscape positions similar to the dominant Veritas soil, moderately coarse textured soils that have a moderately fine textured subsoil above the hardpan. Depth to the hardpan is as little as 30 inches in a few included Areas, mainly where deep leveling cuts have been made. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Veritas soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is moderate. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used as irrigated pasture or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitation is depth to the hardpan. General management considerations include the hazard of soil blowing. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Furrow, border, and sprinkler irrigation systems are suitable. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

If this unit is used for homesite development, the main limitation is depth to the hardpan. The rare flooding is a hazard. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Roads and streets should be constructed above expected flood levels.

This map unit is in capability units IIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

267—Veritas silty clay loam, 0 to 2 percent slopes, overwashed. This moderately well drained, nearly level soil is on low terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. Elevation

is 25 to 35 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is grayish brown silty clay loam about 19 inches thick. It is underlain by a buried surface layer and subsoil, which are grayish brown, light brownish gray, and pale brown fine sandy loam about 27 inches thick. Below this to a depth of 60 inches is a light brownish gray, strongly cemented hardpan. In some areas the surface layer is clay loam.

Included in this unit are small areas of Manteca and Merritt soils in landscape positions similar to those of the Veritas soil and Tinnin soils on the slightly higher parts of the landscape. Also included, in the slightly lower landscape positions, are small areas of Veritas soils that are saline-sodic. Included areas make up about 15 percent of the total acreage.

Permeability is moderately rapid in the Veritas soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 40 to 60 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitation is depth to the hardpan, which limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and increases the rate of water intake and the organic matter content.

This map unit is in capability units IIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group A.

268—Vernalis clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 25 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is brown clay loam about 9 inches thick. The lower part of the surface layer and the upper part of the subsoil are grayish brown and brown clay loam and pale brown loam about 38 inches thick. The lower part of the subsoil to a depth of 60 inches is pale brown fine sandy loam. The soil is calcareous between depths of 27 and 60 inches. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Capay, Cortina, and El Solyo soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Vernalis soil, are small areas of Zacharias soils and small areas of soils that have a moderately coarse textured or gravelly substratum below a depth of 40 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Vernalis soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Depth to the water table is more than 6 feet. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for dryland grain crops or for homesite development.

This unit is well suited to irrigated row, field, and orchard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitation is low strength. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

269—Vernalis clay loam, wet, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. It has a high water table as a result of the application of irrigation water. Drainage systems

that require continual maintenance have been used to lower the water table. Elevation is 25 to 200 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper part of the surface layer is brown and grayish brown clay loam about 9 inches thick. The lower part of the surface layer and the upper part of the subsoil are grayish brown and pale brown loam about 38 inches thick. The lower part of the subsoil to a depth of 60 inches is pale brown fine sandy loam. The soil is calcareous between depths of 27 and 60 inches. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Capay soils and small areas of soils having a substratum that is moderately coarse textured and gravelly. Both of these included soils are in landscape positions similar to those of the Vernalis soil. Also included are small areas of El Solyo and Reiff soils on the slightly higher parts of the landscape, Vernalis soils that do not have a high water table and are on the slightly higher parts of the landscape, and Vernalis soils that are saline-sodic in some part and are in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Vernalis soil. Available water capacity is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for homesite development.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is the high water table. Careful applications of irrigation water are needed to prevent the buildup of a high water table. A drainage system may be needed. Deep-rooted crops can be grown in areas where natural drainage is adequate or where a drainage system has been installed. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are low strength and the high water table. Properly designing buildings and roads can offset the limited ability of the soil to support a load. The high water table increases the possibility that septic tank absorption fields will not function properly. A drainage system is needed if roads or building foundations are constructed.

This map unit is in capability units IIw-2 (MLRA-17), irrigated, and IVw-2 (MLRA-17), nonirrigated. It is in vegetative soil group A.

270—Vignolo silt loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 40 to 110 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown silt loam about 17 inches thick. The upper part of the subsoil is brown silt loam about 16 inches thick. The lower part to a depth of 60 inches is a strong brown and light brown, weakly cemented to indurated hardpan. In some areas the surface layer is loam or sandy loam.

Included in this unit are small areas of Archerdale, Cogna, and Boggiano soils and small areas of Vignolo soils that have a moderately fine textured surface layer. All of these included soils are in landscape positions similar to those of the dominant Vignolo soil. Also included are small areas of Hollenbeck soils in the slightly lower landscape positions. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Vignolo soil. Available water capacity is low. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.7 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitations are depth to the hardpan and the low available water capacity. The hardpan limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Because the soil is droughty, applications of irrigation water should be light and frequent. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Returning crop residue to the soil or regularly

adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, low strength, and depth to the hardpan. The rare flooding is a hazard. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

271—Vignolo silty clay loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on low fan terraces. It is moderately deep to a hardpan. It formed in alluvium derived from mixed rock sources. A few areas are dissected by intermittent sloughs that have been filled as a result of land leveling. Elevation is 40 to 110 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown and dark grayish brown silty clay loam about 14 inches thick. The upper part of the subsoil is variegated brown and pale brown clay loam about 16 inches thick. The lower part to a depth of 60 inches is a light gray, very pale brown, and pale brown, weakly cemented to strongly cemented hardpan. In some areas the surface layer is clay loam.

Included in this unit are small areas of Hollenbeck, Stockton, and Galt soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the dominant Vignolo soil, are small areas of Archerdale and Cogna soils and small areas of Vignolo soils that have a medium textured surface layer. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Vignolo soil. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 20 to 40 inches. Depth to the water table is more than 6 feet, but water may be briefly perched above the hardpan after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.3 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops or orchards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row, field, and orchard crops. The main limitation is depth to the hardpan, which limits the suitability for deep-rooted crops. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. Furrow, border, and sprinkler irrigation systems are suitable. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, low strength, and depth to the hardpan. The rare flooding is a hazard. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves permeability and thus also improves the suitability of the soil for septic tank absorption fields. Properly designing buildings and roads can offset the limited ability of the soil to support a load. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIs-8 (MLRA-17), irrigated, and IVs-8 (MLRA-17), nonirrigated. It is in vegetative soil group G.

272—Vina fine sandy loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on flood plains. It formed in alluvium derived from mixed but dominantly granitic rock sources. Elevation is 50 to 120 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the upper 9 inches of the surface layer is brown fine sandy loam. The lower 28 inches is dark grayish brown and brown loam. The underlying material to a depth of 60 inches is brown loam. In some areas the surface layer is loam.

Included in this unit are small areas of Columbia soils in the slightly lower landscape positions. Also included, in landscape positions similar to those of the Vina soil, are small areas of soils that are similar to the Vina soil but have coarse textured or moderately coarse textured overwash 10 to 22 inches thick. Included areas make up about 15 percent of the total acreage.

Permeability is moderate in the Vina soil. Available water capacity is high. The effective rooting depth is 60

inches or more. Depth to the water table is more than 6 feet, but water may be perched above the stratified substratum after periods of heavy rainfall or irrigation. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. The hazard of soil blowing is slight. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops, orchards, or vineyards. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is well suited to irrigated row, field, orchard, and vineyard crops. It has few limitations. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Furrow, border, and sprinkler irrigation systems are suitable. Maintaining crop residue on or near the surface helps to prevent excessive runoff and soil blowing and helps to maintain the rate of water intake and the organic matter content.

If this unit is used for homesite development, general management considerations include the hazard of rare flooding. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

273—Webile muck, partially drained, 0 to 2 percent slopes. This very deep, very poorly drained, nearly level soil is on deltas. It formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Levees, drainage ditches, and pumping of the water table alter the drainage of this soil. Elevation is 15 feet below sea level to sea level. The average annual precipitation is about 14 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is very dark gray and variegated very dark brown and dark yellowish brown muck about 39 inches thick. The underlying material to a depth of 60 inches is dark gray and dark grayish brown, mottled clay and silty clay. In some areas the surface layer is mucky loam.

Included in this unit are small areas of Kingile, Rindge, and Shinkee soils in landscape positions similar to those of the Webile soil. Also included are small areas of Peltier and Ryde soils on the slightly higher parts of the landscape. Included areas make up about 15 percent of the total acreage.

Permeability is rapid in the upper part of the Webile soil and slow in the mineral substratum. Available water capacity is very high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that is regulated at a depth of 3 to 4 feet by pumping. This soil is subject to subsidence. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. The main limitations are subsidence, the high water table, and the slow permeability. General management considerations include the severe hazard of soil blowing. Because this soil is subject to differential subsidence, frequent leveling of the fields is needed to improve the efficiency of irrigation. Areas adjacent to levees are subject to lateral seepage in wet years when the water level is high. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Large ditches and small spud ditches provide subirrigation and improve drainage. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Subirrigation, furrow, border, and sprinkler systems are suitable. Where a subirrigation system is used, the water table is raised to a depth of 1 foot at planting time and then is slowly lowered during the growing season until it is at a depth of about 5 feet at harvest time. When the wind velocity is high in spring, the hazard of soil blowing can be reduced by properly managing all crop residue and by minimizing tillage. Levees should be checked periodically, and a proper maintenance program should be developed.

This map unit is in capability units IIIw-10 (MLRA-16), irrigated, and IVw-10 (MLRA-16), nonirrigated. It is in vegetative soil group E.

274—Willows clay, partially drained, 0 to 2 percent slopes. This very deep, poorly drained, nearly level, saline-sodic soil is in basins. It formed in alluvium derived from mixed rock sources. Mottles in the profile indicate a poorly drained soil; however, drainage has been improved by levees and reclamation projects. Elevation is 5 to 40 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is gray clay about 20 inches thick. The subsoil to a depth of 60 inches is grayish brown, mottled clay. The soil is calcareous and

saline-sodic throughout. In some areas the surface layer is silty clay.

Included in this unit are small areas of Capay and Stomar soils on the slightly higher parts of the landscape and Pescadero soils in landscape positions similar to those of the Willows soil. Also included are small areas of Grangeville and Merritt soils in the slightly lower positions. Included areas make up about 15 percent of the total acreage.

Permeability is very slow in the Willows soil. Available water capacity is moderate. The shrink-swell potential is high. The effective rooting depth of the crops commonly grown in the county is limited by an apparent water table that has been lowered to a depth of 4 to 6 feet through drainage systems that require continual maintenance. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.1 inch per hour. The soil is subject to rare flooding, which occurs during years of abnormally high precipitation.

Most areas are used for irrigated crops. A few areas are used for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to row and field crops. The main limitations are the saline-sodic conditions, the high water table, and the very slow permeability. The content of salts can be reduced by leaching, applying the proper amount of soil amendments, and returning crop residue to the soil. Intensive management is required to reduce the salinity and maintain productivity. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Tile drainage can lower the water table if a suitable outlet is available. Because of the restricted permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Furrow, border, and sprinkler irrigation systems are suitable. The soil should be cultivated only within a narrow range of moisture content. It is too sticky when wet and too hard when dry. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

If this unit is used for homesite development, the main limitations are the very slow permeability, the high shrink-swell potential, low strength, the high water table, and the saline-sodic conditions. The rare flooding is a hazard. The very slow permeability and the high water table increase the possibility that septic tank absorption fields will not function properly. The very slow permeability can be overcome by increasing the size of the absorption field. Properly designing foundations and footings and diverting runoff away from buildings help to prevent the structural damage caused by shrinking and swelling. Properly designing buildings and roads can offset the limited ability of the soil to support a load. A drainage system is needed if roads or building foundations are constructed. Houses, roads, and streets should be constructed above expected flood levels.

This map unit is in capability units IIIw-6 (MLRA-17), irrigated, and IVw-6 (MLRA-17), nonirrigated. It is in vegetative soil group F.

275—Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes. These steep soils are on mountains. The native vegetation is mainly annual grasses, forbs, and perennial shrubs. Elevation is 300 to 1,500 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 35 percent Wisflat sandy loam, 30 percent Arburua clay loam, and 20 percent San Timoteo sandy loam. The Wisflat soil is on ridges and side slopes. The Arburua and San Timoteo soils are on mountains and foothills. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Wisflat, Arburua, and San Timoteo soils that have slopes of 50 to 70 or 15 to 30 percent. The areas where slopes are 50 to 70 percent are on the slightly higher parts of the landscape, and the areas where slopes are 15 to 30 percent are on toe slopes. Also included are small areas of exposed bedrock in convex positions near the top of the slopes and areas of very shallow to deep, coarse textured soils and deep, fine textured soils in landscape positions similar to those of the Wisflat, Arburua, and San Timoteo soils. Included areas make up about 15 percent of the total acreage.

The Wisflat soil is very shallow or shallow and is well drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown sandy loam about 3 inches thick. The underlying material is light yellowish brown sandy loam about 7 inches thick. Gray, slightly weathered sandstone bedrock is at a depth of 10 inches. In some areas the surface layer is fine sandy loam.

Permeability is moderately rapid in the Wisflat soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe.

The Arburua soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the surface layer is grayish brown clay loam

about 6 inches thick. The subsoil is light brownish gray clay loam about 25 inches thick. Light olive brown, weathered shale bedrock is at a depth of 31 inches. In some areas the surface layer is loam.

Permeability is moderate in the Arburua soil. Available water capacity also is moderate. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

The San Timoteo soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown sandy loam about 5 inches thick. The underlying material is pale brown and light yellowish brown sandy loam about 24 inches thick. Light brownish gray, soft sandstone bedrock is at a depth of 29 inches. In some areas the surface layer is fine sandy loam, gravelly sandy loam, or loam.

Permeability is moderately rapid in the San Timoteo soil. Available water capacity is low. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the severe hazard of erosion, the very low or low available water capacity in the Wisflat and San Timoteo soils, and the limited depth of the Wisflat soil. The characteristic plant community is mainly soft chess, red brome, and California sagebrush on the Wisflat soil; soft chess, foxtail fescue, and red brome on the Arburua soil; and soft chess, wild oat, and filaree on the San Timoteo soil (fig. 4). Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very low or low available water capacity limits the production of desirable forage plants in some areas. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIIe (MLRA-15), nonirrigated. It is in vegetative soil group G.

276—Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes. These very steep soils are on mountains. The native vegetation is mainly annual grasses, forbs, and perennial shrubs. Elevation is 300 to 1,500 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 35 percent Wisflat sandy loam, 30 percent Arburua clay loam, and 20 percent San Timoteo sandy loam. The Wisflat soil is on ridges and side slopes. Arburua and San Timoteo soils are on side slopes. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Wisflat, Arburua, and San Timoteo soils that have slopes of 30 to 50 or 75 to 95 percent. The areas where slopes are 30 to 50 percent are in the slightly lower landscape positions, and the areas where slopes are 75 to 95 percent are in the slightly higher positions. Also included are small areas of exposed bedrock in convex positions near the top of the slopes and areas of very shallow to deep, coarse textured soils and deep, fine textured soils in landscape positions similar to those of the Wisflat, Arburua, and San Timoteo soils. Included areas make up about 15 percent of the total acreage.

The Wisflat soil is very shallow or shallow and is well drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown sandy loam about 3 inches thick. The underlying material is light yellowish brown sandy loam about 7 inches thick. Gray, slightly weathered sandstone bedrock is at a depth of 10 inches. In some areas the surface layer is fine sandy loam.

Permeability is moderately rapid in the Wisflat soil. Available water capacity is very low. The effective rooting depth is limited by the bedrock at a depth of 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very severe.

The Arburua soil is moderately deep and well drained. It formed in material weathered from shale. Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is light brownish gray clay loam about 25 inches thick. Light olive brown, weathered shale bedrock is at a depth of 31 inches. In some areas the surface layer is loam.

Permeability is moderate in the Arburua soil. Available water capacity also is moderate. The effective rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very severe.

The San Timoteo soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown sandy loam about 5 inches thick. The underlying material is pale brown and light yellowish brown sandy loam about 24 inches thick. Light brownish gray, soft sandstone bedrock is at a depth of 29 inches. In some areas the surface layer is fine sandy loam, gravelly sandy loam, or loam.

Permeability is moderately rapid in the San Timoteo soil. Available water capacity is low. The effective

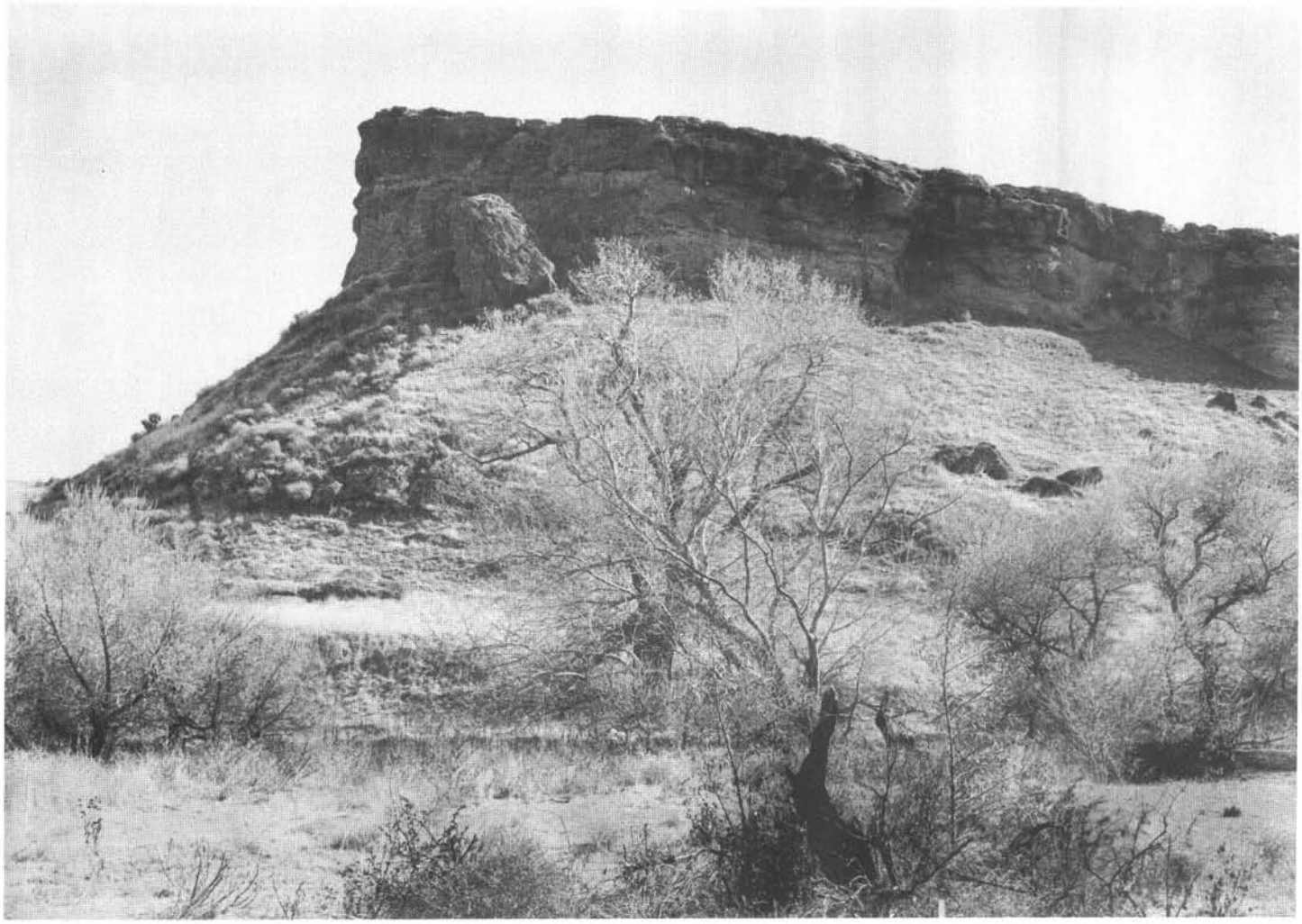

Figure 4.—Typical vegetation in an area of Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes, in the middle ground. The riparian vegetation in the foreground is in an area of Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded. Castle Rock is in the background.

rooting depth is limited by the bedrock at a depth of 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very severe.

This unit is used for livestock grazing or wildlife habitat. General management considerations include the very severe hazard of erosion, the slope, the very low or low available water capacity, and the limited depth of the Wisflat soils. The characteristic plant community is mainly soft chess, red brome, and California sagebrush on the Wisflat soil; soft chess, foxtail fescue, and red brome on the Arburua soil; and soft chess, wild oat, and filaree on the San Timoteo soil. Grazing should be controlled so that desirable vegetation, such as soft chess, is maintained and enough vegetation is left standing to protect the soils from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The very steep topography and the resulting runoff reduce the amount of rainfall that enters the soils. The slope limits access by livestock and results in overgrazing of the less sloping areas. The very low or low available water capacity limits the production of desirable forage plants in some areas. Fencing is difficult because of the depth to bedrock.

This map unit is in capability subclass VIIe (MLRA-15), nonirrigated. It is in vegetative soil group G.

277—Xerofluvents, 0 to 2 percent slopes, frequently flooded. These very deep, excessively drained and well drained, nearly level soils are on flood plains and interchannel bars in river channels. They

formed in alluvium derived from mixed rock sources. Elevation is 40 to 240 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is brown sandy loam or gravelly sandy loam about 14 inches thick. The underlying material to a depth of 60 inches is stratified pale brown sandy loam, loamy sand, fine sandy loam, silt loam, and silty clay loam. In some areas the surface layer is loamy sand.

Included in this unit are small areas of Columbia soils; Riverwash; Pits, gravel; and Dumps, tailings. These areas are in landscape positions similar to those of the Xerofluvents. They make up about 15 percent of the total acreage.

Permeability is slow to rapid in the Xerofluvents because of the variability of the substratum. Available water capacity is low or moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soils are subject to frequent, long periods of flooding from December through June. Channeling and deposition are common along streambanks.

This unit is used for wildlife habitat. It may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This map unit is in capability subclass VIIw (MLRA-17), nonirrigated. It is in vegetative soil group J.

278—Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded. These nearly level to moderately sloping soils are on alluvial fans, in arroyos, in intermittent stream channels, and in areas of gravel tailing deposits. Slopes are plane or convex on alluvial fans and in arroyos and complex in stream channels and in areas of gravel tailing deposits. These deposits are 5 to 25 feet high and have moderately steep or steep slopes. The native vegetation is mainly annual grasses and forbs, but a few areas support riparian trees and shrubs. Elevation is 150 to 800 feet. The average annual precipitation is 9 to 13 inches, the average annual air temperature is about 61 degrees F, and the average frost-free period is about 270 days.

This unit is 50 percent Xerofluvents and 35 percent Xerorthents. The components of this unit occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Riverwash; Dumps; Pits, gravel; and exposed bedrock. These areas are in landscape positions similar to those of the Xerofluvents and Xerorthents. Also included are small areas of Urban land on the slightly higher parts of the landscape; Wisflat, Arburua, and San Timoteo soils on mountains; Cortina soils and very shallow to deep, loamy, gravelly or very gravelly soils in drainageways; and, in the higher landscape positions, Xerorthents that are not flooded. Included areas make up about 15 percent of the total acreage.

The Xerofluvents are very deep and are well drained or somewhat excessively drained. They formed in alluvium derived from mixed rock sources. Typically, the surface layer is about 20 inches of brown very gravelly loam and gravelly sandy loam. The upper 13 inches of the underlying material is stratified, pale brown very gravelly loamy coarse sand. The lower part to a depth of 60 inches is stratified, pale brown very gravelly sandy loam and very gravelly loamy coarse sand. In some areas the surface layer is sand, loamy sand, sandy loam, silt loam, gravelly sand, gravelly loamy sand, gravelly sandy loam, gravelly loam, or gravelly clay loam.

Permeability is slow to rapid in the Xerofluvents because of the variability of the substratum. Available water capacity is very low to high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soils are subject to occasional, brief periods of flooding from December through March. Channeling and deposition are common along streambanks.

The Xerorthents are very deep and are well drained or somewhat excessively drained. They formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown gravelly sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray very gravelly sandy loam and gravelly sandy loam. In some areas the surface layer is sand, loamy sand, sandy loam, loam, or gravelly sand.

Permeability is slow to rapid in the Xerorthents because of the variability of the substratum. Available water capacity is very low to high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight or moderate. The soils are subject to occasional, brief periods of flooding from December through March.

This unit is used for livestock grazing or wildlife habitat. It may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

General management considerations in the areas used for livestock grazing include the very low or low available water capacity in some areas and the content of rock fragments in the surface layer. The occasional flooding is a hazard. The vegetation in most areas is mainly red brome and filaree. The very low or low available water capacity limits the production of

desirable forage plants. The grazing system can be impaired by the occasional flooding. To control erosion, fences should be used to keep livestock out of gullies and off streambanks.

This map unit is in capability subclass VIIw (MLRA-17), nonirrigated. It is in vegetative soil group J.

279—Yellowlark gravelly loam, 0 to 2 percent slopes. This moderately well drained, nearly level soil is on stream terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Slopes are plane, and the landscape is characterized by hummocky microrelief. Meandering drainageways and closed depressions fill with water to form vernal pools during the winter in some areas. Elevation is 110 to 270 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period about 260 days.

Typically, the surface layer is pale brown and reddish yellow gravelly loam about 8 inches thick. The subsoil extends to a depth of about 62 inches. In sequence downward, it is 31 inches of reddish yellow, reddish brown, and strong brown gravelly loam; 8 inches of strong brown very gravelly clay loam; a claypan of strong brown and light yellowish brown gravelly clay about 7 inches thick; 5 inches of very pale brown and strong brown clay loam; and a very pale brown and light yellowish brown, weakly cemented hardpan about 3 inches thick. In some areas the surface layer is loam.

Included in this unit are small areas of Hicksville soils in drainageways and Redding soils on terraces. Also included, in landscape positions similar to those of the Yellowlark soil, are small areas of soils that have a claypan at a depth of 20 to 40 inches or that have a very gravelly loam subsoil at a depth of 15 to 20 inches. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Yellowlark soil and very slow in the claypan. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 45 to 60 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 40 to 55 inches. A perched water table is at a depth of 3 to 4 feet for brief periods in the winter. Runoff is very slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 1.5 inches per hour. Streambank erosion occurs along intermittent drainageways.

Most areas are used for livestock grazing. A few areas are used for irrigated crops or irrigated pasture. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, foxtail fescue, wild oat, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated row, field, orchard, and vineyard crops. The main limitations are the very slow permeability in the claypan and depth to the hardpan. Because of the restricted permeability in the claypan, water applications should be regulated so that the water does not stand on the surface and damage the crops. The hardpan limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. Careful applications of irrigation water are needed to prevent the buildup of a high water table. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This unit is suited to irrigated pasture. Irrigation water can be applied by sprinkler and border methods. Leveling helps to ensure a uniform application of water. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from compaction.

This map unit is in capability units IIs-3 (MLRA-17), irrigated, and IVs-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

280—Yellowlark gravelly loam, 2 to 5 percent slopes. This moderately well drained, gently sloping soil is on fan terraces. It is deep to a hardpan. It formed in alluvium derived from mixed rock sources. The native vegetation is mainly annual grasses and forbs. Slopes are convex, and the landscape is characterized by hummocky microrelief. Deep, intermittent drainageways that have eroding banks are common. Elevation is 110 to 270 feet. The average annual precipitation is about

17 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 260 days.

Typically, the surface layer is pale brown and reddish yellow gravelly loam about 8 inches thick. The subsoil extends to a depth of about 62 inches. In sequence downward, it is 31 inches of reddish yellow, reddish brown, and strong brown gravelly loam; 8 inches of strong brown very gravelly clay loam; a claypan of strong brown and light yellowish brown gravelly clay about 7 inches thick; 5 inches of very pale brown and strong brown clay loam; and a very pale brown and light yellowish brown, weakly cemented hardpan about 3 inches thick. In some areas the surface layer is loam.

Included in this unit are small areas of Redding soils on terraces. Also included are Yellowlark soils that have slopes of 0 to 2 percent and are on toe slopes and small areas of soils that have a claypan at a depth of 20 to 40 inches or that do not have a claypan. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the upper part of the Yellowlark soil and very slow in the claypan. Available water capacity is moderate. The effective rooting depth is limited by the hardpan at a depth of 45 to 60 inches. Roots are restricted to cracks and the faces of peds in the claypan, which is at a depth of 40 to 55 inches. A perched water table is at a depth of 3 to 4 feet for brief periods in the winter. The water moves laterally downslope. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 1.5 inches per hour. Streambank erosion occurs along intermittent drainageways.

Most areas are used for livestock grazing. A few areas are used for irrigated pasture, dryland grain crops, or irrigated crops. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

Where this unit is used for livestock grazing, general management considerations include saturated soil conditions in concave areas following rainy periods. The characteristic plant community is mainly soft chess, foxtail fescue, wild oat, and filaree. Grazing should be delayed until the soil is firm enough to withstand trampling by livestock and the more desirable forage plants have had an opportunity to set seed. The unit responds well to range improvement practices, such as seeding and applying fertilizer. The plants selected for seeding should be those that meet the seasonal requirements of livestock, wildlife, or both. After seeding is complete, grazing should be deferred until the plants have set seed.

This unit is suited to irrigated pasture. General management considerations include the hazard of erosion. Seedbed preparation should be on the contour or across the slope where practical. Irrigation water can be applied by sprinkler and border methods. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and protect the soil from erosion.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to irrigated orchard and vineyard crops. The main limitations are the very slow permeability in the claypan and depth to the hardpan. General management considerations include the hazard of erosion. Because of the restricted permeability in the claypan, water applications should be regulated so that the water does not stand on the surface and damage the crops. Careful applications of irrigation water are needed to prevent the buildup of a high water table. The hardpan limits the suitability for deep-rooted plants. Where feasible, deep ripping of this restrictive layer can help to overcome this limitation. A tillage pan forms easily if the soil is tilled when wet. Chiseling or subsoiling breaks up the pan. All tillage should be on the contour or across the slope. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIIe-3 (MLRA-17), irrigated, and IVe-3 (MLRA-17), nonirrigated. It is in vegetative soil group D.

281—Zacharias clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans and low stream terraces. It formed in alluvium derived from mixed rock sources. Elevation is 50 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark grayish brown clay loam about 19 inches thick. The subsoil and the upper part of the underlying material are brown clay loam about 34 inches thick. The lower part of the underlying material to a depth of 60 inches is yellowish brown

gravelly clay loam. In some areas the surface layer is gravelly clay loam.

Included in this unit are small areas of Capay soils in the slightly lower landscape positions and small areas of Reiff soils in the slightly higher positions. Also included, in landscape positions similar to those of the Zacharias soil, are small areas of Stomar and Vernalis soils and small areas of soils that are similar to the Zacharias soil but are calcareous and underlain by gravel. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Zacharias soil. Available water capacity is high. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for irrigated crops or orchards. A few areas are used for dryland grain crops or for homesite development.

This unit is well suited to irrigated row, field, and orchard crops. It has few limitations. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and low strength. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability class I (MLRA-17), irrigated, and capability unit IVc-1 (MLRA-17), nonirrigated. It is in vegetative soil group A.

282—Zacharias gravelly clay loam, 0 to 2 percent slopes. This very deep, well drained, nearly level soil is on alluvial fans and low stream terraces. It formed in alluvium derived from mixed rock sources. Elevation is 50 to 300 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown gravelly clay loam about 14 inches thick. The subsoil also is dark brown gravelly clay loam. It is about 16 inches thick. The underlying material to a depth of 60 inches is yellowish brown gravelly loam. In some areas the surface layer is clay loam or very gravelly clay loam.

Included in this unit are small areas of Capay and Cortina soils in the slightly lower landscape positions and Xerofluvents and Xerorthents in drainageways. Also included, in landscape positions similar to the Zacharias soil, are small areas of Stomar and Vernalis soils and small areas of soils having a surface layer that is very gravelly and medium textured and soils having a substratum that is gravelly and coarse textured. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Zacharias soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas are used for irrigated crops. A few areas are used for dryland grain crops or for homesite development. This unit may provide wetland functions and values. These should be considered in plans for enhancement of wildlife habitat or land use conversion.

This unit is suited to irrigated row and field crops. General management considerations include a high content of gravel. Coarse fragments on the surface cause rapid wear of tillage equipment. Furrow, border, and sprinkler irrigation systems are suitable. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Maintaining crop residue on or near the surface helps to prevent excessive runoff and helps to maintain tilth and the organic matter content.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and low strength. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

This map unit is in capability units IIs-4 (MLRA-17), irrigated, and IVs-4 (MLRA-17), nonirrigated. It is in vegetative soil group A.

283—Zacharias gravelly clay loam, 2 to 8 percent slopes. This very deep, well drained, gently sloping and moderately sloping soil is on low stream terraces. It

formed in alluvium derived from mixed rock sources. The vegetation in areas that have not been cultivated is mainly annual grasses and forbs. Elevation is 200 to 400 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 60 degrees F, and the average frost-free period is about 270 days.

Typically, the surface layer is dark brown gravelly clay loam about 15 inches thick. The subsoil also is dark brown gravelly clay loam. It is about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown gravelly loam. In some areas the surface layer is gravelly sandy loam or gravelly loam.

Included in this unit are small areas of Cortina soils in drainageways. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Zacharias soil. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The rate of water intake in irrigated areas is 0.5 inch per hour.

Most areas of this unit are used for livestock grazing. A few areas are used for dryland grain crops or for homesite development. If irrigation water is available, the unit can be used for irrigated crops.

Where this unit is used for livestock grazing, general management considerations include the gravelly clay loam surface layer. The characteristic plant community is mainly soft chess, red brome, and filaree. Trampling of the gravelly clay loam surface layer by livestock when the soil is too wet reduces productivity and increases the runoff rate.

Where this unit is used for dryland grain crops, the main limitation is low rainfall during the growing season. General management considerations include a high content of gravel and the hazard of erosion. Because the amount of precipitation is not sufficient for annual cropping, the best suited cropping system is one that includes small grain and summer fallow. Coarse fragments on the surface cause rapid wear of tillage equipment. All tillage should be on the contour or across the slope. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and low strength. On sites for septic tank absorption fields, the moderately slow permeability can be overcome by increasing the size of the absorption field. Properly designing buildings and roads can offset the limited ability of the soil to support a load.

Where this unit is used for irrigated row, field, and orchard crops, general management considerations include the hazard of erosion. All tillage should be on the contour or across the slope. Sprinkler and drip irrigation systems are suitable. They permit an even, controlled application of water, help to prevent excessive runoff, and minimize the risk of erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water intake.

This map unit is in capability units IIe-4 (MLRA-17), irrigated, and IVe-4 (MLRA-17), nonirrigated. It is in vegetative soil group A.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 494,000 acres in the survey area, or nearly 55 percent of the total acreage, would meet the soil requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 6. This list does not constitute a recommendation for a particular land use. See appendix A for the specific criteria used to determine prime farmland. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

The map units listed in table 6 meet the soil requirements for prime farmland where irrigation water is available. On some soils included in the list, additional measures are needed to overcome a hazard or limitation, such as flooding or wetness, in order to meet the requirements for prime farmland. The need for these measures is indicated after the map unit name. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or a hardpan or other dense soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Clifford C. Sorensen, district conservationist, and John Weatherford, area agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service and the Storie index used by the University of California Agricultural Experiment Station are explained; and the estimated yields of some of the main crops and hay and pasture plants are listed for the soils that are used for crops.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information and technical assistance can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Soils strongly influence the kind of crops and pasture plants that can be grown in a given area. The climate of San Joaquin County favors a wide variety of crops. The hazard of winter frost, however, affects the growth of semitropical fruits, such as citrus, and cotton and raisin grapes cannot be grown because of the somewhat cool temperatures and the rainfall early in autumn.

Irrigated field crops are grown on a variety of soils in the county. Corn silage, corn, and wheat are grown on San Joaquin and other soils that are moderately deep to a hardpan; on Cosumnes, Scribner, and other very deep soils; and on Rindge, Kingile, and other highly organic soils. The conservation practices necessary for sustained productivity vary greatly on each of these soils. San Joaquin soils require heavy applications of fertilizer, careful water management, and chiseling. Cosumnes and Scribner soils may require measures that remove surface and subsurface water. Kingile and Rindge soils require careful water management to reduce the rates of oxidation and subsidence in organic layers and to control the accumulation of salts resulting from subirrigation and a high water table. Salinity in these soils can be controlled by leaching every 3 to 5 years. Soil blowing is a hazard on all excessively cultivated soils used for corn in the Delta area. It can be controlled by crop residue management and other good management measures.

Alfalfa grows best on very deep, well drained soils, such as Cogna soils. It also grows well in areas of Ryde

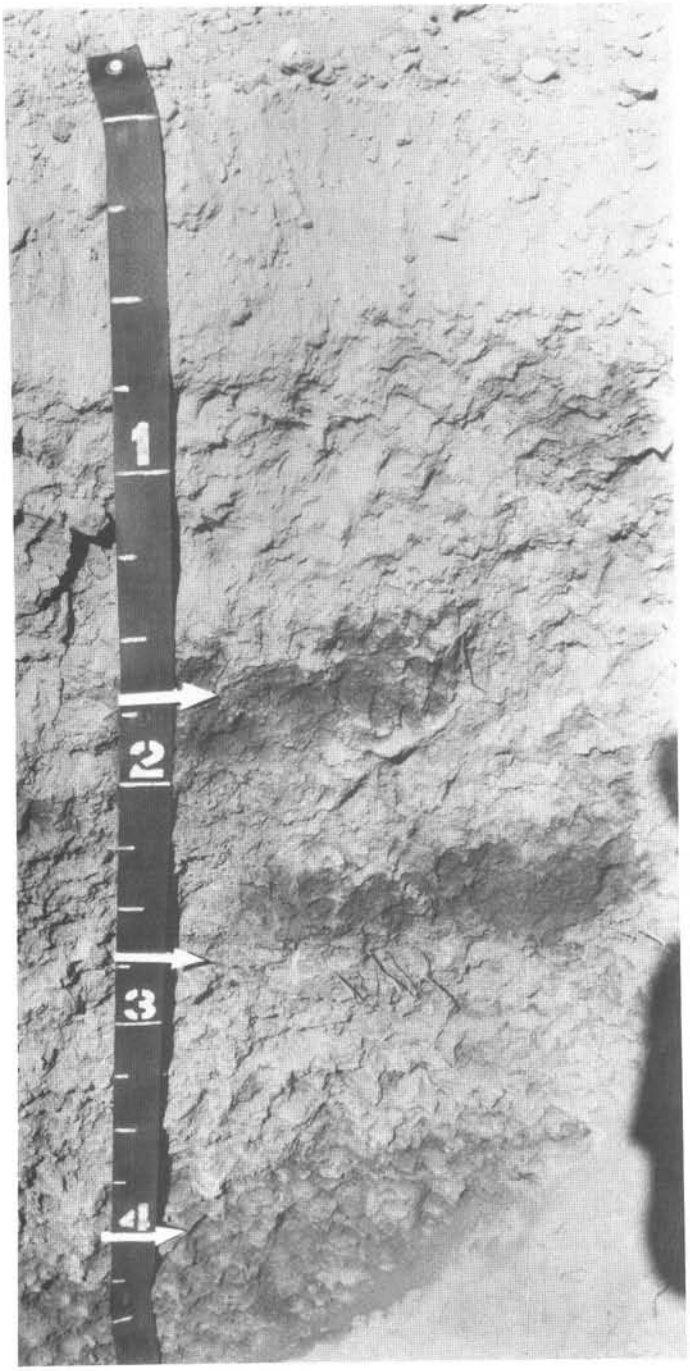

Figure 5.—Profile of a San Joaquin loam that has been slip plowed and cross ripped. Depth is marked in feet. Between depths of 20 and 24 inches, portions of the claypan have been redistributed and are surrounded by loam and a fractured hardpan. Remnants of the original hardpan are at a depth of 32 to 48 inches; note the roots from a previous vineyard on top of this layer. Weakly cemented loamy sediments are below a depth of 48 inches.

soils and in other areas where the water table is carefully managed and protection from flooding is provided. Alfalfa is grown on San Joaquin and other soils that are moderately deep to a hardpan, but stands are short lived and yields are low. Alfalfa grown in areas that are commonly flooded, such as some areas of Cosumnes soils, can drown out at any time.

Vegetable crops are grown on very deep soils, such as Scribner, Egbert, and Cosumnes soils. In some areas removal of subsurface water is required. Compacted layers commonly are broken up by chiseling. Growing the vegetable crops in rotation with field crops helps to maintain tilth and control diseases. Portable sprinkler systems that are used to germinate processing tomatoes are replaced by furrow irrigation as the crop becomes established.

Clover and sudan are grown for seed in many areas of soils that are moderately deep to a hardpan, such as San Joaquin soils. These areas are irrigated by systems that include graded borders. Chiseling and careful water management are needed.

Dryland field crops are grown on Rocklin, San Joaquin, Cometa, and Montpellier soils. Slopes in areas of these soils range from 2 to 15 percent and are irregular. Water erosion is a hazard in cultivated areas. Crops can be damaged by runoff and sediment that accumulates in low areas. Crop residue management and other good management measures can control erosion in most areas.

Fruit and nut crops grow best on very deep, medium textured to coarse textured soils, such as Cogna, Tokay, and Tinnin soils. In some areas of the county, wine grapes are grown on soils that are moderately deep to a hardpan, such as San Joaquin and Madera soils (fig. 5). In places deep ripping or slip plowing has improved the internal drainage of these soils. Many types of irrigation systems are used, although sprinkler irrigation is most common. Perennial cover crops are commonly grown to improve water infiltration, to reduce the hazard of erosion, to improve access between periods of irrigation and in winter, and to remove excess water.

Pasture plants grow well on a wide variety of soils. They are commonly grown on soils that are moderately deep to a hardpan, such as San Joaquin and Devries soils. Large parts of formerly pastured areas have been converted to silage crops for the dairy industry. Most of the pastures are irrigated by systems that include graded borders. Water management, applications of fertilizer, and rotation grazing are key management practices.

The main management needs in areas where the soils in the county are used for irrigated or nonirrigated crops or pasture are measures that maintain or improve crop or forage production and minimize erosion. These measures include chiseling and subsoiling, a

Figure 6.—Hardpan remnants in an area of Devries sandy loam, drained, 0 to 2 percent slopes.

conservation cropping system, conservation tillage, cover crops, crop residue management, hayland management, land leveling in irrigated areas, irrigation water management, pasture management, removal of subsurface water, control of surface water, and reduction of the content of toxic salts.

Chiseling and subsoiling increase the effective rooting depth in soils that have a plowpan, claypan, or hardpan. Chiseling the plowpan and subsoiling the claypan or hardpan improve permeability and internal drainage, help to prevent the development of a perched water table, and allow for deeper root penetration (fig. 6). Chiseling is temporarily beneficial on clayey soils, such as Stockton, Galt, and Jacktone, but these soils may rapidly return to their original condition.

A *conservation cropping system* is a system in which the crop rotation and the cultural and management practices more than offset the effects of soil-depleting crops and the effects of measures that result in deterioration of the cropland. Conservation cropping systems are recommended on all tilled soils in the survey area. Practices in a conservation cropping system on irrigated cropland include rotating various row and field crops and returning crop residue to the soil. They may include cover crops of grasses and legumes, applications of fertilizer, and weed and pest control. Examples of suitable crop rotations are a rotation of corn and small grain and a rotation of small grain and tomatoes.

In areas where nonirrigated small grain is grown, a summer fallow system is used. Where this system is applied, weeds are controlled by tillage every other

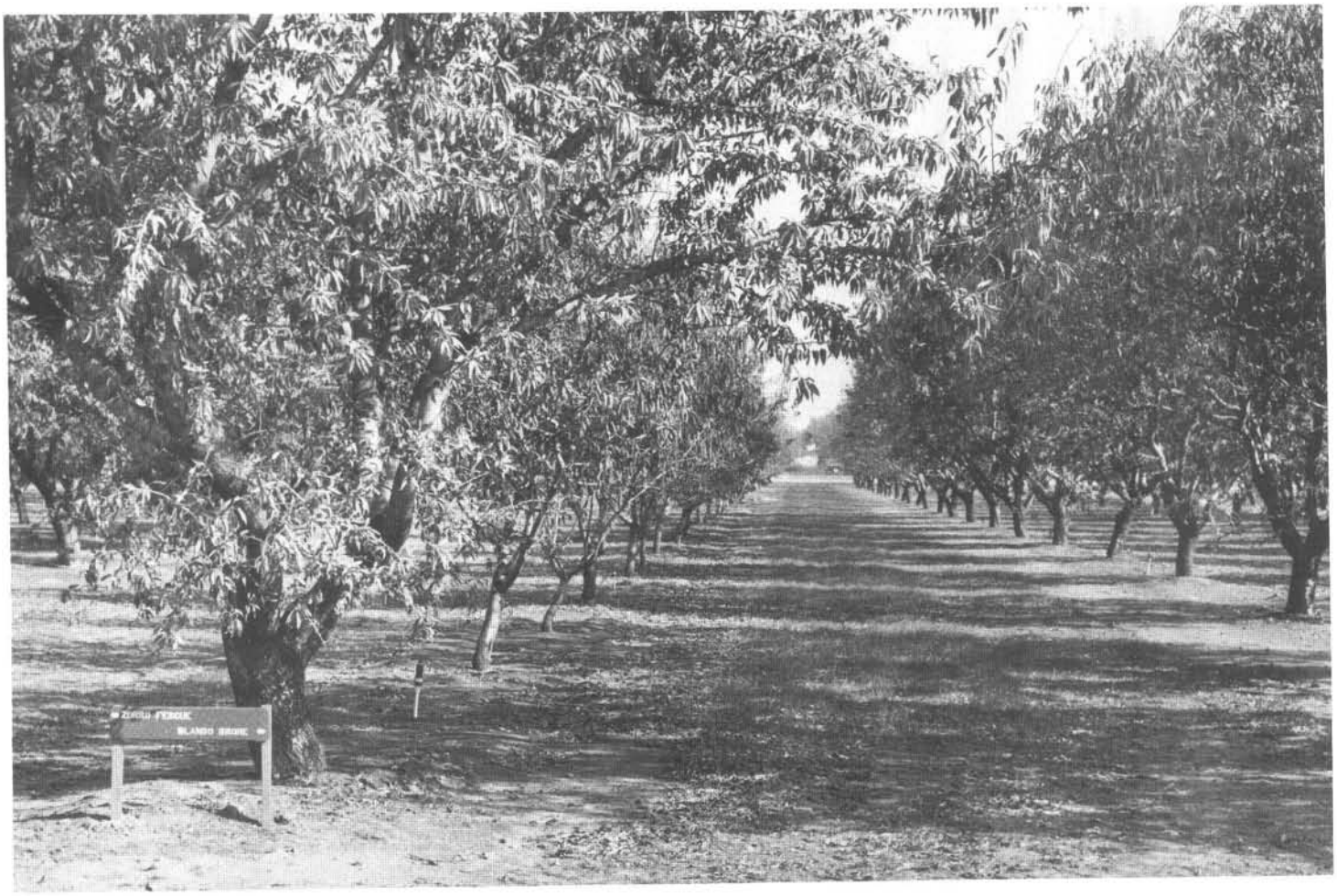

Figure 7.—Almond trees in an area of Delhi loamy sand, 0 to 2 percent slopes. The cover crop protects the orchard from soil blowing.

summer and moisture is stored in the soil when the field is fallowed. This system permits normal planting in tilled areas and controls the diseases resulting from continuous cropping. Because of advances in no-till grain drills, herbicides, and disease-resistant wheat varieties, it may be possible to produce a crop every year. A typical cropping sequence in areas of Montpellier and Cometa soils is one in which small grain is planted in the fall and harvested in early summer. The stubble remains standing until the spring of the second year, when it can be incorporated into the soil. During the second summer, the field is fallowed and weeds are controlled by cultivation. The hazard of erosion on sloping soils is reduced by keeping as much crop residue as possible on the surface during the rainy season. The use of subsurface tillage implements, such as chisels, blade-type sweeps, and rod weeders, is recommended on soils that do not have a high content of gravel near the surface.

Conservation tillage keeps to a minimum the number of operations necessary to prepare a seedbed, plant the crop, and control weeds and maintains a protective cover of crop residue. At least 30 percent of the surface is covered by residue after planting. Excessive tillage tends to break down soil structure, causes compaction, reduces the content of organic matter, and could result in the formation of a plowpan below the tilled layer. These conditions increase the hazard of erosion, decrease the rate of water intake, and restrict root penetration. Varying the depth of tillage helps to prevent the formation of a plowpan. Combining tillage operations so that the number of trips over the field is reduced and delaying tillage when the soils are wet help to maintain tilth, prevent compaction, and conserve energy. Conservation tillage is particularly beneficial on Rocklin, Cometa, and Montpellier soils.

Cover crops are needed in orchards and vineyards (fig. 7) and on soils that are left fallow during the rainy season. Cover crops help to maintain or increase the rate of water infiltration. Maintaining or increasing the

infiltration rate permits winter access for cultural operations. Early in spring, prior to the end of the frost season, mowing the cover crop at a height of 2 to 4 inches reduces the likelihood that frost will damage the crop. The cover crop should then be allowed to produce seed.

Crop residue management returns crop residue to the soil. This measure helps to maintain tilth, the organic matter content, and fertility and reduces the hazard of erosion. On soils that have slopes of more than 2 percent and on soils that are subject to soil blowing, crop residue should be left on or near the surface during critical erosion periods.

Organic matter enhances the development and stabilization of soil structure and increases the rate of water infiltration and the available water capacity. The supply of organic matter should be periodically replenished. Returning crop residue to the soil is the easiest and most common way to replenish the supply. Corn, rice, wheat, or other crops that produce a large amount of residue should be included in the cropping system because they help to compensate for tomatoes, sugar beets, and other crops that produce a small amount of residue. Other excellent sources of organic matter are prunings from orchards and vineyards, animal manure, and grasses and legumes.

Hayland management is needed to protect irrigated and nonirrigated hayland, to provide for maximum hay production, to maintain a desirable plant community, and to extend the period of productivity. The management measures needed include managing irrigation water, applying fertilizer, and mowing and baling when the soils are firm enough to support the equipment used.

When irrigated hay crops are being established, seed should be planted in a firm seedbed early in fall or in spring. The first mowing should be delayed until the plants are well established. Planting on beds improves production and drainage on the wet or fine textured Egbert and Capay soils. The width of the beds should be based on the kind of soil and the wheel widths of the harvesting equipment. The spacing of borders in areas of hayland irrigated by controlled flooding should be in multiples of the cutting width of the mower to be used.

Land leveling in irrigated areas is necessary to conserve irrigation water. It helps to ensure that the water is applied uniformly to the entire field and that the field has no wet swales or dry ridges. Land leveling also permits better field arrangements, which conserve labor, time, and energy. Following the initial leveling of a field, the first crop to be planted should be an annual crop. Planting an annual crop will give the filled areas a chance to settle. The field can be smoothed before a longer lived crop is planted.

Accurate land leveling is important. Laser-guided equipment is used to produce a uniform grade. Significant benefits can be realized by releveling periodically and by releveling fields that were leveled without the aid of laser equipment.

Irrigation water management meets the needs of the crop for water in a planned and efficient manner by controlling the amount of water applied and the time of application. It results in the efficient use of the available water in the soil, minimizes erosion, controls costly water losses, and preserves the quality of the water. Furrow, border, subirrigation, basin, sprinkler, and drip methods are used in the survey area. Furrow and border systems are the most common methods. Their use is limited to nearly level slopes. Subirrigation through spud ditches is limited to highly organic soils, such as Venice and Rindge soils. Sprinkler irrigation is commonly used to germinate tomatoes or corn on nearly level soils. Basin irrigation is commonly used in areas where rice is grown. Drip irrigation is used on orchards and vineyards.

Pasture management is needed to prevent deterioration of the pasture, provide for maximum forage production, maintain a desirable plant community, and extend the period of productivity. The practices used in irrigated areas include managing irrigation water, rotation grazing, applying fertilizer, harrowing or dragging to scatter animal droppings, mowing as necessary to maintain uniform plant growth, and controlling weeds. Grazing should be deferred when the pasture is irrigated and when the soil is wet. The pasture should not be grazed until the plants are 8 to 10 inches high, and livestock should be removed when the stubble is a minimum of 3 to 4 inches high. Selection of a suitable plant mixture is important when a pasture is established. On most of the soils in the survey area, mixtures that include a perennial grass and trefoil or clover produce an abundance of high-quality forage.

When nonirrigated pasture is established, annual grasses and legumes should be seeded. During the year of establishment, grazing should not be permitted and annual weeds should be controlled. After the pasture is established, grazing should be deferred until the plants are 4 to 6 inches high and livestock should be removed when the stubble is 2 to 4 inches high. Annual pastures should be managed so that they have enough seed-producing plants to maintain plant density and a good stand.

Removal of subsurface water is required on some soils to keep river seepage or low-quality water below the primary root zone of plants. The soils that may require a subsurface drainage system include the wet Capay soil and Columbia, Cosumnes, Egbert, Ryde,

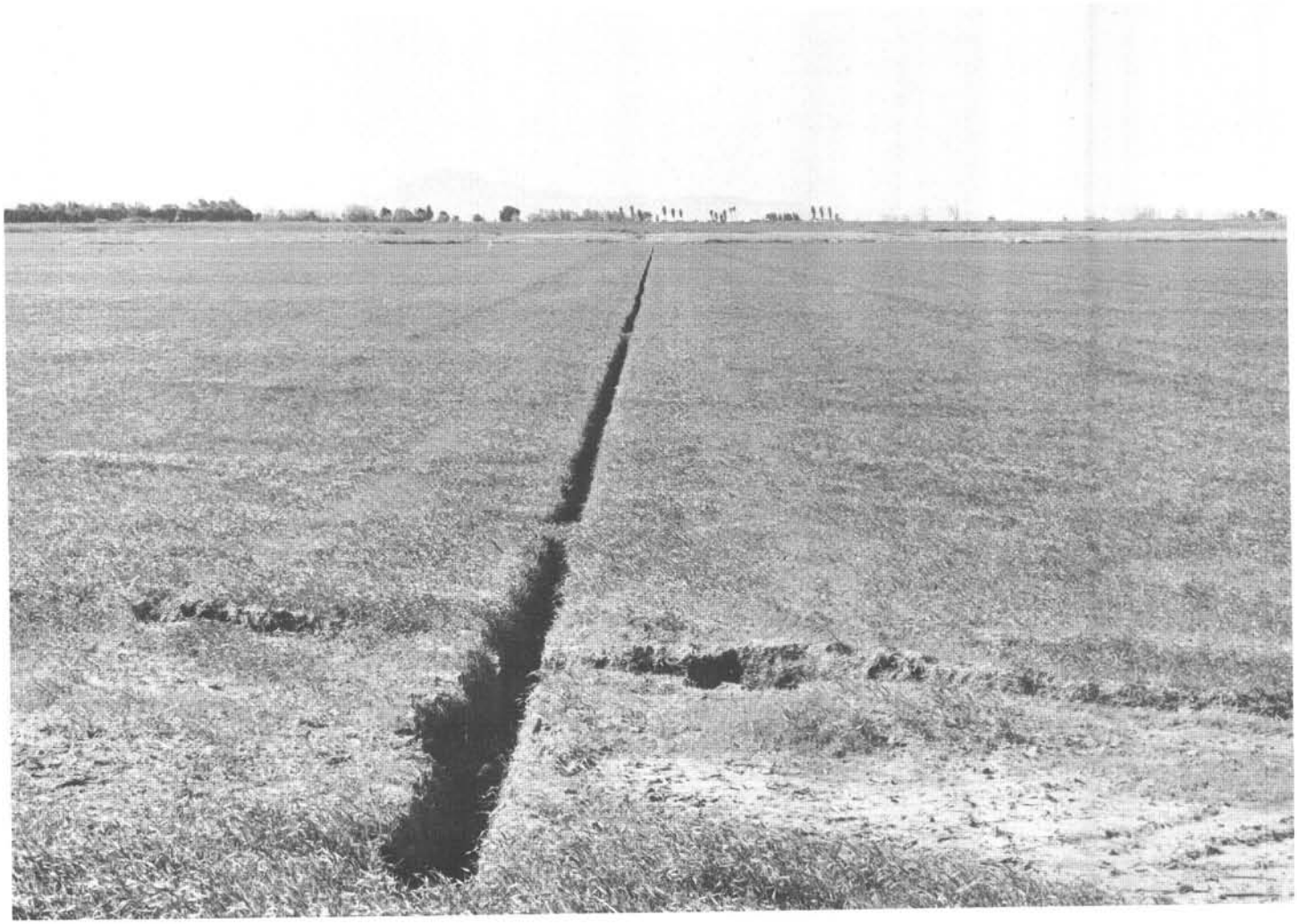

Figure 8.—Spud ditches in an area of Rindge muck, partially drained, 0 to 2 percent slopes. The ditches are about 8 inches wide and 3 feet deep.

Rindge, Sailboat, Scribner, and Webile soils. Because of the subsidence caused by oxidation, the water table in Rindge and Webile soils should not be lowered below the depth needed for water to be available to the roots of the crop.

Subsurface drainage can be improved by constructing open drainage ditches, spud ditches, tile drains, or other perforated pipe systems (fig. 8). Any poor-quality water that is collected by the drainage system should be removed. High-quality ground water should be protected from the pollution caused by any drainage water that is of low quality.

Control of surface water is needed where excess water from rainfall or irrigation is a problem in low areas and in areas adjacent to levees or at the lower end of irrigated fields. Excess surface water reduces crop production. It can be controlled by shaping and grading, constructing open drainage ditches, maintaining the existing natural drainageways, leveling irrigated areas, installing irrigation tailwater recovery systems, and managing irrigation water. Stockton, Egbert, Jacktone, and Galt are examples of soils that are in areas where control of surface water is needed.

Protection from flooding is needed on all soils in the Delta area and on the flood plains throughout the survey area. All low-lying soils in the Delta area and along the San Joaquin River, such as Rindge, Columbia, Scribner, Ryde, Egbert, Sailboat, and Grangeville soils, require an extensive levee system that includes a pumped outlet to provide protection from flooding and to lower the water table. Low-lying soils along streams, such as Cosumnes and Columbia soils,

require diversions, dikes, or levees to remove and control floodwater.

Reduction of the content of toxic salts is needed in areas where salts rise to the surface and accumulate in the root zone over a period of several years. The content of soluble salts can be reduced by leaching. Kingile and Rindge are examples of soils in the Delta area that can be affected by salinity if water in the adjacent rivers and sloughs is of poor quality.

A soil that has a large amount of sodium is considered to be sodic. Applying a proper amount of soil amendments, returning crop residue to the soil, and leaching reduce the sodicity. The Willows and Pescadero soils in the Tracy area are examples of soils that are affected by both salinity and sodicity. Intensive management is required to reduce the salinity and sodicity of these soils. Carefully applying irrigation water helps to prevent the buildup of a high water table. A drainage system may be needed.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors and in management.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(35)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United

States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIs-5 and IIw-2. The numbers used to designate units within the subclasses are as follows:

0. Indicates limitations caused by stony, cobbly, or gravelly material in the substratum.
1. Indicates limitations caused by slope or by an actual or potential erosion hazard.
2. Indicates a limitation of wetness caused by poor drainage or flooding.
3. Indicates a limitation of slow or very slow permeability in the subsoil or substratum.
4. Indicates a low available water capacity in sandy or gravelly soils.
5. Indicates limitations caused by a fine textured or very fine textured surface layer.
6. Indicates limitations caused by salts or sodium.
7. Indicates limitations caused by rocks, stones, or cobblestones.
8. Indicates that the soil has a very low or low available water capacity because the root zone generally is less than 40 inches deep over a hardpan or massive bedrock.
9. Indicates that a problem or limitation is caused by low or very low fertility associated with strong acidity; a low calcium-magnesium ratio; or excess sodium, boron, or molybdenum.
10. Indicates that a problem or limitation, such as subsidence or susceptibility to burning or soil blowing, is caused by a high content of organic matter.

The irrigated and nonirrigated capability classification of each map unit is shown in table 8 and in the section "Detailed Soil Map Units." If a soil is not irrigable, only the nonirrigated capability classification is shown. Miscellaneous areas are not assigned a capability classification.

Major Land Resource Areas

The land capability classification system is further refined by designating the major land resource area (MLRA) of the soils. A land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, land use, and general type of farming. Parts of four of these nationally designated areas are in the county. These areas and their numbers are Central California Coast Range, MLRA-15; California Delta, MLRA-16; Sacramento and San Joaquin Valley, MLRA-17; and Sierra Nevada Foothills, MLRA-18. The major land resource area number is added in parentheses after the land capability class, subclass, or unit designation at the end of each map unit description in the section "Detailed Soil Map Units."

A soil in one resource area may have characteristics similar to those of a soil in another resource area and have the same capability symbol, but the climate, vegetation, suitable crops, and needed management practices may differ. For example, both capability unit IIw-2 (MLRA-16) and IIw-2 (MLRA-17) consist of very deep soils. The soils in capability unit IIw-2 (MLRA-16) are in the California Delta. They are poorly suited to most deep-rooted crops because of the seasonal high water table. Those in capability unit IIw-2 (MLRA-17) are in the Sacramento and San Joaquin Valley. They are occasionally flooded but are suited to deep-rooted crops in most areas.

MLRA-15, the Central California Coast Range.—The mountains of the Coast Range, which are in the southwestern part of the county, are in this major land resource area. Most of the soils are shallow or moderately deep to bedrock and are steep or very steep.

The natural vegetation is mainly annual grasses and forbs in the northeastern part of the Coast Range and mixed annual grasses, forbs, shrubs, and blue oak in the southwestern part. Elevation ranges from 300 to 3,300 feet. The average annual precipitation is 10 to 18 inches. The average annual air temperature is 60 to 61 degrees F, and the average frost-free period is 200 to 270 days.

The part of the county in this resource area generally is used for livestock grazing. A few areas are used for more intensive purposes, such as off-highway vehicle recreation areas and industrial development. Throughout most of the area, the supply of ground water is very limited and streamflow is intermittent. Water for livestock is provided by stock ponds, which are in scattered areas. Water for domestic and industrial uses is limited in quantity and poor in quality. This area provides valuable habitat for wildlife.

MLRA-16, the California Delta.—The Sacramento-San Joaquin Delta, which is at the confluence of the Sacramento and San Joaquin Rivers in the western part of the county, is in this major land resource area. The delta is divided by rivers and sloughs into a large number of tracts or islands that are commonly

surrounded by manmade levees. The area is made up of flood plains and freshwater marshes that have been reclaimed. Most of the soils are very deep and nearly level.

The natural vegetation in this area is mainly tules, reeds, and other hydrophytic plants. Cottonwood and willow grow in the higher areas along channels. Most of the area is below sea level. Elevation ranges from 20 feet below sea level to 10 feet above. The average annual precipitation is 10 to 16 inches. The average annual air temperature is 59 to 60 degrees F, and the average frost-free period is 260 to 300 days.

The part of the county in this resource area generally is used for irrigated crops. The main crops are corn, wheat, and asparagus. The area provides valuable habitat for Pacific Flyway waterfowl and other wildlife.

The highly organic soils generally are subirrigated. Most of the mineral soils are irrigated by furrow, border, or sprinkler systems. Water for irrigation is obtained from the adjacent sloughs and channels. Maintaining adequate drainage is a continuing limitation. An extensive system of open ditches is used to lower the water table and convey drainage water to pumps. The water is pumped from the main ditches back into the adjacent waterways. Subsidence of the highly organic soils, peat fires, soil blowing, and the possibility of a levee failure are continuing hazards. Saltwater intrusion and the concentration of salts in the soil are continuing problems.

MLRA-17, the Sacramento and San Joaquin Valley.—The lower San Joaquin Valley, which extends from north to south through the eastern, southwestern, and central parts of the county, is in this major land resource area. The basins and basin rims in this resource area are in the central part of the county. The terraces are in the northern, eastern, and southwestern parts. Most of the flood plains and alluvial fans cross the county from east to west. The flood plain along the San Joaquin River, however, enters the county from the southern part. Alluvial fans extending from the Coast Range are in the southwestern part of the county. Most of the soils in this resource area are deep to a hardpan or are very deep. They are nearly level and gently sloping.

The natural vegetation in this area is mainly annual grasses and forbs and scattered oak. Elevation ranges from sea level to 360 feet. The average annual precipitation is 10 to 18 inches. The average annual air temperature is 60 to 61 degrees F, and the average frost-free period is 250 to 300 days.

The part of the county in this resource area generally is used for irrigated crops, including orchards and vineyards, or for irrigated hay and pasture, livestock grazing, or urban development. A few areas are used for dryland crops, such as small grain. The main crops are corn, wheat, alfalfa hay, almonds, wine grapes, sugar beets, and tomatoes. Riparian areas and irrigated pastures provide valuable habitat for wildlife.

Water for agricultural, domestic, and industrial uses is obtained from wells or nearby rivers and creeks. Furrow, border, sprinkler, and level basin irrigation systems are used in most areas. Protection from flooding is needed during winter on the soils in basins, on basin rims, and on flood plains. The fine textured soils in basins and on basin rims have a high shrink-swell potential, which can cause structural damage to improperly designed buildings and roads. A shallow or moderately deep claypan and a moderately deep hardpan in many of the soils on terraces restrict the movement of water and the penetration of roots.

MLRA-18, the Sierra Nevada Foothills.—The foothills of the Sierra Nevada, which are in the eastern part of the county, are in this major land resource area. Most of the soils are very shallow or shallow to bedrock and are undulating to steep.

The natural vegetation in this area is mainly annual grasses, forbs, and blue oak. The oak has been cleared in some areas. Elevation ranges from 140 to 830 feet. The average annual precipitation is 14 to 18 inches. The average annual air temperature is 61 to 62 degrees F, and the average frost-free period is 250 to 275 days.

The part of the county in this resource area generally is used for livestock grazing. A few areas are used for homesite development. Throughout most of the area, the supply of ground water is very limited and streamflow is intermittent. Water for livestock is provided by stock ponds, which are in scattered areas. Water for domestic and industrial uses is provided by deep wells. This area provides valuable habitat for wildlife.

Storie Index Rating

By Gordon L. Huntington, lecturer and soil specialist, Department of Land, Air, and Water Resources, University of California, Davis.

The soils in the survey area are rated in table 9 according to the Storie index *(33)*. This index expresses numerically the relative degree of suitability of a soil for general intensive agricultural uses at the time of evaluation. The rating is based on soil characteristics only and is obtained by evaluating such factors as soil depth, texture of the surface soil, subsoil characteristics, and surface relief. Availability of water for irrigation, local climate, size and accessibility of mapped areas, distance to markets, and other factors that might determine the desirability of growing certain plants in a given locality are not considered. Therefore, the index should not be used as the only indicator of

land value. Where the local economic and geographic factors are known to the user, however, the Storie index provides additional objective information for land tract value comparisons.

Four general factors are used in determining the index rating—*A*, the permeability, available water capacity, and depth of the soil; *B*, the texture of the surface soil; *C*, the dominant slope of the soil body; and *X*, other conditions more readily subject to management or modification by the land user. In this survey area these conditions include drainage, flooding, saline-sodic conditions, fertility, acidity, erosion, and microrelief. For some soils more than one of these conditions are used in determining the rating. A rating of 100 percent expresses the most favorable, or ideal, condition for general crop production. Lower percentage ratings are assigned for less favorable conditions or characteristics. Factor ratings, in percentages, are selected from tables prepared from data and observations that relate soil properties to plant growth and crop yields *(32)*. In the tables currently used *(33)*, certain properties are assigned a range of values to allow for variations in the properties that affect the suitability of the soil for general agricultural purposes. Examples of these properties are soil depth, content of gravel in a gravelly surface layer, and microrelief. When there is a range of values, the modal condition of a soil property, as it is described in a soil map unit, is used to select a value for a factor.

The index rating for a soil is obtained by multiplying the percentage rating values given to its four factors, A, B, C, and X. If more than one condition is recognized for the X factor for a soil, the value for each condition acts as an additional multiplier. Thus, any of the general factors or X factor conditions may dominate or control the final rating. For example, consider a soil such as Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded. This is a very deep, permeable soil that formed in alluvium derived from mixed rock sources. It is on flood plains. The rating for factor A is 100 percent because no significant subsoil development restricts water movement and root penetration and the available water capacity is moderate. The rating for factor B is 100 percent because the soil has a fine sandy loam surface layer that can be easily worked during seedbed preparation, has a favorable water intake rate, and does not require frequent applications of water to maintain a favorable moisture status for plants. The rating for factor C is 100 percent because the soil is nearly level. Under the present drainage and flood-control systems, which require continual maintenance, the soil has a water table at a depth of 3 to 5 feet and is subject to flooding during winter and spring. These characteristics restrict the kinds of crops that can be grown and warrant a value of 60 percent for drainage and 80 percent for occasional flooding for the X factor. Multiplying A, B, C, and X gives a Storie index of 48 for this soil under the conditions described. If the depth to the water table can be effectively lowered and the flooding controlled, the Storie index can be increased by assigning appropriate higher values to the X factor conditions to reflect the changed conditions. For example, the Storie index for Columbia fine sandy loam, drained, 0 to 2 percent slopes, is 85.

Soil complexes in the survey area, such as Alo-Vaquero complex, 8 to 30 percent slopes, are rated to reflect the proportion of the dominant soils described in the map units. Each of the dominant soils in such complexes is rated separately in table 9. The Storie index rating for each unit is a weighted average of the separate ratings. Miscellaneous areas, such as Dumps, are not evaluated in terms of factors A, B, C, or X. They have features that preclude common agricultural use; therefore, they have an index rating of zero.

Soils are assigned grades according to their suitability for general intensive agriculture as shown by their Storie index ratings. The six grades and their range in index ratings are:

Grade 1	80 to 100
Grade 2	60 to 79
Grade 3	40 to 59
Grade 4	20 to 39
Grade 5	10 to 19
Grade 6	less than 10

In the survey area, soils in *grade 1* are well suited to intensively grown irrigated crops that are climatically adapted to the region. *Grade 2* soils are good agricultural soils, although they are not so desirable as soils in grade 1 because of a less permeable subsoil, deep hardpan layers, a gravelly or moderately fine textured surface layer, moderate or strong slopes, restricted drainage, low available water capacity, lower soil fertility, or a slight or moderate hazard of flooding. *Grade 3* soils are only fairly well suited to agriculture because of moderate soil depth; moderate to steep slopes; restricted permeability in the subsoil; a clayey, sandy, or gravelly surface layer; somewhat restricted drainage; acidity; low fertility; or a hazard of flooding. *Grade 4* soils are poorly suited. They are more limited in their agricultural potential than the soils in grade 3 because of restrictions, such as a shallower depth; steeper slopes; poorer drainage; a less permeable subsoil; a gravelly, sandy, or clayey surface layer; channeled or hummocky microrelief; a hazard of flooding; low fertility; or acidity. *Grade 5* soils are very poorly suited to agriculture and are seldom cultivated. They are more commonly used as pasture, rangeland,

or woodland. *Grade 6* soils and miscellaneous areas are not suited to agriculture because of very severe or extreme limitations. They are better suited to limited use as rangeland, woodland, or watershed or for continued use as urban land. Table 9 lists the grade for each soil in the survey area.

Rangeland

By John E. Hansen, area range conservationist, Soil Conservation Service.

About 169,000 acres in San Joaquin County, or more than 18 percent of the total acreage, is rangeland or dryland pasture, and about 28,000 acres is irrigated pasture. Livestock and livestock products account for about 30 percent of the agricultural production in the county. Approximately 80 percent of this portion of the production is derived from the dairy industry and the remaining 20 percent from beef enterprises. Most of the dairy enterprises are well established and family run. The beef industry is dominated by year-round cow-calf enterprises. In years of above average, well distributed rainfall and good forage growth, seasonal stocker-feeder enterprises become more significant.

The dominant vegetation in the areas of rangeland in the county is annual grasses and forbs and scattered blue oak. Soils strongly influence the natural vegetation *(11)*. Most of the soils in the mountains of the Coast Range are steep and very steep and are moderately deep or shallow. The production of herbaceous vegetation is related to soil depth and the tree canopy. Moderate to dense stands of blue oak and digger pine generally are on north-facing slopes, where the average annual production of herbaceous vegetation is moderate, or 2,000 pounds per acre. Gonzaga soils are an example of soils that have a dense tree canopy. Open areas of annual grasses generally are on east-, south-, and west-facing slopes, where the average annual production of herbaceous vegetation on moderately deep soils, such as Honker soils, is high, or 3,200 pounds per acre.

On the soils in the foothills east of the mountains of the Coast Range, the production of herbaceous vegetation is related primarily to soil depth and texture. On moderately deep, fine textured soils, such as Alo soils, the average annual production is high, or 3,000 pounds per acre, whereas on shallow or very shallow, moderately coarse textured soils, such as Wisflat soils, it is low, or 1,500 pounds per acre.

The soils on terraces and alluvial fans east of the foothills are deep and are nearly level to steep. The amount of annual precipitation is lower than that in the foothills and mountains. Depending on the content of gravel and the related available water capacity, the annual production of herbaceous vegetation is low to high. It averages 2,800 pounds per acre on Carbona soils and 800 pounds per acre on the gravelly Cortina soils.

The other major area of rangeland consists of the terraces and hills in the eastern part of the county. It is divided from the Coast Range area by the intensively farmed San Joaquin Valley. This area of rangeland generally is gently sloping and moderately sloping. Rainfall is more evenly distributed than in the Coast Range area. Furthest east are soils on high terraces and hills. These soils are shallow to deep. On the shallow soils, such as Pentz soils, the average annual production of herbaceous vegetation is moderate, or 2,000 pounds per acre, whereas on soils that are moderately deep to a hardpan, such as Redding soils, it is 2,400 pounds per acre.

The soils on low terraces are moderately deep to a hardpan or are deep. They are higher in fertility than the soils on high terraces and hills. The production of herbaceous vegetation is low to high, depending on depth and landscape position. Deep, nearly level soils, such as Hicksville soils, receive additional moisture as runoff from the higher surrounding areas and are highly productive. Annual production averages 3,200 pounds per acre on these soils. On soils that are moderately deep to a hardpan, such as San Joaquin soils, the average annual production is moderate or high, or 1,800 to 3,300 pounds per acre, depending on the effective rooting depth.

In areas of annual grasses, the length of the green forage period and the total production of herbaceous vegetation are strongly influenced by climate and soil properties. Annual grasses and forbs start to grow after the first heavy rains in the fall. At this time the young plants make up a small percentage of the forage and are high in moisture and low in carbohydrates. The old grass has very little nutritional quality. The period of rapid growth and adequate nutritional quality begins in February and lasts until late April or early May. As annual plants dry, they lose many of their nutrients, especially protein. At the onset of fall rains, the remainder of the nutrients are leached and the cycle of germination and growth of new seedlings begins again. The green forage period is longest on Gonzaga and other soils on north-facing slopes that have a tree canopy and on Hicksville and other deep soils on bottom land. It is shortest on shallow soils, such as Wisflat soils, and on gravelly soils at the lower elevations, such as Cortina soils.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship

between the soils and vegetation and water.

Table 10 shows, for many of the soils, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 10 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction and runoff from the higher adjacent areas are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. Because only major species are listed, the percentages do not necessarily total 100 percent. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present composition and production of the vegetation under favorable management. Past management and climatic fluctuations are the major factors affecting plant composition and production.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a plant species composition different from the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The major management needs in the areas of the county used for livestock grazing are proper grazing use, a proper season of use, an even distribution of grazing, water development, cross fencing, range seeding, and applications of fertilizer.

Proper grazing use is grazing at an intensity that maintains a protective plant cover and maintains or improves the quality and quantity of desirable vegetation. Annual grasses reproduce almost entirely through seed. Allowing some of the desirable species to set seed helps to maintain a desirable composition of plant species. Because wildlife and livestock graze selectively, especially as the plants mature, controlled grazing is needed to achieve a desirable composition. If the range is subject to continuous heavy grazing, unpalatable species reproduce and increase in extent. As a result, quality of the forage gradually decreases. Leaving a minimum amount of dry vegetation on the range at the beginning of the fall-winter period promotes the establishment and growth of new seedlings. Standing herbage protects the seedlings from drying winds and sunlight. Herbaceous material lying flat on the surface and partially mixed with mineral soil conserves moisture and promotes the establishment and early growth of each year's seedlings.

The amount of residue left on the surface should be between 700 and 1,000 pounds of air-dry weight per acre on sites having slopes of less than 30 percent and between 1,000 and 1,200 pounds per acre on sites having slopes of more than 30 percent. The residue should be measured just prior to the rainy season, which normally begins in late October or early November.

The recommended stocking rate is an estimate of the number and kinds of animals that can be safely and profitably allowed to graze in an area of range. It is based primarily on the productivity of the soils in the area. Because production fluctuates from year to year, the initial stocking rate is based on the total production

of vegetation in a normal year, as indicated in table 10. A standard for measuring production and carrying capacity is the animal unit month (AUM). One AUM is the amount of forage required by an animal unit for 1 month. An animal unit is generally one mature cow of approximately 1,000 pounds and a calf as old as 6 months, or their equivalent. One AUM is equal to 1,000 pounds of forage, by air-dry weight.

The carrying capacity of a particular soil is expressed in AUM's per acre. It is determined by subtracting the amount of vegetation to be left as residue from the total amount of vegetation produced during a normal year. The result of this subtraction is the net amount of available forage. On Peters clay, 2 to 8 percent slopes, for example, the total amount of vegetation during a normal year is 3,000 pounds per acre, the amount of vegetation to be left as residue is 700 pounds per acre, and the net amount of available forage is 2,300 pounds per acre. Realistically, only about half of the 2,300 pounds per acre can be grazed by livestock because of waste, trampling, and the distribution of grazing, which is less than optimal. A calculation of the number of animal units needed to achieve the recommended stocking rate is based on the number of acres in a particular grazing unit and the length of the grazing period. This procedure is a conservative estimate of the carrying capacity, which is affected by the season of use and the distribution of grazing.

A proper season of use is determined largely by the yearly phenological cycle of annual plants. In this survey area three phenological stages or "seasons" are recognized. These are the inadequate green forage season, the adequate green forage season, and the dry forage season.

The inadequate green forage season begins with fall germination and usually occurs between November and January. Most plant growth takes place after short rainy periods. The forage during this season is characterized by high moisture and low energy. Supplemental feeding of hay is often necessary to meet the nutritional needs of the livestock.

The adequate green forage season occurs from about February to late April or early May. During this period the rate of plant growth is adequate to meet the needs of livestock forage and still leave enough of the current year's growth for residue in the fall. Even if grazed during the dry forage period, some of the current year's growth should be left to conserve moisture, control erosion, and provide residue for a seedbed.

The dry forage season occurs from about late May through October. As annual plants dry, they lose many of their nutrients, especially protein. Livestock that graze on dry forage should be provided supplemental nutrients.

The proper season of use is the period following fall germination when plant growth is sufficient to support grazing by livestock. On soils that accumulate or retain water during periods of saturation, deferment of grazing until after the soils are sufficiently drained minimizes compaction and trampling by livestock. Soils that have a surface layer of clay loam or clay, such as Alo, Carbona, and Peters soils, and soils that are on bottom land, such as Hicksville soils, generally remain saturated for longer periods following rains than other soils.

An even distribution of grazing is achieved through measures that cause livestock to graze the forage within a grazing unit as uniformly as possible. The goal of grazing management is to minimize the overuse and the waste of forage in a grazing unit. The potential efficiency of grazing differs from one grazing unit to another because of variations in water and shade distribution, in topography, in the kinds of available forage, in the class of livestock, and in the season of use. Salt can be used to achieve more uniform forage utilization by inducing cattle to move to areas that they would not ordinarily graze. It should be located away from sources of livestock water.

Livestock water developments that are properly located and provide a clean, dependable water supply are essential for good grazing management and a proper distribution of livestock. Long distances to and from sources of water adversely affect both the livestock and the distribution of grazing. Also, they increase the potential for degradation of the plants and soils in the vicinity of the water. The interval between supplies of livestock water depends on the class of livestock, the terrain, and the season of use.

Cross fencing achieves a more uniform distribution of grazing by controlling or confining livestock. In areas of soils that are shallow or very shallow to bedrock or to a hardpan, such as Amador, Toomes, and Wisflat soils, setting fenceposts is difficult. In areas of soils that have a high shrink-swell potential, such as Vaquero soils, the fenceposts can be tilted or lifted out of the ground.

Range seeding can improve forage production and plant composition. The best results are obtained on soils that have high potential for forage production but have been heavily used or disturbed by past cultivation. Generally, the soils best suited to seeding are those that are moderately deep or deep, have slopes of less than 30 percent, are not cobbly or bouldery, have a moderate or higher available water capacity, and receive 12 or more inches of annual rainfall. Under normal conditions, areas affected by natural disasters, such as fire and drought, do not require range seeding. Range seeding is effective in converting cropland to rangeland. After the range is seeded, grazing should be

deferred until the new plants have set seed.

Applications of fertilizer are not common on the rangeland in the county because they are not economical. They are suitable when used in combination with range seeding. If deemed to be economically feasible, they generally are most effective on the soils that are best suited to range seeding.

Technical assistance in managing rangeland can be obtained from the local offices of the Soil Conservation Service, the Cooperative Extension Service, and the resource conservation district.

Vegetative Soil Groups

A vegetative soil group consists of soils that have similar properties and qualities that characterize the group in terms of plant adaptation and use. Vegetative soil groups are used primarily in determining the best suited plants for conservation practices and forage production. The suitability is affected by the major limiting soil feature or problem that characterizes the group. Technical assistance in using vegetative soil groups can be obtained from local offices of the Soil Conservation Service and the resource conservation district.

The vegetative soil group of each map unit in San Joaquin County is given in the section "Detailed Soil Map Units." Letters are used to designate the vegetative soil groups.

The letter *A* indicates that the choice of plants is not limited by soil features. The soils are deep or very deep, moderately coarse textured or medium textured, moderately well drained or well drained, and moderately rapidly permeable to moderately slowly permeable. They may be slightly wet and slightly saline or sodic.

The letter *B* indicates that the choice of plants is limited by droughtiness and low fertility. The soils are coarse textured to gravelly and medium textured, are excessively drained, and have less than 5 inches of available water in the root zone.

The letter *C* indicates that the choice of plants is limited by texture. The soils are moderately fine textured or fine textured, deep or very deep, moderately well drained, and moderately slowly permeable or slowly permeable.

The letter *D* indicates that the choice of plants is limited by very slow permeability in a claypan subsoil. The soils are moderately well drained.

The letter *E* indicates that the choice of plants is limited by wetness. The soils are somewhat poorly drained to very poorly drained. Drained soil phases are assigned to the group indicated by the current status of the water table. The soils may be slightly saline, slightly sodic, or both.

The letter *F* indicates that the choice of plants is limited by salinity or sodicity. The soils are moderately or strongly saline-sodic and generally are somewhat poorly drained or poorly drained.

The letter *G* indicates that the choice of plants is limited by depth. The soils are shallow or moderately deep over a hardpan, bedrock, or other unfractured, dense material and are well drained.

The letter *H* indicates that the choice of plants is limited by pH of less than 5.6. The soils are strongly acid to extremely acid.

The letter *I* indicates that the choice of plants is limited by toxic properties or a serious nutrient imbalance. The soils generally are moderately or strongly affected by serpentine.

The letter *J* indicates that the choice of plants depends on onsite investigation. The map units occur as nonarable miscellaneous areas, such as Dumps, tailings, and Pits, gravel.

Environmental Plantings

Environmental plantings can be grown as windbreaks around farmsteads and fields, for wildlife habitat, and for beautification. They protect yards, fruit trees, and gardens and abate noise. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Organic soils and moderately coarse textured and coarse textured soils are subject to soil blowing during the growing season, especially if the surface is not protected by crop residue or growing crops. Field windbreaks can reduce the hazard of soil blowing, reduce the drying effects of wind on soil and plants, and help to protect tender plants from the abrasive action of windblown soil particles.

Farmstead windbreaks protect both homes and livestock from the wind. As a result of these windbreaks, fuel consumption in the home may be reduced 20 to 30 percent and livestock in feedlots gain weight faster and require less feed.

Wide intervals between the tree rows (at least 16 to 20 feet) normally enhance wildlife habitat within a windbreak. Most animals prefer edge areas rather than the interior of a dense windbreak.

Environmental plantings grown as windbreaks are most effective in protecting soils, crops, and farmsteads when established at right angles to the prevailing wind, along the perimeter of the field, and at intervals across the field. In nearly all areas of the county, environmental plantings cannot survive unless they are irrigated. Several different irrigation methods are suitable, including drip, sprinkler, and furrow systems and open ditches. Applications of fertilizer are needed

on most of the soils in the county. Applying a small amount of ammonium sulfate (21-0-0) during the first application of irrigation water helps to establish the plants. Environmental plantings should be adequately protected from fire, harmful rodents, poultry, and livestock. Fencing may be necessary.

San Joaquin, Rocklin, Exeter, and Redding soils are moderately deep to a hardpan, which limits the number of trees that can be grown as environmental plantings. The species that have been proven to grow fairly well on these soils are eucalyptus, such as dwarf bluegum, manna gum, and redgum, and Arizona cypress, black acacia, eldarica pine, and tamarisk. If a windbreak or enhancement of wildlife habitat is desired on soils that do not have a hardpan, some trees and shrubs in addition to those species can be planted. The species that can be planted to enhance wildlife habitat include multiflora rose, pampasgrass, and Russian olive.

Technical assistance in planning and establishing environmental plantings on a particular soil can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, and the California Department of Fish and Game.

Recreation

San Joaquin County has numerous areas that provide opportunities for recreation. These areas are used for boating, fishing, rafting, hiking, biking, picnicking, camping, or hunting. Some are of historical and scenic interest. The recreational areas include many county, city, and regional parks and the Carnegie State Vehicular Recreation Area, an off-highway vehicle park south of Tracy. Hundreds of miles of rivers and sloughs in the Delta area and along the San Joaquin, Stanislaus, and Mokelumne Rivers provide opportunities for a wide variety of recreational activities.

Hunting of pheasant is common on the farmland in the county. Opportunities for hunting also are available in a few areas where fields in the Delta area are managed for waterfowl.

The use of recreational areas in the county has increased greatly in the past several years. Many areas are well suited to the development of recreational facilities. Table 11 provides information that can be used to select new recreation sites.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures. The specific criteria used to determine soil limitations are given in appendix B.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not

dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Larry H. Norris, area biologist, Soil Conservation Service.

Fish and wildlife are valuable resources in San Joaquin County. Fish and wildlife improve the quality of the environment, act as early indicators of pollution, and provide numerous opportunities for recreation. Wildlife-related activities, such as nature study, bird-watching, hunting, and fishing have a positive effect on the economy of the county. Many types of wildlife help in the natural control of weeds, insects, and animal pests.

Warm water fish, including largemouth bass, smallmouth bass, bluegill, black crappie, and other sunfish, catfish, and several nongame species inhabit the rivers, reservoirs, and ponds in the county. The rivers, creeks, and drainageways provide habitat for fish and important riparian habitat corridors for mammals, birds, reptiles, amphibians, insects, and other invertebrates. In the areas developed for intensive agriculture, these riparian corridors commonly are the only remaining areas of perennial wildlife habitat. Although the value of these corridors to wildlife cannot be overemphasized, most have not been separated out as map units because of their limited size. The soils that support significant amounts of undeveloped native riparian vegetation include the occasionally flooded or frequently flooded Sailboat, Columbia, Cosumnes, Reiff, Coyotecreek, and Merritt soils.

The Sacramento-San Joaquin Delta, which has islands and waterways and is centrally located in the state, provides important habitat for wintering migratory waterfowl of the Pacific Flyway (fig. 9).

Human activities have various effects on wildlife populations. Many wildlife species, such as coyotes, blackbirds, and ground squirrels, can tolerate these activities and actually thrive in close association with humans. In contrast, the existence of some species has been threatened by human activities. Some species that have been listed as threatened, rare, or endangered inhabit the county. The giant garter snake and the California black rail are listed by the state as rare. The giant garter snake is one of the most aquatic of the garter snakes inhabiting permanent areas of fresh water. Changing land uses, which have resulted in drainage and loss of permanent freshwater wetlands, have destroyed much of the giant garter snake's original habitat within its limited range. The California black rail inhabits coastal salt marshes and inland freshwater marshes. Filling and draining coastal and inland marshes have significantly impacted the habitat for this species. Critical habitat for both of the rare species should be preserved. Preserving the habitat for any of the threatened, rare, or endangered species also can benefit other wildlife species.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their suitability for providing specific elements of wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining the habitat elements; and in determining the intensity of management needed for each habitat element.

In table 12, a rating of *well suited* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *suited* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poorly suited* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *unsuited* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The vegetative elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil

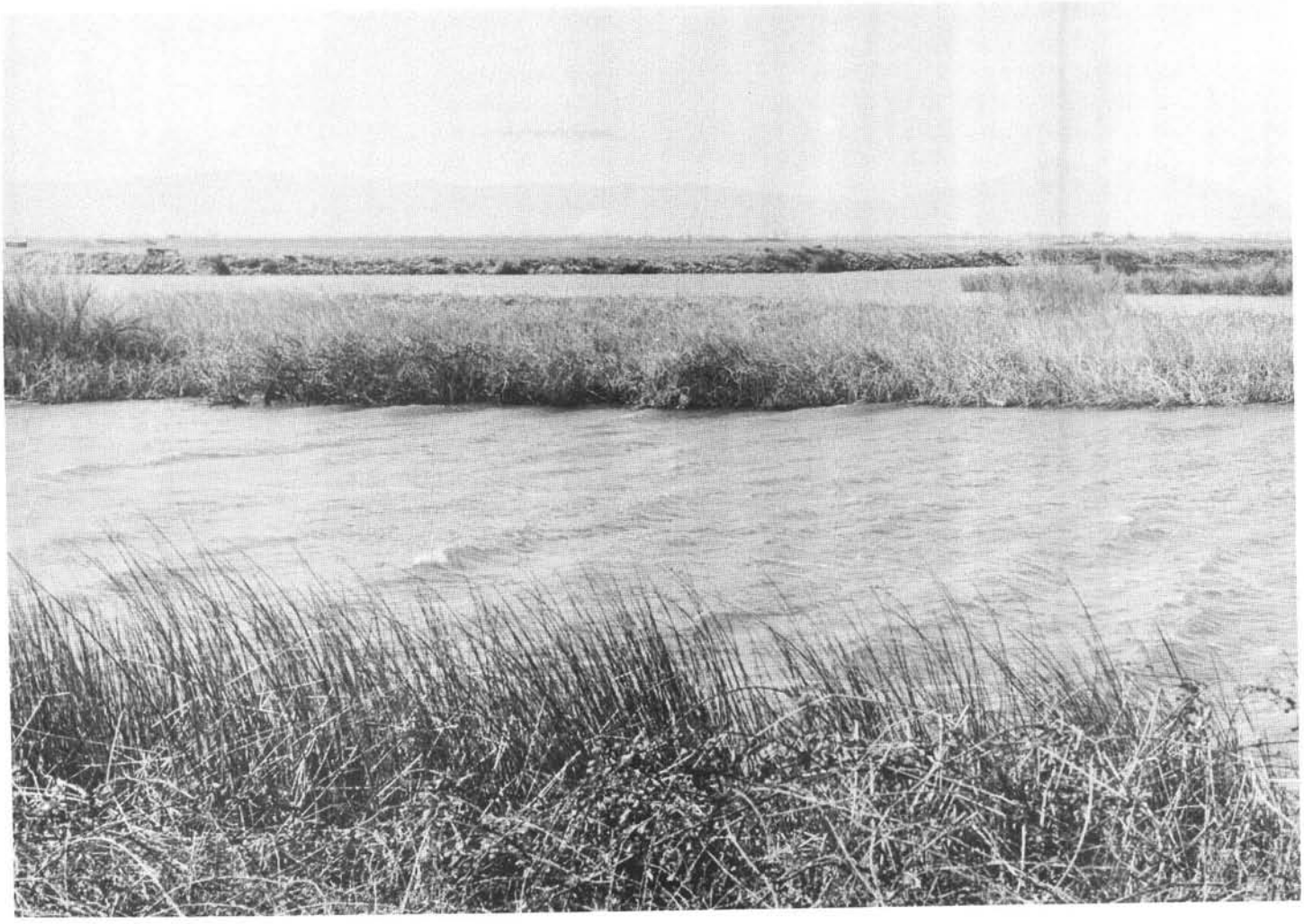

Figure 9.—An area of Fluvaquents, 0 to 2 percent slopes, frequently flooded, which provides excellent habitat for migrating waterfowl. This area is a remnant tule marsh that is not protected by levees.

moisture are also considerations. In table 12, grain and seed crops are rated for both nonirrigated and irrigated areas. Examples of these crops are corn, wheat, oats, and barley.

Domestic grasses and legumes are domestic perennial and naturally reseeding grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. In table 12, domestic grasses and legumes are rated for both nonirrigated and irrigated areas. Examples of grasses and legumes are creeping wildrye, fescue, orchardgrass, hardinggrass, Blando brome, trefoil, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are soft chess, wild oats, filaree, annual lupine, annual brome, and annual clovers.

Riparian herbaceous plants are native or naturally established wetland herbaceous grasses or forbs that provide food and cover for wildlife. Soil properties and features that affect the growth of these plants are depth to the water table, flooding, salinity in the surface layer, sodicity in the surface layer, and soil temperature regime. Examples of riparian herbaceous plants are buttercup, Baltic rush, barnyardgrass, canarygrass, smartweed, and cattail.

Shrubs and vines produce buds, twigs, bark, or foliage used for food or for shade and cover. Soil properties and features that affect the growth of shrubs and vines are available water capacity, texture of the surface layer, the shrink-swell potential, salinity or sodicity within a depth of 20 inches, and soil moisture regime. Examples of shrubs and vines are mule fat, quailbush, Arizona cypress, and toyon.

Desertic shrubs are native or naturally established desirable shrubs that produce buds, twigs, bark, or foliage and provide a substantial portion of wildlife food and cover. Soil properties and features that affect the growth of these plants are available water capacity, texture of the surface layer, depth to the water table, soil moisture regime, salinity or sodicity, and soil temperature regime. Examples of desertic shrubs are sagebrush, bladderpod, wolfberry, fourwing saltbush, and sulfurflower buckwheat.

Riparian shrubs, vines, and trees make up a major portion of the potential native plant community along the edge of streams, lakes, and ponds. They furnish cover or supply food for wildlife in the form of nuts, buds, twigs, catkins, bark, browse, seeds, or fruit-like cones. These plants grow on flood plains or in other low areas where the soils are saturated during some part of the year or are subject to overflow. Soil properties and features that affect the growth of these plants are available water capacity, depth to the water table, and flooding. Examples of riparian shrubs, vines, and trees are willow, blackberry, California wild rose, buttonbrush, elderberry, Fremont cottonwood, California sycamore, and Oregon ash.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are California white oak, blue oak, live oak, black walnut, and dwarf bluegum.

Nonsaline wetland plants are native or naturally occurring obligate hydrophytes, such as grasses, forbs, and shrubs, that provide food and cover for wildlife. Submerged or floating aquatic plants are not included. Soil properties and features that affect the growth of nonsaline wetland plants are depth to the water table, flooding, salinity in the surface layer, sodicity, and permeability. Examples of these plants are cattails, smartweed, barnyardgrass, and spikerush.

Saline wetland plants are annual or perennial native herbaceous plants and shrubs on wet, salt-affected sites. Submerged or floating aquatic plants are not included. Soil properties and features that affect the growth of saline wetland plants are depth to the water table, flooding, salinity in the surface layer, sodicity, reaction, and permeability. Examples of these plants are alkali bulrush, brassbuttons, fathen saltweed, and pickleweed.

The following paragraphs describe the suitability of the groups of map units in the section "General Soil Map Units" for various kinds of wildlife habitat.

Nearly Level Soils on Deltas and Flood Plains

The soils in this group are well suited to the development of openland wildlife habitat. Some minor limitations should be taken into account on particular soils. The selection of trees and shrubs is limited to water-tolerant varieties because of a perched or apparent water table. In addition, the shrink-swell potential limits the growth of trees and shrubs on Cosumnes, Egbert, and Peltier soils. Maintaining and improving the existing stands of trees and shrubs in areas along irrigation and drainage ditches and especially in areas adjacent to rivers and sloughs can greatly improve the habitat for openland wildlife by providing year-round hiding, resting, and nesting sites.

These soils have good or fair potential for the development of wetland wildlife habitat. Adequate areas of surface water generally are available.

Nearly Level Soils in Basins and on Basin Rims

The soils in this group have poor or fair potential for the development of openland wildlife habitat. High salinity and sodicity in Pescadero and Willows soils and a high shrink-swell potential in those soils and in Hollenbeck, Stockton, and Jacktone soils limit the diversity and production of the grain and seed crops, wild herbaceous plants, and shrubs that provide important food and cover for openland wildlife. In most areas crops and irrigation can provide food, water, and seasonal cover if good management is applied. Establishing vegetation in areas along irrigation and drainage ditches can greatly improve the habitat for openland wildlife by providing year-round hiding, resting, and nesting sites.

The potential of these soils for the development of wetland wildlife habitat is good in areas where sufficient quantities of water are available. The primary limiting factors are the effects of saline-sodic conditions on plant growth and of soil texture on the construction of shallow water areas.

Nearly Level Soils in Interfan Basins and on Alluvial Fans, Low Fan Terraces, Stream Terraces, and Dunes

Except for Capay soils, the soils in this group have good potential for the development of openland wildlife habitat. Essentially no limitations affect the growth of the habitat elements that make up openland habitat.

Figure 10.—Corn stubble in an area of Delhi loamy sand, 0 to 2 percent slopes, provides shelter for wildlife.

The Capay soils have only fair potential for openland habitat because of a high shrink-swell potential, which affects the growth of trees and shrubs. The development of water systems, such as irrigation and return systems, can improve the habitat. In most areas crops and irrigation can provide food, water, and seasonal cover if good management is applied (fig. 10). Establishing vegetation in areas along irrigation and drainage ditches can greatly improve the habitat for openland wildlife by providing year-round hiding, resting, and nesting sites.

The potential of these soils for the development of wetland wildlife habitat is fair in areas where sufficient quantities of water are available. Saline-sodic conditions limit plant growth in some areas. Soil texture limits the construction of shallow water areas on some soils.

Nearly Level to Undulating Soils on Low Terraces

The soils in this group generally have fair potential for the development of openland wildlife habitat. The primary limitations are a restricted rooting depth and a low or very low available water capacity, which hinders the growth and limits the diversity of trees and shrubs in dry areas that are not irrigated. Trees and shrubs provide important food and cover for openland wildlife. Maintaining and improving the existing stands of trees and shrubs in areas along irrigation and drainage ditches and especially in areas adjacent to rivers can greatly improve the habitat for openland wildlife by providing year-round hiding, resting, and nesting sites.

Except for the Madera and San Joaquin soils that have slopes of more than 3 percent, the soils in this group have good potential for the development of wetland wildlife habitat. If adequate areas of surface water are available, wetland habitat can be successfully established.

The soils in this group generally have fair potential for the development of rangeland wildlife habitat. The restricted rooting depth and the low or very low available water capacity are the main limiting factors

affecting the growth of trees and shrubs on most of the soils.

Nearly Level to Steep Soils on Dissected Terraces, Fan Terraces, High Terraces, and Hills

The soils in this group have good or fair potential for the development of openland and rangeland wildlife habitat. A very low or low available water capacity in Pentz, Pardee, and Redding soils and a high shrink-swell potential in Carbona soils limit the potential for openland wildlife habitat. These factors hinder the growth and limit the diversity of trees and shrubs in dry areas that are not irrigated. Trees and shrubs provide important food and cover for openland wildlife. Developing watering facilities, such as small ponds and guzzlers, and planting shrubs can improve the habitat.

Rolling to Very Steep Soils on Uplifted, Dissected Terraces and Mountains

The soils in this group have poor or fair potential for the development of rangeland wildlife habitat. In areas of Vallecitos soils, a very low available water capacity and a shallow rooting depth limit the potential for rangeland habitat. Although the growth of shrubs is limited, a good diversity of shrubs is evident on Gonzaga and Honker soils. The main concerns in managing the soils in this group for wildlife are maintaining and improving the existing habitat through strict control of grazing by domestic livestock. The development of watering facilities, such as small ponds and guzzlers, can improve the habitat, especially in areas of Gonzaga soils.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreation uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil

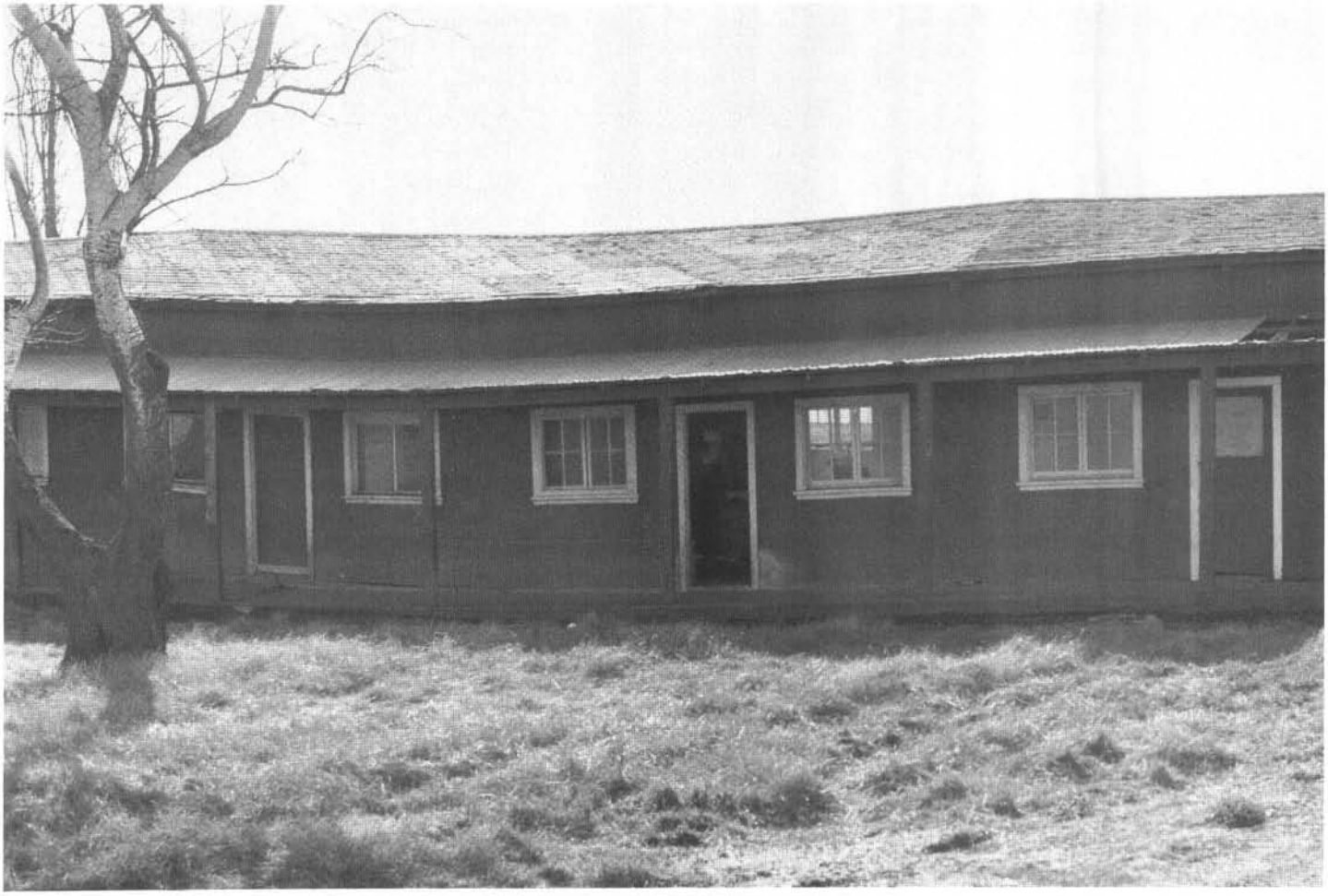

Figure 11.—Differential subsidence is a problem if organic soils on the Sacramento-San Joaquin Delta are used as sites for buildings. It has resulted in the swayback of this building.

properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. Differential subsidence can be a problem on organic soils (fig. 11). A high water table, depth to

bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, subsidence of organic layers, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel, organic layers, or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of

landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils and highly organic soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil),

the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts,

sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Taxonomic Units and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for some soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate or high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.43. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Tables 19 and 20 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the

surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 19, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions or after a levee failure; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

In many areas in the county, the natural frequency of flooding has been reduced by the construction of levees or upstream dams. This reduction was considered in determining the hazard of flooding. No attempt was made, however, to rate the reliability of the protection provided by levees. Most areas that are protected by levees are considered to be subject to rare flooding. Because of impeded outlets for surface water or increased runoff in urbanized areas, flooding sometimes occurs on some soils that are not flooded under natural conditions. Only the largest areas of these soils have been assigned a hazard of flooding. The small areas are difficult to identify and are considered inclusions in the map units. The occurrence of flooding in such situations can increase in the future unless surface drainage systems are properly designed during land leveling, urban development, or other construction activities.

High water table is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on field observations and on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 19 are the depth to the high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is high for less than 1 month is not indicated in table 19. Only saturated zones within a depth of about 6 feet are indicated.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

In table 20, *depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Soil blowing and field burning also contribute to the overall subsidence of organic soils. Subsidence takes place gradually, usually over a period of several years. Table 20 shows the estimated initial subsidence, which usually is a result of drainage, and total subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

Many soils in San Joaquin County were sampled by the Soil Survey Laboratory, United States Department of Agriculture, Soil Conservation Service, Lincoln, Nebraska. The physical and chemical data obtained from the samples include particle-size distribution, reaction, organic matter content, mineralogy, and extractable cations.

The series names and laboratory identification numbers of the soils sampled are Rindge (S72CA-039-005), Shima (S72CA-039-007), Rindge (S72CA-039-008), Kingile (S72CA-039-009), Venice (S72CA-039-010), San Joaquin (S78CA-077-000), Veritas (S79CA-077-001), Manteca (S79CA-077-002), Devries (S79CA-077-003), Stockton (S82CA-077-004), Vignolo (S82CA-077-005), and San Joaquin (S83CA-077-042).

These data were used in classifying and correlating the soils and in evaluating their behavior under various land uses. The data are available from the Soil Survey Laboratory, Lincoln, Nebraska.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(36)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Vertisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xerert (*Xer*, meaning dry, plus *ert*, from Vertisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Pelloxererts (*Pello*, meaning low chroma, plus *xerert*, the suborder of the Vertisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Pelloxererts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, montmorillonitic, thermic Typic Pelloxererts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(34)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(36)*. Unless otherwise stated, colors in the descriptions are for dry soil. Soil reaction was determined by Hellige-Truog indicator solution unless otherwise indicated. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Acampo Series

The Acampo series consists of moderately well drained soils on low fan terraces. These soils are deep

to a hardpan. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Acampo series are coarse-loamy, mixed, thermic Typic Haploxerolls.

Typical pedon of Acampo sandy loam, 0 to 2 percent slopes; 1,400 feet south and 1,850 feet west of the northeast corner of sec. 27, T. 3 N., R. 6 E., Lodi South quadrangle:

Ap—0 to 6 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; common very fine interstitial pores; mildly alkaline; abrupt smooth boundary.

A—6 to 19 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular and interstitial pores; mildly alkaline; clear wavy boundary.

Bw1—19 to 26 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; mildly alkaline; gradual wavy boundary.

Bw2—26 to 37 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; mildly alkaline; gradual wavy boundary.

Bq—37 to 47 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; few medium dark gray (10YR 3/1) manganese stains; massive; hard, slightly brittle, nonsticky and nonplastic; weakly cemented with silica; few very fine tubular pores; mildly alkaline; abrupt wavy boundary.

Bkqm1—47 to 49 inches; indurated duripan that has a laminar cap 1 to 4 millimeters thick; abrupt wavy boundary.

Bkqm2—49 to 60 inches; variegated yellowish brown (10YR 5/4) and brownish yellow (10YR 6/6), strongly cemented duripan, dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) moist; few medium dark gray (10YR 3/1) manganese stains; massive; very hard, brittle; slightly effervescent; accumulations of lime in remnant pores; moderately alkaline.

Depth to the Bq horizon is 25 to 40 inches. Depth to the duripan is 40 to 60 inches.

The A horizon has color of 10YR 5/3 or 5/2 or 2.5Y 5/2. When moist, it has color of 10YR 3/3 or 3/2 or 2.5Y 3/2. Reaction is slightly acid to mildly alkaline.

The Bw and Bq horizons have color of 10YR 6/4, 6/3, 6/2, or 5/4. When moist, they have color of 10YR 4/4, 4/3, 4/2, or 3/4. Reaction is neutral to moderately alkaline.

The Bkqm horizon has color of 10YR 6/6, 5/6, 5/4, 7/2, or 8/2 or 2.5Y 7/2 or 8/1. When moist, it has color of 10YR 5/6, 4/4, 5/3, or 4/2 or 2.5Y 7/2 or 5/2.

Alamo Series

The Alamo series consists of poorly drained soils in basins and drainageways on old terraces. These soils are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Alamo series are fine, montmorillonitic, thermic Typic Duraquolls.

Typical pedon of Alamo clay, 0 to 2 percent slopes; 2,250 feet south and 120 feet west of the northeast corner of sec. 21, T. 1 S., R. 9 E., Escalon quadrangle:

Ap—0 to 12 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few fine distinct yellowish brown (10YR 5/4) mottles when moist; moderate coarse subangular blocky structure; very hard, firm, sticky and very plastic; few fine and very fine tubular pores; neutral; gradual smooth boundary.

Bk—12 to 33 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; massive; very hard, firm, sticky and very plastic; few fine and very fine tubular pores; slightly effervescent; few fine concretions of lime; mildly alkaline; abrupt wavy boundary.

Bkqm—33 to 60 inches; variegated pale brown (10YR 6/3) and brown (10YR 5/3), indurated duripan, dark brown (10YR 4/3) moist; massive; extremely hard; thin indurated laminar cap; 75 percent silica cemented within the matrix; strongly effervescent; accumulations of lime in common fine and medium soft masses and in seams; moderately alkaline.

Depth to the duripan is 20 to 40 inches. Some pedons have overburden of sandy loam because of land leveling. The overburden has color of 7.5YR 5/2 or 10YR 5/1. When moist, it has color of 7.5YR 3/2 or 10YR 3/1.

The A horizon has color of 10YR 4/1, 4/2, 5/1, or 5/2. When moist, it has color of 10YR 3/1 or 3/2 or 2.5Y 3/2. Mottles are distinct or prominent. Reaction is neutral or mildly alkaline. The Ap horizon is slightly acid or neutral.

The Bk horizon has color of 10YR 4/1 or 5/1. When moist, it has color of 10YR 3/1, 4/1, or 4/2. Reaction is neutral to moderately alkaline.

The Bkqm horizon is strongly cemented or indurated and has a thin laminar cap. Accumulations of lime occur as soft masses or as seams.

The Alamo soils in this survey area are outside the range of the series because they have segregated lime throughout the B horizon. This difference, however, does not significantly affect the use or management of the soils.

Alo Series

The Alo series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from shale. Slope ranges from 8 to 50 percent.

Soils of the Alo series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Alo clay, in an area of Alo-Vaquero complex, 30 to 50 percent slopes; 3,000 feet south and 2,500 feet west of the northeast corner of sec. 24, T. 4 S., R. 5 E., Solyo quadrangle:

A1—0 to 10 inches; brown (10YR 4/3) clay, very dark grayish brown (2.5Y 3/2) moist; strong fine and medium granular and strong very coarse prismatic structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine and fine interstitial pores; neutral; gradual smooth boundary.

A2—10 to 16 inches; brown (10YR 4/3) clay, very dark grayish brown (2.5Y 3/2) moist; strong coarse prismatic structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine and coarse tubular and interstitial pores; common intersecting slickensides; neutral; clear wavy boundary.

Bk—16 to 34 inches; dark yellowish brown (10YR 4/4) clay, dark brown (10YR 3/3) moist; strong coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular and interstitial pores; slightly effervescent; few fine filaments of lime; mildly alkaline; clear smooth boundary.

Cr—34 inches; pale brown (10YR 6/3) and light yellowish brown (2.5Y 6/4), highly weathered shale.

The depth to soft shale is 24 to 40 inches.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3 or 2.5Y 4/2 or 5/2. When moist, it has color of 10YR 3/2 or 2.5Y 3/2. The content of gravel is 0 to 5 percent. Reaction is neutral or mildly alkaline.

The Bk horizon has color of 10YR 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 2.5Y 5/2, 5/4, or 6/4. When moist, it has color of 10YR 3/2 or 3/3. It is clay loam, silty clay, or clay. The content of gravel is 5 to 10 percent. Reaction is neutral to moderately alkaline.

Amador Series

The Amador series consists of well drained soils on hills. These soils are shallow. They formed in material weathered from hard, rhyolitic, tuffaceous sandstone. Slope ranges from 2 to 15 percent.

Soils of the Amador series are loamy, mixed, thermic, shallow Typic Xerochrepts.

Typical pedon of Amador loam, in an area of Amador-Lithic Xerorthents complex, 2 to 15 percent slopes; 2,000 feet north and 70 feet west of the southeast corner of sec. 23, T. 3 N., R. 9 E., Valley Springs quadrangle:

A—0 to 4 inches; light gray (10YR 6/1) loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial and common fine tubular pores; 5 percent gravel; moderately acid; clear smooth boundary.

Bw1—4 to 11 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine interstitial and tubular and common fine tubular pores; 5 percent gravel; slightly acid; clear wavy boundary.

Bw2—11 to 15 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial and tubular and common fine tubular pores; few thin clay films lining pores and bridging mineral grains; 10 percent gravel; slightly acid; abrupt wavy boundary.

R—15 inches; white (10YR 8/1), hard, rhyolitic, tuffaceous sandstone, light gray (2.5Y 7/2) moist; black (N 2/0) iron and manganese stains on horizontal and vertical fractures.

The depth to hard sandstone is 10 to 20 inches. The content of gravel ranges from 0 to 15 percent in the solum. Reaction is strongly acid to slightly acid.

The A horizon has color of 10YR 6/1, 6/2, or 7/2. When moist, it has color of 10YR 3/3 or 4/2.

The Bw horizon has color of 10YR 6/2 or 6/3. When moist, it has color of 10YR 4/2 or 5/2.

The Amador soils in this survey area are a taxadjunct to the series and classify as loamy, mixed, thermic Lithic Xerorthents. They are underlain by hard, rhyolitic, tuffaceous sandstone and have slightly higher reaction values in the subsoil than is defined as the range for the series. These differences, however, do not significantly affect the use or management of the soils.

Arburua Series

The Arburua series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from calcareous shale. Slope ranges from 30 to 75 percent.

Soils of the Arburua series are fine-loamy, mixed (calcareous), thermic Typic Xerorthents.

Typical pedon of Arburua clay loam, in an area of Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes; 2,400 feet south and 2,575 feet west of the northeast corner of sec. 24, T. 4 S., R. 5 E., Solyo quadrangle:

A—0 to 6 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak very coarse subangular blocky structure; slightly hard, very friable, sticky and plastic; many very fine, fine, and medium roots; common very fine, fine, and medium tubular and interstitial pores; strongly effervescent; common fine seams of lime; moderately alkaline; clear wavy boundary.

Bk1—6 to 19 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, sticky and plastic; common very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; strongly effervescent; common fine seams of lime; moderately alkaline; abrupt irregular boundary.

Bk2—19 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, sticky and plastic; few very fine and fine roots; common medium interstitial pores; strongly effervescent; common fine seams of lime; moderately alkaline; abrupt irregular boundary.

Cr—31 to 37 inches; weathered, light olive brown (2.5Y 5/4) shale that has seams of lime and gypsum.

R—37 inches; light olive brown (2.5Y 5/4), calcareous shale.

The depth to soft shale is dominantly 30 to 40 inches, but it ranges from 20 to 40 inches. The soft bedrock is underlain by hard sandstone or shale. The content of gravel is 0 to 15 percent in the solum.

The A horizon has color of 10YR 4/2, 5/2, 5/3, or 5/4 or 2.5Y 5/2. When moist, it has color of 10YR 4/2 or 2.5Y 4/2 or 4/4. Reaction is mildly alkaline or moderately alkaline.

The Bk horizon has color of 10YR 5/2, 6/2, 6/3, or 7/2 or 2.5Y 6/2. When moist, it has color of 10YR 4/2, 5/2, or 5/3 or 2.5Y 4/2, 5/4, or 6/2. It is loam or clay loam.

Archerdale Series

The Archerdale series consists of well drained soils on low fan terraces and alluvial fans. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Archerdale series are fine, mixed, thermic Pachic Haploxerolls.

Typical pedon of Archerdale clay loam, 0 to 2 percent slopes; 800 feet south and 1,850 feet west of the northeast corner of sec. 16, T. 2 N., R. 8 E., Linden quadrangle:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, and medium and few coarse roots; few very fine interstitial and tubular pores; neutral; clear smooth boundary.

A—8 to 15 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; few very fine interstitial and tubular pores; few pressure faces; neutral; gradual smooth boundary.

AB—15 to 24 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine interstitial and tubular pores; few pressure faces; neutral; gradual smooth boundary.

Bw1—24 to 35 inches; brown (10YR 5/3) clay, variegated dark brown (10YR 3/3) and brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; few pressure faces; neutral; diffuse smooth boundary.

Bw2—35 to 60 inches; brown (10YR 5/3) clay, variegated dark brown (7.5YR 4/4 and 4/2) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine and medium roots; few very fine tubular pores; many pressure faces; neutral.

The 10- to 40-inch control section has 35 to 45 percent clay.

The A horizon has color of 7.5YR 5/2 or 10YR 4/2, 4/3, 5/1, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/1, 3/2, or 3/3. Areas adjacent to streams or sloughs have overwash of stratified very fine sandy loam 12 to 20 inches thick. The content of gravel in the overwash is 0 to 5 percent. The overwash has color of 10YR 6/2 or 6/3. When moist, it has color of 10YR 4/2 or 4/3. It is slightly acid or neutral.

The Bw horizon has color of 7.5YR 5/4 or 6/4 or 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. When moist, it has color of 7.5YR 3/4 or 4/4 or 10YR 3/2, 3/3, 3/4, 4/2, 4/3, or 4/4. It is clay loam, silty clay loam, or clay.

Arents

Arents consist of somewhat poorly drained soils in areas on low alluvial fans or terraces where ripping, cutting, or filling has altered the landscape. These soils are moderately deep or deep to a hardpan or are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Reference pedon of Arents, saline-sodic, 0 to 2 percent slopes; 2,075 feet south and 2,000 feet east of the northwest corner of sec. 12, T. 2 S., R. 6 E., Lathrop quadrangle:

A—0 to 10 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) sandy loam and loam, dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) moist; massive; hard or very hard, firm, slightly sticky and slightly plastic; many very fine roots; common very fine and fine interstitial pores; 2 percent hardpan fragments; saline-sodic; slightly effervescent to violently effervescent; mildly alkaline to strongly alkaline; clear smooth boundary.

B/C—10 to 40 inches; light brownish gray (10YR 6/2 and 2.5Y 6/2), pale brown (10YR 6/3), and yellowish brown (10YR 5/4 and 5/6), mottled loam and clay loam, grayish brown (10YR 5/2 and 2.5Y 5/2), brown (10YR 5/3), dark brown (10YR 4/3), dark grayish brown (10YR 4/2 and 2.5Y 4/2), and olive brown (2.5Y 4/4) moist; massive; hard or very hard, firm, sticky and plastic; common very fine roots; common very fine and fine pores; saline-sodic; 10 percent hardpan fragments; slightly effervescent to violently effervescent; mildly alkaline to strongly alkaline; diffuse broken boundary.

Ckq—40 to 50 inches; light gray (2.5Y 7/2) and light brownish gray (2.5Y 6/2), weakly cemented to strongly cemented hardpan that has been disrupted by ripping, grayish brown (2.5Y 5/2) moist; massive; brittle; violently effervescent; mildly alkaline to strongly alkaline; clear broken boundary.

C—50 to 60 inches; mottled light brownish gray (10YR 6/2 and 2.5Y 6/2) and grayish brown (10YR 5/2 and 2.5Y 5/2), stratified loamy sand and sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard or hard, firm or friable, slightly sticky and slightly plastic; common very fine pores; slightly effervescent to strongly effervescent; mildly alkaline to strongly alkaline.

Texture and color are highly varied. Fragments of an argillic horizon and a duripan are throughout most pedons in areas where deep ripping has occurred. These fragments are not arranged in any discernible order. Fill material is 12 to 36 inches thick in areas where land leveling has filled historic low spots. The percentage of exchangeable sodium is 15 to 50, and electrical conductivity is 4 to 16 millimhos per centimeter.

Bellota Series

The Bellota series consists of moderately well drained soils on hills. These soils are moderately deep to a hardpan. They formed in material weathered from basic andesitic, tuffaceous sandstone overlain by alluvium derived from mixed rock sources. Slope ranges from 2 to 15 percent.

Soils of the Bellota series are fine-loamy, mixed, thermic Abruptic Durixeralfs.

Typical pedon of Bellota sandy loam, in an area of Keyes-Bellota complex, 2 to 15 percent slopes; 1,200 feet south and 20 feet west of the northeast corner of sec. 30, T. 3 N., R. 9 E., Linden quadrangle:

A1—0 to 3 inches; light brownish gray (10YR 6/2) sandy loam, very dark grayish brown (10YR 3/2) moist; common medium distinct strong brown (7.5YR 5/6) root stains, brown (7.5YR 4/4) moist; weak very coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine roots; many very fine tubular and common very fine interstitial pores; 10 percent rounded pebbles; slightly acid; clear smooth boundary.

A2—3 to 9 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and tubular and few fine tubular pores; 10 percent rounded pebbles; slightly acid; gradual smooth boundary.

Bt1—9 to 17 inches; brown (7.5YR 5/2) gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; weak

coarse subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; many very fine interstitial and tubular, common fine tubular, and few medium tubular pores; common thin clay films bridging mineral grains; 15 percent rounded pebbles; slightly acid; clear wavy boundary.

Bt2—17 to 23 inches; brown (7.5YR 5/2) and dark brown (7.5YR 4/2) cobbly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine tubular and interstitial and few fine tubular pores; common moderately thick clay films bridging mineral grains and few thin clay films lining pores; 10 percent rounded pebbles and 15 percent cobbles; slightly acid; abrupt wavy boundary.

2Bt3—23 to 31 inches; dark grayish brown (10YR 4/2) clay, dark grayish brown (10YR 4/2) moist; moderate very coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few very fine tubular pores; continuous moderately thick clay films bridging mineral grains; common slickensides; 5 percent rounded pebbles; neutral; clear wavy boundary.

2Bt4—31 to 35 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; moderate coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few very fine tubular pores; many moderately thick clay films bridging mineral grains; intersecting slickensides that form sphenoids ½ inch to 2 inches wide and 2 to 3 inches long; neutral; abrupt wavy boundary.

2Bqm—35 to 37 inches; light gray (2.5Y 7/2) duripan, light gray (2.5Y 7/2) and light brownish gray (2.5Y 6/2) moist; pink (7.5YR 7/4) opal coatings bridging mineral grains and laminar bands lining fractures, brown (7.5YR 4/4) and reddish yellow (7.5YR 6/6) moist; few medium manganese stains, black (10YR 2/1) dry and moist; neutral; clear wavy boundary.

2Cr—37 inches; pale brown (10YR 6/3), weakly consolidated, basic andesitic, tuffaceous sandstone, brown (10YR 4/3) moist; neutral.

Depth to the duripan is 20 to 40 inches. The duripan is underlain by soft sandstone.

The A horizon has color of 10YR 4/2, 5/2, 5/3, 6/2, or 6/4. When moist, it has color of 7.5YR 3/2 or 10YR 3/2, 3/3, or 3/4. It is sandy loam or loam. The content of gravel is 0 to 15 percent. Reaction is moderately acid or slightly acid.

The Bt horizon has color of 7.5YR 4/2, 5/2, or 5/4 or 10YR 5/2, 5/3, or 6/4. When moist, it has color of 7.5YR 3/2 or 3/4 or 10YR 3/3. It is cobbly sandy clay loam, gravelly clay loam, or gravelly sandy clay loam. The content of clay is 20 to 30 percent. The content of gravel is 15 to 25 percent. The content of cobbles is 5 to 15 percent. Reaction is moderately acid or slightly acid.

The 2Bt horizon has color of 7.5YR 4/2 or 5/2 or 10YR 4/2 or 5/3. When moist, it has color of 7.5YR 3/2 or 4/2 or 10YR 3/3, 4/2, or 4/3. The content of clay is 40 to 60 percent. The content of gravel is 0 to 5 percent. Reaction is slightly acid or neutral.

The 2Bqm horizon has color of 10YR 5/3, 6/3, 7/4, 7/6, or 8/1 or 2.5Y 7/2. When moist, it has color of 10YR 4/3, 4/4, 5/4, 6/3, or 7/2 or 2.5Y 6/2 or 7/2. It is weakly to strongly cemented with indurated opal coatings and laminar bands. The 2Cr horizon has the same colors as the 2Bqm horizon.

Bisgani Series

The Bisgani series consists of poorly drained soils on low alluvial fans. These soils are artificially drained. They are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Bisgani series are sandy, mixed, thermic Typic Haplaquolls.

Typical pedon of Bisgani loamy coarse sand, partially drained, 0 to 2 percent slopes; 2,000 feet north and 250 feet west of the southeast corner of sec. 12, T. 2 S., R. 6 E., Lathrop quadrangle:

Ap—0 to 11 inches; gray (10YR 5/1) loamy coarse sand, very dark gray (10YR 3/1) moist; weak fine granular structure; loose, nonsticky and nonplastic; few fine and common very fine and medium roots; many very fine interstitial and few very fine tubular pores; moderately alkaline; clear wavy boundary.

C1—11 to 20 inches; light gray (10YR 6/1) loamy coarse sand, dark gray (5Y 4/1) moist; common fine distinct olive brown (2.5Y 4/4) mottles when moist; massive; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C2—20 to 40 inches; light brownish gray (10YR 6/2) loamy coarse sand, dark gray (5Y 4/1) moist; common fine distinct dark grayish brown (2.5Y 4/2) mottles when moist; massive; loose, nonsticky and nonplastic; many very fine interstitial pores; moderately alkaline; gradual wavy boundary.

C3—40 to 60 inches; light brownish gray (10YR 6/2) loamy coarse sand, olive gray (5Y 4/2) moist; common fine distinct light yellowish brown (2.5Y 6/4) mottles, olive brown (2.5Y 4/4) moist; massive; loose, nonsticky and nonplastic; many very fine

interstitial pores; slightly effervescent; disseminated lime; moderately alkaline.

The content of clay in the 10- to 40-inch control section averages less than 5 percent but ranges from 2 to 10 percent. The content of gravel is 0 to 5 percent. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has color of 10YR 4/1, 4/2, 5/1, or 5/2 or 2.5Y 4/2 or 5/2. When moist, it has color of 10YR 2/1, 3/1, 3/2, or 3/3 or 2.5Y 3/2.

The C horizon has color of N 7/0; 10YR 6/1, 6/2, 6/3, 7/1, 7/2, or 7/3; or 2.5Y 6/2, 7/1, or 7/2. When moist, it has color of 10YR 4/2, 4/3, 5/3, or 5/4; 2.5Y 4/2, 5/2, 5/4, or 6/2; or 5Y 4/1 or 4/2. It is loamy sand, loamy coarse sand, or coarse sand.

Boggiano Series

The Boggiano series consists of moderately well drained soils on low fan terraces and alluvial fans. These soils are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Boggiano series are fine-silty, mixed, thermic Calcic Pachic Haploxerolls.

Typical pedon of Boggiano clay loam, 0 to 2 percent slopes; 1,700 feet north and 2,000 feet west of the southeast corner of sec. 19, T. 2 N., R. 8 E., Waterloo quadrangle:

Ap—0 to 6 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial and tubular pores; neutral; clear smooth boundary.

A—6 to 14 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine tubular and interstitial pores; neutral; clear smooth boundary.

AB—14 to 23 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine tubular pores; mildly alkaline; clear smooth boundary.

Bk1—23 to 39 inches; brown (7.5YR 5/4) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine tubular and interstitial pores; few pressure faces; slightly effervescent; segregated seams of lime; mildly alkaline; gradual smooth boundary.

Bk2—39 to 48 inches; light yellowish brown (10YR 6/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine tubular pores; slightly effervescent; segregated seams of lime; mildly alkaline; abrupt wavy boundary.

Bkqm—48 to 60 inches; light yellowish brown (10YR 6/4), strongly cemented duripan, dark brown (7.5YR 4/4) moist; massive; brittle; indurated laminar cap 1 to 2 millimeters thick; slightly effervescent; segregated seams of lime.

Depth to the duripan is 40 to 60 inches.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3 or 7.5YR 5/2. When moist, it has color of 10YR 3/2 or 3/3 or 7.5YR 3/2.

The Bk horizon has color of 10YR 6/3, 6/4, 5/3, 5/4, or 4/3 or 7.5YR 6/4 or 5/4. When moist, it has color of 10YR 4/3, 4/4, 3/3, or 3/4 or 7.5YR 4/4. It has segregated seams or soft masses of lime. It is loam, silt loam, or clay loam. The content of clay is 20 to 30 percent.

The Bkqm horizon has color of 10YR 7/4, 6/4, or 5/4 or 7.5YR 6/6 or 5/4. When moist, it has color of 10YR 4/4 or 5/4 or 7.5YR 4/4.

Bruella Series

The Bruella series consists of well drained or moderately well drained soils on low terraces. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Bruella series are fine-loamy, mixed, thermic Ultic Palexeralfs.

Typical pedon of Bruella sandy loam, 0 to 2 percent slopes; 20 feet north and 800 feet west of the southeast corner of sec. 11, T. 4 N., R. 7 E., Lockeford quadrangle:

Ap—0 to 11 inches; brown (10YR 5/3) sandy loam, dark brown (7.5YR 3/2) moist; moderate medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; many very fine interstitial and tubular pores; moderately acid; clear wavy boundary.

BA—11 to 18 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/4) moist; moderate medium angular blocky structure; very hard, friable, slightly

sticky and slightly plastic; few very fine, fine, and medium and common coarse roots; many very fine and common fine interstitial and tubular pores; slightly acid; clear wavy boundary.

Bt1—18 to 24 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium and coarse angular blocky structure; very hard, friable, sticky and plastic; few very fine and fine and common medium roots; many very fine and common fine interstitial and tubular pores; common thin clay films on faces of peds and lining pores; slightly acid; clear wavy boundary.

Bt2—24 to 31 inches; brown (7.5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; very hard, friable, sticky and plastic; few very fine, fine, medium, and coarse roots; many very fine interstitial and many very fine and common fine tubular pores; common thin clay films on faces of peds and lining pores; slightly acid; gradual wavy boundary.

Bt3—31 to 47 inches; brown (7.5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; very hard, firm, sticky and plastic; few very fine and fine and common coarse roots; few very fine interstitial and common very fine and few fine tubular pores; common thin clay films bridging mineral grains; many moderately thick clay films on faces of peds and lining pores; many black (10YR 2/1) iron and manganese stains on faces of peds and fractures; neutral; gradual wavy boundary.

Bt4—47 to 63 inches; brown (7.5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) and yellowish red (5YR 4/6) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; common very fine, fine, and medium roots; many very fine and common fine interstitial and tubular pores; many moderately thick clay films bridging mineral grains, on faces of peds, and lining pores; few iron and manganese concretions; common fine and medium iron and manganese stains on faces of peds and fractures; neutral; clear wavy boundary.

Bt5—63 to 67 inches; strong brown (7.5YR 5/6) and light brown (7.5YR 6/4) sandy clay loam, reddish brown (5YR 4/4) moist; massive; very hard, firm, sticky and plastic; few fine and medium roots; common very fine interstitial and many very fine and few fine tubular pores; few moderately thick clay films lining pores and common thin clay films bridging mineral grains; neutral.

The A horizon has color of 7.5YR 5/2, 5/4, 5/6, or 6/4 or 10YR 5/3, 5/4, or 6/3. When moist, it has color of 5YR 3/4 or 4/4; 7.5YR 3/2, 3/4, or 4/4; or 10YR 3/3, 3/4, or 4/4. Reaction is slightly acid or neutral.

The Bt horizon has color of 5YR 4/6 or 5/6 or 7.5YR 4/4, 4/6, 5/4, 5/6, or 6/4. When moist, it has color of 5YR 3/4, 4/4, 4/6, or 5/6 or 7.5YR 3/4, 4/4, 4/6, or 5/4. It is sandy loam or sandy clay loam in the upper part and sandy clay loam or clay loam in the lower part. It is slightly acid or neutral.

Some pedons have a Btq horizon below a depth of 40 inches. This horizon is weakly cemented soil material that slakes in water after prolonged periods of wetness. It has the same colors and reaction as the Bt horizon. It crushes to sandy clay loam or sandy clay.

Some pedons have a hard substratum at a depth of 40 to 60 inches.

Calla Series

The Calla series consists of well drained soils on uplifted, dissected terraces. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 2 to 50 percent.

Soils of the Calla series are fine-loamy, mixed, thermic Calcixerollic Xerochrepts.

Typical pedon of Calla clay loam, in an area of Calla-Pleito complex, 8 to 30 percent slopes; 1,150 feet north and 2,200 feet east of the southwest corner of sec. 29, T. 3 S., R. 5 E., Tracy quadrangle:

A—0 to 5 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; few very fine tubular pores; strongly effervescent; disseminated lime and common fine irregular soft masses of lime; moderately alkaline; clear smooth boundary.

Bk1—5 to 11 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; few very fine tubular pores; violently effervescent; disseminated lime and common fine irregular soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bk2—11 to 19 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores; violently effervescent; disseminated lime and many medium irregular soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bk3—19 to 29 inches; light gray (2.5Y 7/2) and light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, very friable, very sticky and very plastic; violently effervescent; disseminated lime and many medium seams and irregular soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bk4—29 to 37 inches; white (2.5Y 8/2) and light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, very friable, sticky and plastic; violently effervescent; disseminated lime and common fine irregular soft masses of lime; moderately alkaline; clear wavy boundary.

Bk5—37 to 52 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, very friable, sticky and plastic; violently effervescent; disseminated lime and common fine irregular soft masses of lime; moderately alkaline; clear wavy boundary.

Bk6—52 to 60 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, very friable, sticky and plastic; violently effervescent; disseminated lime and common fine irregular soft masses of lime; moderately alkaline.

The content of gravel is 0 to 10 percent. Few to many fine or medium soft masses or filaments of lime are at a depth of 5 to 20 inches. Reaction is mildly alkaline or moderately alkaline.

The A horizon has color of 10YR 6/1, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. When moist, it has color of 10YR 4/2 or 4/3 or 2.5Y 4/2 or 5/2.

The Bk horizon has color of 10YR 5/2, 5/3, 6/2, 6/3, 6/4, 7/2, 7/3, or 8/2 or 2.5Y 6/2. When moist, it has color of 10YR 4/2, 4/3, 5/2, 5/3, or 5/4 or 2.5Y 4/2, 5/2, or 6/2. The calcium carbonate equivalent is 15 to 25 percent.

Capay Series

The Capay series consists of moderately well drained soils on alluvial fans and in interfan basins. In some areas these soils are irrigated. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Soils of the Capay series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Capay clay, 0 to 2 percent slopes; 2,450 feet south and 400 feet west of the northeast corner of sec. 9, T. 2 S., R. 4 E., Clifton Court Forebay quadrangle:

Ap—0 to 7 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and very plastic; many very fine and common medium roots; common very fine tubular pores; neutral; abrupt smooth boundary.

A—7 to 20 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure; very hard, firm, sticky and very plastic; many very fine and fine and few medium roots; common very fine and fine tubular pores; intersecting slickensides; mildly alkaline; clear wavy boundary.

Bk1—20 to 34 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; few very fine and fine tubular pores; common slickensides; violently effervescent; seams of lime; moderately alkaline; clear smooth boundary.

Bk2—34 to 40 inches; dark brown (10YR 4/3) and pale brown (10YR 6/3) clay, olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine and fine tubular pores; common slickensides; violently effervescent; seams of lime; moderately alkaline; clear smooth boundary.

Bk3—40 to 60 inches; pale brown (10YR 6/3) clay, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, sticky and plastic; strongly effervescent; seams of lime; moderately alkaline.

Disseminated or segregated lime is at a depth of 20 or more inches. In some pedons, the percentage of exchangeable sodium is 15 to 25 and electrical conductivity is 4 to 8 millimhos per centimeter below a depth of 20 inches. Reaction is neutral to moderately alkaline.

The A horizon has color of 7.5YR 4/2; 10YR 4/2, 4/3, 5/2, or 5/3; or 2.5Y 4/2 or 5/2. When moist, it has color of 7.5YR 3/2; 10YR 3/2, 3/3, 4/2, or 4/3; or 2.5Y 3/2 or 4/2.

The Bk horizon has color of 10YR 4/2, 4/3, 5/2, 5/3, 5/4, 6/3, 6/4, or 7/2 or 2.5Y 4/4 or 5/4. When moist, it has color of 10YR 3/2, 3/3, 4/2, 4/3, 4/4, or 6/3 or 2.5Y 4/2 or 4/4. It is clay, silty clay, silty clay loam, or clay loam.

Capay clay loam, 0 to 2 percent slopes, is outside the range of the series because it has fine strata of silty clay loam and clay loam below a depth of 20 inches. This difference, however, does not significantly affect the use or management of the soil.

Carbona Series

The Carbona series consists of well drained soils on uplifted, dissected terraces. These soils are deep or very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 2 to 50 percent.

Soils of the Carbona series are fine, montmorillonitic, thermic Vertic Haploxerolls.

Typical pedon of Carbona clay loam, 2 to 8 percent slopes; 1,100 feet north and 300 feet west of the southeast corner of sec. 28, T. 3 S., R. 5 E., Tracy quadrangle:

Ap—0 to 6 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; many very fine tubular and interstitial pores; 6 percent gravel; moderately alkaline; abrupt wavy boundary.

A1—6 to 17 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; many very fine tubular and interstitial pores; 6 percent gravel; moderately alkaline; gradual wavy boundary.

A2—17 to 25 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular and interstitial pores; 6 percent gravel; moderately alkaline; clear wavy boundary.

Bk1—25 to 36 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine tubular and interstitial pores; few krotovinas 50 to 100 millimeters in diameter; violently effervescent; common fine soft masses of lime; 6 percent gravel; moderately alkaline; gradual wavy boundary.

Bk2—36 to 50 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine tubular and interstitial pores; few krotovinas 50 to 100 millimeters in diameter; violently effervescent; common fine soft masses of lime; 6 percent gravel; moderately alkaline; clear wavy boundary.

Bk3—50 to 62 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; few thin clay films bridging mineral grains; violently effervescent; common fine soft masses of lime; 3 percent gravel; moderately alkaline.

Soft sandstone is at a depth of 40 to 60 inches in some pedons. The content of gravel is 0 to 15 percent.

The A horizon has color of 7.5YR 5/2 or 10YR 4/1, 4/2, 5/1, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/1, 3/2, or 3/3. It is clay loam or clay. Reaction is mildly alkaline or moderately alkaline.

The Bk horizon has color of 10YR 6/3, 6/4, or 7/4. When moist, it has color of 10YR 5/3 or 5/4. It is clay loam or clay.

Chuloak Series

The Chuloak series consists of moderately well drained soils on low alluvial fans. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Chuloak series are fine-loamy, mixed, thermic Typic Argixerolls.

Typical pedon of Chuloak coarse sandy loam, 0 to 2 percent slopes; 2,450 feet north and 500 feet west of the southeast corner of sec. 14, T. 2 S., R. 8 E., Avena quadrangle:

Ap—0 to 11 inches; grayish brown (10YR 5/2) coarse sandy loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine interstitial and tubular pores; 2 percent gravel; moderately acid; clear smooth boundary.

A—11 to 19 inches; grayish brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial and tubular pores; slightly acid; clear wavy boundary.

Bt—19 to 44 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots; few very fine interstitial pores; few thin clay films on faces of peds and bridging sand grains; slightly acid; clear wavy boundary.

C1—44 to 55 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores; neutral; clear wavy boundary.

C2—55 to 64 inches; pale brown (10YR 6/3) loamy coarse sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral.

Distinct or prominent mottles are in the lower part of the B horizon or in the C horizon. The content of gravel is 0 to 15 percent.

The A horizon has color of 10YR 4/1, 4/2, 5/1, or 5/2. When moist, it has color of 10YR 3/1 or 3/2. Reaction is moderately acid or slightly acid.

The Bt horizon has color of 10YR 5/2 or 5/3. When moist, it has color of 10YR 4/2 or 4/3. It is sandy loam or sandy clay loam. Reaction is slightly acid or neutral.

The C horizon has color of 10YR 5/3 or 6/3. When moist, it has color of 10YR 4/3 or 5/3. It is fine sandy loam or loamy coarse sand.

Cogna Series

The Cogna series consists of well drained soils on low fan terraces and alluvial fans. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Cogna series are fine-silty, mixed, thermic Calcic Pachic Haploxerolls.

Typical pedon of Cogna loam, 0 to 2 percent slopes; 2,250 feet north and 1,950 feet east of the southwest corner of sec. 16, T. 2 N., R. 8 E., Linden quadrangle:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium and common very fine roots; few very fine interstitial and tubular pores; slightly acid; clear smooth boundary.

A—6 to 13 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine tubular and interstitial pores; neutral; clear smooth boundary.

AB—13 to 25 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine tubular pores; neutral; gradual smooth boundary.

Bk—25 to 38 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; few very fine tubular and interstitial pores; slightly effervescent; accumulations of lime in seams; mildly alkaline; gradual smooth boundary.

C1—38 to 49 inches; pale brown (10YR 6/3) loam, dark brown (7.5YR 4/2) moist;.moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few medium and few very fine tubular and interstitial pores; slightly effervescent; disseminated lime; mildly alkaline; gradual smooth boundary.

C2—49 to 64 inches; brown (10YR 5/3) loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; slightly effervescent; disseminated lime; moderately alkaline.

The A horizon has color of 7.5YR 5/2 or 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3. It is slightly acid to mildly alkaline. Areas adjacent to streams or sloughs have overwash of stratified fine sandy loam 12 to 20 inches thick.

The Bk horizon has color of 7.5YR 5/4 or 6/4 or 10YR 4/3, 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 7.5YR 4/4 or 10YR 3/3, 3/4, 4/3, or 4/4. It is loam, silt loam, or clay loam. Accumulations of lime occur as seams or as soft masses.

The C horizon has the same colors and textures as the Bk horizon. Reaction is mildly alkaline or moderately alkaline.

Columbia Series

The Columbia series consists of somewhat poorly drained soils on flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed sources. Slope ranges from 0 to 2 percent.

Soils of the Columbia series are coarse-loamy, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Columbia fine sandy loam, drained, 0 to 2 percent slopes; 300 feet north and 850 feet east of the southwest corner of sec. 19, T. 4 N., R. 8 E., Lockeford quadrangle:

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine and medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots; many very fine and fine interstitial pores; slightly acid; clear smooth boundary.

A—4 to 12 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine and fine tubular pores; slightly acid; abrupt wavy boundary.

C1—12 to 21 inches; light gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; many fine distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; common very fine tubular pores; slightly acid; clear wavy boundary.

C2—21 to 26 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; many fine distinct light gray (10YR 6/1) mottles, dark gray (10YR 4/1) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; common very fine tubular pores; slightly acid; abrupt wavy boundary.

C3—26 to 34 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; many fine distinct light gray (10YR 6/1) mottles, dark gray (10YR 4/1) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; many very fine and common fine tubular pores; slightly acid; abrupt wavy boundary.

C4—34 to 40 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; many fine distinct light gray (10YR 6/1) mottles, dark gray (10YR 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; slightly acid; clear wavy boundary.

C5—40 to 48 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; many fine distinct light gray (10YR 6/1) mottles, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; common very fine tubular pores; slightly acid; clear wavy boundary.

C6—48 to 60 inches; variegated yellowish brown (10YR 5/4) and pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly acid.

The content of gravel is 0 to 5 percent.

The A horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. When moist, it has color of 10YR 4/2, 4/3, 4/4, or 5/4. Reaction is slightly acid to mildly alkaline.

The C horizon has color of 10YR 5/3, 5/4, 6/1, 6/2, 6/3, 6/4, 7/1, 7/2, 7/3, or 7/4. When moist, it has color of 10YR 3/3, 4/1, 4/2, 4/3, 4/4, 5/2, 5/3, or 5/4. Mottles are distinct or prominent. The horizon is stratified with textures ranging from sand to silt loam. Reaction is slightly acid to mildly alkaline.

Some pedons have an Ab horizon below a depth of 40 inches. This horizon has color of 10YR 2/1, 3/1, 4/1, 4/2, 5/1, or 6/1 or 2.5Y 6/2. When moist, it has color of N 2/0; 10YR 2/1, 3/1, 4/1, or 5/1; or 2.5Y 3/2. It is clay loam, silty clay loam, or clay. Reaction is neutral to moderately alkaline.

Cometa Series

The Cometa series consists of moderately well drained soils on dissected terraces. These soils are moderately deep to dense, weakly cemented sediments. They formed in old alluvium derived from granitic rock sources. Slope ranges from 2 to 8 percent.

Soils of the Cometa series are fine, mixed, thermic Typic Palexeralfs.

Typical pedon of Cometa sandy loam, in an area of Montpellier-Cometa complex, 5 to 8 percent slopes; 25 feet south and 1,125 feet east of the northwest corner of sec. 24, T. 3 N., R. 8 E., Linden quadrangle:

Ap—0 to 6 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and common fine tubular pores; moderately acid; gradual smooth boundary.

A—6 to 13 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and few fine tubular pores; slightly acid; abrupt wavy boundary.

AB—13 to 22 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium tubular pores; slightly acid; abrupt wavy boundary.

Bt1—22 to 31 inches; brown (7.5YR 5/4) sandy clay, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine, fine, and medium tubular pores; common moderately thick clay films on faces of peds and lining pores; slightly acid; gradual smooth boundary.

Bt2—31 to 36 inches; brown (7.5YR 5/4) sandy clay,

brown (7.5YR 4/4) moist; strong coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine and medium tubular pores; many moderately thick clay films on faces of peds and lining pores; slightly acid; abrupt wavy boundary.

Btq1—36 to 48 inches; brown (7.5YR 5/4), weakly cemented sandy clay loam, dark brown (7.5YR 4/4) moist; massive; very hard and dense, brittle, slightly sticky and nonplastic; common thin clay films lining pores and bridging sand grains; neutral; abrupt wavy boundary.

Btq2—48 to 60 inches; brown (7.5YR 5/4), discontinuous, weakly cemented sandy loam, dark brown (7.5YR 4/4) moist; massive; very hard and dense, brittle, nonsticky and nonplastic; common thin clay films lining pores and bridging sand grains; 10 percent gravel; neutral.

Depth to the dense, weakly cemented Btq horizon is 24 to 40 inches.

The A horizon has color of 7.5YR 5/2 or 5/4 or 10YR 5/2, 5/3, 5/4, or 6/3. When moist, it has color of 7.5YR 4/2 or 4/4 or 10YR 3/3 or 4/3. Reaction is moderately acid or slightly acid.

The Bt horizon has color of 5YR 4/3, 4/4, 4/6, 5/3, or 5/4 or 7.5YR 4/2, 4/4, 4/6, 5/2, or 5/4. When moist, it has color of 5YR 3/3, 3/4, 4/3, or 4/4 or 7.5YR 3/4, 4/2, 4/4, or 4/6. It is clay, sandy clay, or clay loam. The content of clay is 35 to 50 percent. Reaction is slightly acid or neutral.

The Btq horizon has color of 7.5YR 4/4, 5/4, or 5/6. When moist, it has color of 7.5YR 4/4 or 5/4.

Corning Series

The Corning series consists of moderately well drained soils on the side slopes of terraces. These soils are very deep. They formed in weakly consolidated alluvium derived from mixed but dominantly granitic rock sources. About 8 percent of the surface is covered with cobbles. Slope ranges from 2 to 15 percent.

Soils of the Corning series are fine, mixed, thermic Typic Palexeralfs.

Typical pedon of Corning cobbly loam, in an area of Corning-Redding complex, 8 to 15 percent slopes; 260 feet south and 2,000 feet west of the northeast corner of sec. 28, T. 5 N., R. 8 E., Goose Creek quadrangle:

A—0 to 6 inches; light brown (7.5YR 6/4) cobbly loam, dark brown (7.5YR 4/4) moist; common coarse distinct reddish yellow (5YR 6/6) mottles, yellowish red (5YR 4/6) moist; weak very coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and few very fine interstitial pores; 10 percent gravel and 15 percent cobbles; moderately acid; clear smooth boundary.

BA—6 to 12 inches; yellowish red (5YR 5/6) and light brown (7.5YR 6/4) gravelly loam, dark red (2.5YR 3/6) and brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine tubular and interstitial and few very fine tubular pores; 15 percent gravel and 15 percent cobbles; moderately acid; abrupt wavy boundary.

2Bt1—12 to 19 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong very coarse columnar structure parting to strong coarse prismatic; extremely hard, very firm, very sticky and very plastic; common very fine roots on faces of peds; few very fine tubular pores; many thin clay films on faces of peds; common pressure faces; slightly acid; clear wavy boundary.

2Bt2—19 to 25 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; strong very coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine tubular pores; many moderately thick clay films on faces of peds; slightly acid; clear wavy boundary.

3Bt3—25 to 31 inches; reddish yellow (7.5YR 7/6) clay loam, strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; very hard, firm, sticky and slightly plastic; few very fine tubular and interstitial pores; many thin clay films on faces of peds; neutral; clear wavy boundary.

3Bt4—31 to 35 inches; reddish yellow (7.5YR 7/6) loam, strong brown (7.5YR 5/6) moist; weak medium angular blocky structure; hard, firm, sticky and slightly plastic; few very fine tubular pores; many thin and few moderately thick clay films on faces of peds; very weak brittleness when moist; slakes in water after drying; neutral; gradual wavy boundary.

3Bt5—35 to 58 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; weak medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; many moderately thick clay films lining pores and on faces of peds; very weak brittleness when moist; slakes in water after drying; neutral; gradual wavy boundary.

3Bt6—58 to 67 inches; light brown (7.5YR 6/4) loam, strong brown (7.5YR 5/6) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; few very fine tubular and interstitial pores; common moderately thick clay films on faces of peds; neutral.

The A horizon has color of 5YR 5/4, 5/6, 6/4, or 6/6 or 7.5YR 5/4, 5/6, 6/4, or 6/6. When moist, it has color of 2.5YR 3/6; 5YR 3/4, 4/4, or 4/6; or 7.5YR 3/4 or 4/4. It is cobbly loam or gravelly loam. The content of gravel is 5 to 30 percent. Reaction is strongly acid to slightly acid.

The 2Bt horizon has color of 2.5YR 3/6 or 4/6 or 5YR 5/4, 5/6, or 6/6. When moist, it has color of 2.5YR 3/6 or 4/6 or 5YR 4/4 or 4/6. The content of clay is 60 to 70 percent. The content of gravel is 0 to 5 percent. Reaction is very strongly acid to slightly acid.

The 3Bt horizon has color of 7.5YR 6/4, 6/6, 7/4, or 7/6. When moist, it has color of 7.5YR 4/4, 4/6, or 5/6. It is loam or clay loam. The content of gravel is 0 to 5 percent. Some pedons are weakly consolidated. Reaction is strongly acid to neutral.

The Corning soils in this survey area are a taxadjunct to the series and classify as very fine, mixed, thermic Typic Palexeralfs. They have 60 to 70 percent clay and 0 to 5 percent gravel in the 2Bt horizon. These differences, however, do not significantly affect the use or management of the soils.

Cortina Series

The Cortina series consists of somewhat excessively drained soils on alluvial fans. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Soils of the Cortina series are loamy-skeletal, mixed, nonacid, thermic Typic Xerofluvents.

Typical pedon of Cortina gravelly sandy loam, 0 to 5 percent slopes; 1,800 feet north and 800 feet west of the southeast corner of sec. 12, T. 4 S., R. 5 E., Solyo quadrangle:

Ap—0 to 8 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular and interstitial pores; 25 percent gravel and 10 percent cobbles; moderately alkaline; clear wavy boundary.

A—8 to 18 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular and interstitial pores; 25 percent gravel and 10 percent cobbles; mildly alkaline; gradual wavy boundary.

C1—18 to 46 inches; pale brown (10YR 6/3), stratified very gravelly loamy sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; few very fine and fine and few medium roots; common very fine, fine, and medium pores; 50 percent gravel and 5 percent cobbles; neutral; abrupt wavy boundary.

C2—46 to 56 inches; pale brown (10YR 6/3) very gravelly sandy loam that has pockets of silty clay loam; dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few medium and coarse roots; common fine interstitial pores; 60 percent gravel; mildly alkaline; abrupt wavy boundary.

C3—56 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; common very fine interstitial pores; 55 percent gravel and 5 percent cobbles; neutral.

The content of rock fragments is 35 to 60 percent. Reaction is neutral to moderately alkaline.

The A horizon has color of 10YR 5/2 or 5/3. When moist, it has color of 10YR 3/2 or 3/3. The content of gravel is 15 to 35 percent.

The C horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, 6/4, or 7/3. When moist, it has color of 10YR 4/2, 4/3, 4/4, 5/3, 5/4, 6/2, or 6/3. The content of gravel is 30 to 60 percent.

The Cortina soils in this survey area are a taxadjunct to the series and classify as loamy-skeletal, mixed, nonacid, thermic Mollic Xerofluvents. They have darker colors in the surface layer and receive slightly less rainfall than is defined as the range for the series. These differences, however, do not significantly affect the use or management of the soils.

Cosumnes Series

The Cosumnes series consists of somewhat poorly drained soils on low flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Cosumnes series are fine, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of the Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded; lat. 38 degrees 13 minutes 32 seconds N. and long. 121 degrees 23 minutes 32 seconds W., in an unsectionized area of the Thornton quadrangle:

Ap—0 to 7 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine interstitial pores; slightly acid; abrupt smooth boundary.

C1—7 to 14 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; common very fine and few fine tubular pores; slightly acid; clear wavy boundary.

C2—14 to 21 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; many very fine and common fine roots; common very fine and few fine tubular pores; slightly acid; gradual smooth boundary.

2Ab1—21 to 29 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine roots; common very fine and few fine tubular pores; neutral; clear wavy boundary.

2Ab2—29 to 47 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; extremely hard, very firm, sticky and very plastic; common very fine roots; common very fine and few fine tubular pores; mildly alkaline; abrupt wavy boundary.

2Bk1—47 to 57 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; massive; extremely hard, very firm, sticky and very plastic; few very fine roots; common very fine tubular pores; few pressure faces; slightly effervescent; few fine irregularly shaped soft masses of lime; moderately alkaline; abrupt wavy boundary.

2Bk2—57 to 63 inches; pale brown (10YR 6/3) clay, dark brown (10YR 4/3) moist; common medium distinct brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; massive; very hard, firm, sticky and plastic; common very fine tubular pores; strongly effervescent; common fine irregularly shaped soft masses of lime; moderately alkaline.

The A horizon has color of 10YR 6/3 or 6/4. When moist, it has color of 10YR 3/3, 3/4, 4/3, or 4/4. It is slightly acid to mildly alkaline.

The C horizon has color of 10YR 5/3, 5/4, 6/3, or 7/3. When moist, it has color of 10YR 3/3, 3/4, 4/3, 4/4, or 5/4. Common distinct or prominent mottles are in most pedons. This horizon is stratified silty clay loam or clay. It is slightly acid to mildly alkaline.

The 2Ab horizon has color of 10YR 4/1, 5/1, or 5/2. When moist, it has color of 10YR 3/1, 3/2, or 4/1. It has distinct or prominent mottles. It is clay loam or clay. It is neutral to moderately alkaline.

The 2Bk horizon has color of 10YR 5/2, 5/3, 6/4, or 6/3 or 2.5Y 5/2. When moist, it has color of 10YR 4/2, 4/3, or 4/4 or 2.5Y 4/2. It is clay loam or clay. It is mildly alkaline or moderately alkaline.

Coyotecreek Series

The Coyotecreek series consists of well drained soils on flood plains. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Coyotecreek series are fine-silty, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded; 725 feet north and 2,600 feet west of the southeast corner of sec. 19, T. 5 N., R. 8 E., Clay quadrangle:

A1—0 to 7 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; many very fine tubular pores; neutral; clear wavy boundary.

A2—7 to 14 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

A3—14 to 23 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

AC—23 to 36 inches; dark brown (10YR 4/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine and few fine tubular pores; neutral; clear wavy boundary.

C1—36 to 45 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; massive; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; neutral; clear wavy boundary.

C2—45 to 58 inches; dark brown (7.5YR 4/4) silty clay loam, dark brown (7.5YR 3/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; neutral; clear wavy boundary.

C3—58 to 69 inches; dark brown (7.5YR 4/4) silty clay loam, dark brown (7.5YR 3/4) moist; massive; hard, firm, sticky and plastic; neutral.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 10YR 3/2 or 3/3. Reaction is slightly acid or neutral.

The C horizon has color of 7.5YR 4/4, 5/2, or 5/4 or 10YR 4/3 or 5/3. When moist, it has color of 7.5YR 3/2, 3/4, or 4/4 or 10YR 3/2, 3/3, or 4/2. It is loam or silty clay loam. Reaction is neutral or mildly alkaline.

Delhi Series

The Delhi series consists of somewhat excessively drained soils on dunes. These soils are very deep. They formed in wind-modified alluvium derived from granitic rock sources. Slope ranges from 0 to 5 percent.

Soils of the Delhi series are mixed, thermic, Typic Xeropsamments.

Typical pedon of Delhi loamy sand, 0 to 2 percent slopes; 250 feet south and 55 feet east of the northwest corner of sec. 27, T. 1 S., R. 7 E., Manteca quadrangle:

Ap1—0 to 3 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose, very friable, nonsticky and nonplastic; common fine and many very fine roots; many very fine interstitial pores; neutral; clear smooth boundary.

Ap2—3 to 8 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral; clear smooth boundary.

A—8 to 16 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, very friable, nonsticky and nonplastic; few fine roots; many very fine interstitial pores; slightly acid; clear wavy boundary.

C1—16 to 26 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose, very friable, nonsticky and nonplastic; few fine and common medium roots; many very fine interstitial pores; slightly acid; gradual smooth boundary.

C2—26 to 44 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; massive; loose, very friable, nonsticky and nonplastic; few medium roots; many very fine interstitial pores; slightly acid; gradual smooth boundary.

C3—44 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; massive; loose, very friable, nonsticky and nonplastic; few fine interstitial pores; slightly acid.

The content of clay is 0 to 5 percent. Reaction is slightly acid to mildly alkaline.

The A horizon has color of 10YR 4/3, 5/2, 5/3, 5/4, or 6/2. When moist, it has color of 10YR 4/2 or 4/3. It is fine sand or loamy sand.

The C horizon has color of 10YR 5/2, 6/1, 6/2, 6/3, 6/4, 7/1, 7/2, 7/3, or 7/4. When moist, it has color of 10YR 5/1, 5/2, 5/3, 5/4, 6/1, 6/2, 6/3, or 6/4. It is fine sand, loamy sand, or sand.

Dello Series

The Dello series consists of very poorly drained soils on flood plains and old slough remnants. These soils are artificially drained. They are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Dello series are mixed, thermic Typic Psammaquents.

Typical pedon of Dello loamy sand, drained, 0 to 2 percent slopes; lat. 37 degrees 44 minutes 49 seconds N. and long. 121 degrees 15 minutes 36 seconds W., in an unsectionized area of the Vernalis quadrangle:

Ap—0 to 7 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; single grained; loose, nonsticky and nonplastic; common very fine and fine roots; neutral; clear wavy boundary.

C—7 to 32 inches; pale brown (10YR 6/3) sand, grayish brown (10YR 5/2) moist; many fine and medium distinct yellowish red (5YR 5/6) mottles, reddish brown (5YR 5/4) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; moderately alkaline; clear wavy boundary.

Cg—32 to 60 inches; light gray (2.5Y 7/2) sand, variegated light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) moist; many fine distinct strong brown (7.5YR 5/6) mottles, dark brown (7.5YR 4/4) moist; single grained; loose, nonsticky and nonplastic; moderately alkaline.

Reaction is neutral to moderately alkaline.

The A horizon has color of 10YR 4/2, 4/3, 4/4, 5/2, 5/3, 6/2, 6/3, or 6/4; 2.5Y 4/2, 5/2, or 6/2; or 5Y 5/2. When moist, it has color of 10YR 4/2, 4/3, or 4/4; 2.5Y 4/2; or 5Y 4/2. Most pedons have distinct or prominent mottles. This horizon is sand, loamy sand, or sandy loam. Some pedons have a layer of clay loam overwash.

The Cg and C horizons have color of 10YR 5/3, 6/2, 6/3, 6/4, 6/6, 7/2, 7/3, 8/2, or 8/3; 2.5Y 6/2, 7/2, or 8/2; or 5Y 6/1. When moist, they have color of 10YR 5/2, 5/4, 6/2, 6/3, 6/4, or 7/2 or 2.5Y 5/2, 6/2, or 7/2. Mottles are distinct or prominent. Lenses with stratified textures of silty clay to clay loam are below a depth of 40 inches in some pedons.

Devries Series

The Devries series consists of somewhat poorly drained soils on basin rims. These soils are artificially drained. They are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Devries series are coarse-loamy, mixed, thermic Typic Duraquolls.

Typical pedon of Devries sandy loam, drained, 0 to 2 percent slopes; lat. 38 degrees 06 minutes 38 seconds N. and long. 121 degrees 23 minutes 35 seconds W., in an unsectionized area of the Terminous quadrangle:

A1—0 to 4 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine and common very fine interstitial pores; neutral; gradual wavy boundary.

A2—4 to 13 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; few fine distinct light olive brown (2.5Y 5/4) mottles, olive brown (2.5Y 4/4) moist; moderate medium angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine and common very fine interstitial pores; mildly alkaline; gradual smooth boundary.

Bt—13 to 28 inches; light gray (10YR 7/2) sandy loam, dark grayish brown (10YR 4/2) moist; few fine distinct light yellowish brown (2.5Y 6/4) mottles, olive brown (2.5Y 4/4) moist; moderate medium angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine and very fine interstitial pores; very few thin clay films bridging sand grains and lining pores; slightly effervescent; disseminated lime; moderately alkaline; abrupt wavy boundary.

Bkqm—28 to 80 inches; light gray (10YR 7/2) duripan, dark grayish brown (2.5Y 4/2) moist; common fine faint light yellowish brown (2.5Y 6/4) mottles, olive brown (2.5Y 4/4) moist; massive; indurated continuous laminar cap 3 to 4 millimeters thick; strongly cemented in 75 percent of the matrix and weakly cemented in the remainder; cemented primarily by silica; strongly effervescent; disseminated lime and segregations of gypsum in remnant pores; moderately alkaline.

Depth to the duripan is 20 to 40 inches. Reaction is neutral to moderately alkaline. The content of gravel is 0 to 5 percent.

The A horizon has color of 10YR 4/1, 4/2, 5/1, or 5/2 or 2.5Y 4/2 or 5/2. When moist, it has color of 10YR 3/1 or 3/2 or 2.5Y 3/2. It has distinct or prominent mottles in the lower part.

The Bt horizon has color of 10YR 4/2, 5/2, 5/3, 6/3, or 7/2 or 2.5Y 4/2 or 5/2. When moist, it has color of 10YR 4/2, 4/3, 4/4, or 5/2 or 2.5Y 4/2. It has distinct or prominent mottles. It is sandy loam or fine sandy loam.

The Bkqm horizon has a strongly cemented or indurated continuous laminar cap over weakly cemented to strongly cemented material. The cementation typically decreases with increasing depth. This horizon has color of 10YR 5/4, 6/2, 6/3, 6/4, or 7/2; 2.5Y 5/2, 6/2, or 6/4; or 5Y 5/2, 5/3, 5/4, or 6/2. When moist, it has color of 10YR 4/2, 4/3, 5/2, or 5/3; 2.5Y 4/2 or 5/2; or 5Y 4/2 or 4/3. Mottles are faint to prominent.

Egbert Series

The Egbert series consists of poorly drained soils on flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Egbert series are fine, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Egbert mucky clay loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 56 minutes 49 seconds N. and long. 121 degrees 21 minutes 25 seconds W., in an unsectionized area of the Stockton West quadrangle:

Ap—0 to 8 inches; gray (10YR 5/1) mucky clay loam, very dark gray (N 3/0) moist; few fine distinct reddish brown (5YR 5/4) mottles, reddish brown (5YR 4/4) moist; weak very fine granular structure; loose, friable, sticky and plastic; many very fine roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

A1—8 to 19 inches; dark gray (10YR 4/1) clay, variegated black (N 2/0) and very dark gray (N 3/0) moist; common fine distinct reddish brown (5YR 5/4) and yellowish red (5YR 5/6) mottles, dark reddish brown (5YR 3/4) and reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; many very fine and fine and few medium roots; few very fine and common fine tubular pores; neutral; gradual smooth boundary.

A2—19 to 36 inches; variegated gray (5Y 5/1) and olive gray (5Y 4/2) clay, very dark gray (5Y 3/1) and black (5YR 2/1) moist; few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles, dark reddish brown (5YR 3/4) and yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine and few medium roots; common very fine and fine tubular pores; mildly alkaline; diffuse smooth boundary.

A3—36 to 54 inches; dark gray (5Y 4/1) clay, black (5Y 2/1) moist; common medium distinct strong brown (7.5YR 5/6 and 5/8) mottles, yellowish red (5YR 4/6 and 4/8) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine, fine, and medium roots; common very fine and fine tubular pores; slightly effervescent; disseminated lime; mildly alkaline; clear smooth boundary.

Cg—54 to 60 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; many medium distinct strong brown (7.5YR 5/6) mottles, yellowish red (5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine roots; few very fine tubular pores; slightly effervescent; disseminated lime and concretions of lime; moderately alkaline.

The 10- to 40-inch control section has 35 to 50 percent clay. The content of organic matter in this section averages 2 to 10 percent. In some pedons, however, it ranges from 10 to 50 percent in strata ¼ inch to 2 inches thick. Mottles are distinct or prominent.

The upper part of the A horizon has color of 10YR 3/1, 4/1, 4/2, 5/1, 5/2, or 5/3. When moist, it has color of N 3/0 or 2/0 or 10YR 2/1, 3/1, 3/2, or 3/3. It is mucky clay loam or silty clay loam. It is slightly acid to mildly alkaline.

The lower part of the A horizon, the upper part of the C horizon, and the Ab horizon, if it occurs, have color of N 2/0; 10YR 4/1, 4/2, 5/1, 5/2, 6/1, or 7/1; or 5Y 2/1, 4/1, 4/2, or 5/1. When moist, they have color of 10YR 2/2, 3/1, or 3/2 or 5Y 2/1 or 3/1. Texture is clay loam, silty clay loam, or clay. Reaction is slightly acid to mildly alkaline.

The Cg horizon has color of 10YR 6/1; 2.5Y 4/2, 5/2, or 6/2; 5Y 4/2, 4/3, 5/1, 5/2, 5/3, 6/1, or 7/1; 5GY 5/1 or 6/1; 5G 5/1; or 5BG 5/1. When moist, it has color of 10YR 3/1, 4/1, or 5/1; 2.5Y 4/2 or 5/2; 5Y 3/2, 4/1, 4/2, or 5/1; or 5GY 5/1 or 4/1. It is dominantly clay loam, silty clay loam, or clay. In some pedons, however, it has strata of sand, loamy fine sand, or loamy coarse sand below a depth of 40 inches. It is slightly acid to moderately alkaline.

El Solyo Series

The El Solyo series consists of well drained soils on low alluvial fans. These soils are very deep. They formed in alluvium derived from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Soils of the El Solyo series are fine, mixed, thermic Calcixerollic Xerochrepts.

Typical pedon of El Solyo clay loam, 0 to 2 percent slopes; 2,100 feet north and 1,100 feet east of the southwest corner of sec. 2, T. 3 S., R. 5 E., Tracy quadrangle:

Ap—0 to 10 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; few fine tubular pores; neutral; clear smooth boundary.

Bw—10 to 21 inches; brown (10YR 5/3) silty clay loam, variegated very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and medium roots; few very fine and fine tubular pores; strongly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

Bk1—21 to 36 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and few fine tubular pores; violently effervescent; disseminated lime and common fine filaments of lime; moderately alkaline; diffuse smooth boundary.

Bk2—36 to 48 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; common very fine and few fine tubular pores; violently effervescent; disseminated lime and common fine filaments of lime; moderately alkaline; diffuse smooth boundary.

Bk3—48 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, sticky and slightly plastic; few very fine, fine, and coarse roots; common very fine and few fine tubular pores; violently effervescent; disseminated lime and many fine filaments of lime; moderately alkaline.

The 10- to 40-inch control section has 35 to 45 percent clay.

The A horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. When moist, it has color of 10YR 3/2, 3/3, 4/2, or 4/3 or 2.5Y 3/2 or 4/2. It is neutral or mildly alkaline.

The Bw and Bk horizons have color of 10YR 5/2, 5/3, 6/2, 6/3, or 6/4. When moist, the Bw horizon has color of 10YR 3/2, 3/3, 4/2, 4/3, or 4/4 and the Bk horizon has color of 10YR 4/2, 4/3, or 4/4. Texture is silty clay loam or silty clay. Reaction is mildly alkaline or moderately alkaline.

Exeter Series

The Exeter series consists of moderately well drained soils on low terraces. These soils are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Exeter series are fine-loamy, mixed, thermic Typic Durixeralfs.

Typical pedon of Exeter sandy loam, 0 to 2 percent slopes; 1,275 feet north and 150 feet west of the southeast corner of sec. 13, T. 4 N., R. 6 E., Lodi North quadrangle:

Ap1—0 to 8 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; weak coarse angular blocky structure; very hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine tubular and interstitial pores; slightly acid; clear wavy boundary.

Ap2—8 to 13 inches; dark brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; few fine faint brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; weak coarse angular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine interstitial and tubular pores; mildly alkaline; gradual irregular boundary.

BAt—13 to 26 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; few fine faint brown (7.5YR 5/2) mottles, dark brown (7.5YR 4/2) moist; weak coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine roots; few thin clay films bridging mineral grains; many very fine interstitial and tubular pores; mildly alkaline; clear wavy boundary.

Bt1—26 to 29 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; few fine faint brown (7.5YR 5/2) mottles, dark brown (7.5YR 4/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and fine interstitial and tubular pores; common thin clay films lining pores and bridging mineral grains; neutral; clear wavy boundary.

Bt2—29 to 33 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; few fine faint brown (7.5YR 5/2) mottles, dark brown (7.5YR 4/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular and common very fine interstitial pores; common thin clay films lining pores and bridging mineral grains; neutral; abrupt wavy boundary.

Bqm—33 to 60 inches; brown (7.5YR 5/4), indurated duripan, dark brown (7.5YR 4/4) moist; few fine dark gray (10YR 4/1) stains on thin laminar cap; extremely hard and very strongly cemented; 75 to 90 percent silica cemented within the matrix.

Depth to the duripan is 20 to 40 inches. The content of gravel is 0 to 10 percent.

The A horizon has color of 7.5YR 4/2, 5/2, or 5/4 or 10YR 5/2 or 5/3. When moist, it has color of 7.5YR 3/2, 3/4, or 4/4 or 10YR 3/3, 4/2, or 4/3. Reaction is slightly acid or neutral.

The Bt horizon has color of 7.5YR 4/4, 5/2, or 5/4. When moist, it has color of 7.5YR 4/2 or 4/4. It is loam or sandy clay loam. Reaction is neutral or mildly alkaline.

The Bqm horizon has color of 7.5YR 5/2 or 5/4. When moist, it has color of 7.5YR 4/2 or 4/4.

The Exeter soils in this survey area are outside the range of the series because they have darker colors, a slightly acid A horizon, and a duripan that extends to a depth of 60 inches. These differences, however, do not significantly affect the use or management of the soils.

Finrod Series

The Finrod series consists of moderately well drained soils on low fan terraces and alluvial fans. These soils are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Finrod series are fine, mixed, thermic Pachic Haploxerolls.

Typical pedon of Finrod clay loam, 0 to 2 percent slopes; 1,240 feet south and 1,880 feet east of the northwest corner of sec. 18, T. 2 N., R. 8 E., Waterloo quadrangle:

Ap—0 to 8 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; few very fine interstitial and tubular

pores; neutral; gradual smooth boundary.

A—8 to 21 inches; dark brown (10YR 4/3) clay, variegated very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular pores; few pressure faces; mildly alkaline; gradual smooth boundary.

Bw1—21 to 33 inches; yellowish brown (10YR 5/4) clay, variegated dark brown (10YR 3/3) and brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few medium, fine, and very fine roots; common very fine tubular pores; few pressure faces; mildly alkaline; gradual wavy boundary.

Bw2—33 to 40 inches; brown (7.5YR 5/4) clay, variegated dark brown (10YR 4/3) and brown (7.5YR 4/4) moist; few very fine dark gray (10YR 3/1) manganese stains; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; many pressure faces; mildly alkaline; gradual smooth boundary.

Bw3—40 to 48 inches; variegated light yellowish brown (10YR 6/4) and strong brown (7.5YR 4/6) clay, brown (7.5YR 4/4) and dark brown (7.5YR 3/4) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; many pressure faces; moderately alkaline; abrupt wavy boundary.

Bkqm—48 to 60 inches; variegated very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4), strongly cemented duripan, light yellowish brown (10YR 6/4) and brown (10YR 5/3) moist; massive; brittle; indurated continuous laminar cap 1 to 3 millimeters thick; strongly cemented in 50 percent of the matrix; slightly effervescent; segregated seams and filaments of lime; moderately alkaline.

Depth to the duripan is 40 to 60 inches. The 10- to 40-inch control section has 35 to 45 percent clay.

The A horizon has color of 10YR 5/1, 5/2, 5/3, 4/2, or 4/3 or 7.5YR 5/2. When moist, it has color of 10YR 3/1, 3/2, or 3/3 or 7.5YR 3/2.

The Bw horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4 or 7.5YR 5/4 or 6/4. When moist, it has color of 10YR 3/2, 3/3, 3/4, 4/2, 4/3, or 4/4 or 7.5YR 3/4 or 4/4. It is clay loam, silty clay loam, or clay. It is neutral to moderately alkaline.

The Bkqm has color of 10YR 5/4, 6/4, or 7/4 or 7.5YR 5/4 or 6/6. When moist, it has color of 10YR 4/4, 5/3, 5/4, or 6/4 or 7.5YR 4/4.

Fluvaquents

Fluvaquents consist of poorly and very poorly drained soils on low flood plains and interchannel bars and in tidal marshes on deltas. These soils are very deep. They formed in mineral sediments and hydrophytic plant remains derived from mixed rock sources and reeds and tules. Slope ranges from 0 to 2 percent.

Reference pedon of Fluvaquents, 0 to 2 percent slopes, frequently flooded; lat. 38 degrees 00 minutes 06 seconds N. and long. 121 degrees 31 minutes 20 seconds W., in an unsectionized area of the Bouldin Island quadrangle:

A—0 to 14 inches; gray (5Y 5/1) silty clay loam, black (5Y 2/1) moist; many fine faint olive (5Y 4/3) mottles, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, sticky and very plastic; many very fine and fine roots; few very fine and fine tubular pores; moderately acid; abrupt smooth boundary.

Cg1—14 to 20 inches; gray (5Y 5/1) silty clay loam, dark greenish gray (5BG 4/1) moist; many fine distinct olive (5Y 5/3) mottles, olive (5Y 4/3) moist; massive; hard, firm, very sticky and very plastic; common very fine and few fine roots; few very fine tubular pores; neutral; abrupt smooth boundary.

Cg2—20 to 26 inches; variegated gray (5Y 5/1) and olive (5Y 5/3) silt loam, dark greenish gray (5BG 4/1) and dark olive gray (5Y 3/2) moist; massive; hard, firm, very sticky and very plastic; few very fine and fine roots; few very fine pores; neutral; abrupt smooth boundary.

Cg3—26 to 36 inches; variegated gray (5Y 5/1) and olive (5Y 5/3) silty clay loam, dark greenish gray (5BG 4/1) and dark olive gray (5Y 3/2) moist; massive; hard, friable, sticky and very plastic; few very fine roots; neutral; abrupt smooth boundary.

Cg4—36 to 44 inches; variegated gray (5Y 5/1) and olive (5Y 5/3) silty clay loam, dark greenish gray (5BG 4/1) and dark olive gray (5Y 3/2) moist; massive; hard, firm, very sticky and very plastic; slightly acid; abrupt smooth boundary.

Cg5—44 to 60 inches; variegated dark gray (5Y 4/1) and olive (5Y 5/3) fine sandy loam, dark greenish gray (5BG 4/1) and dark olive gray (5Y 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; moderately acid.

Texture and color are highly varied. The content of organic matter in individual strata ranges from 1 to more than 25 percent. By weighted average, the content of clay in the 10- to 40-inch control section

ranges from 5 to 45 percent. Some pedons have a buried organic soil.

In some areas dredging material has been deposited. The soils in these areas are sand, loamy sand, or fine sand throughout. Where the soils are remnants of cuts that provided levee material, the remaining interchannel island resembles soils in the adjacent tracts protected by levees.

Franciscan Series

The Franciscan series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Soils of the Franciscan series are fine-loamy, mixed, thermic Typic Argixerolls.

Typical pedon of Franciscan loam, in an area of Gonzaga-Franciscan complex, 30 to 50 percent slopes; 300 feet south and 1,100 feet west of the northeast corner of sec. 2, T. 5 S., R. 4 E., Lone Tree Creek quadrangle:

A1—0 to 2 inches; grayish brown (10YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 10 percent gravel; slightly acid; abrupt smooth boundary.

A2—2 to 13 inches; brown (10YR 5/3) loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; 10 percent gravel; slightly acid; clear smooth boundary.

Bt1—13 to 24 inches; yellowish brown (10YR 5/4) clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; many thin clay films lining tubular pores and bridging sand grains; 10 percent gravel; slightly acid; clear smooth boundary.

Bt2—24 to 36 inches; brown (7.5YR 5/4) clay loam, strong brown (7.5YR 4/6) moist; weak coarse angular blocky structure; hard, firm, very sticky and plastic; common fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; many moderately thick clay films lining tubular pores and bridging sand grains; 15 percent gravel; slightly acid; abrupt irregular boundary.

R—36 inches; slightly weathered sandstone.

The depth to hard sandstone is 20 to 40 inches. Reaction is slightly acid or neutral.

The A horizon has color of 7.5YR 5/2 or 10YR 5/2, 5/3, or 5/4. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3. The content of gravel is 0 to 10 percent.

The Bt horizon has color of 7.5YR 5/4, 6/2, or 6/4 or 10YR 5/3, 5/4, or 6/2. When moist, it has color of 10YR 3/4 or 4/4 or 7.5YR 3/2, 4/4, or 4/6. The content of gravel is 5 to 15 percent.

Galt Series

The Galt series consists of moderately well drained soils on basin rims and in basins. These soils are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Soils of the Galt series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Galt clay, 0 to 2 percent slopes; 990 feet north and 1,650 feet west of the southeast corner of sec. 3, T. 1 N., R. 8 E., Peters quadrangle:

A1—0 to 2 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; many very fine roots; few very fine interstitial pores; neutral; abrupt wavy boundary.

A2—2 to 8 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/4) moist; strong very coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; many very fine roots; common very fine interstitial pores; neutral; abrupt wavy boundary.

A3—8 to 25 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; common medium tubular and few very fine interstitial pores; common intersecting slickensides and sphenoids; mildly alkaline; abrupt irregular boundary.

Bk—25 to 34 inches; mixed dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) and brown (10YR 4/3) moist; strong very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; few fine roots; common very fine interstitial pores; many intersecting slickensides and sphenoids; slightly effervescent; disseminated lime and common fine soft masses of lime;

moderately alkaline; abrupt smooth boundary.

Bkqm—34 to 60 inches; variegated light yellowish brown (10YR 6/4), dark grayish brown (10YR 4/2), and white (10YR 8/1), strongly cemented duripan that has a thin, strongly cemented opal laminar cap; variegated brown (10YR 4/3 and 3/3) and very pale brown (10YR 7/4) moist; strong thick platy structure; brittle; common very fine interstitial and tubular pores; strongly cemented opal coatings lining pores and interstices; slightly effervescent; soft masses and seams of lime; moderately alkaline.

Depth to the duripan is 20 to 40 inches.

The A horizon has color of 10YR 4/2, 5/2, or 5/3. When moist, it has color of 10YR 2/2, 3/2, or 3/3.

The Bk horizon has color of 10YR 4/2, 5/2, 5/3, 6/2, or 7/2. When moist, it has color of 10YR 3/2, 3/3, 4/2, or 4/3. It is silty clay or clay. Reaction is neutral to moderately alkaline.

The Bkq horizon has color or 10YR 4/2, 6/4, 7/3, 7/4, 8/1, or 8/2. It is massive or platy. It is weakly cemented to strongly cemented and has strongly cemented or indurated laminar bands.

Gonzaga Series

The Gonzaga series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from shale. Slope ranges from 30 to 75 percent.

Soils of the Gonzaga series are fine, mixed, thermic Typic Palexerolls.

Typical pedon of Gonzaga loam, in an area of Gonzaga-Franciscan complex, 30 to 50 percent slopes; 1,200 feet north and 2,200 feet west of the southeast corner of sec. 36, T. 4 S., R. 4 E., Lone Tree Creek quadrangle:

A1—0 to 5 inches; brown (10YR 5/3) loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium and many very fine roots; many very fine and common fine and medium tubular pores; 5 percent gravel; neutral; gradual wavy boundary.

A2—5 to 10 inches; brown (10YR 5/3) clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium and many very fine roots; common fine and medium and many very fine tubular pores; 5 percent gravel; neutral; abrupt wavy boundary.

Bt—10 to 29 inches; yellowish red (5YR 4/6) clay, dark red (2.5YR 3/6) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; few fine, medium, and coarse roots; common fine and many very fine tubular pores; few moderately thick clay films on faces of peds, lining tubular pores, and bridging sand grains; thin stoneline at the upper boundary; 10 percent gravel; neutral; abrupt wavy boundary.

R—29 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2), slightly weathered, fractured hard shale.

The depth to hard shale ranges from 20 to 40 inches. The content of gravel is 0 to 15 percent in the solum. The mollic epipedon is 10 to 20 inches thick.

The A horizon has color of 10YR 5/2 or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3.

The Bt horizon has color of 5YR 4/6, 5/4, or 5/6 or 7.5YR 4/6, 5/4, or 5/6. When moist, it has color of 2.5YR 3/6; 5YR 4/2, 4/4, or 5/4; or 7.5YR 4/4, 4/6, 5/4, or 5/6. It is clay loam or clay. The content of clay is 35 to 55 percent. Reaction is neutral or mildly alkaline.

Grangeville Series

The Grangeville series consists of somewhat poorly drained soils on flood plains. These soils are very deep. They are artificially drained. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Grangeville series are coarse-loamy, mixed, thermic Fluvaquentic Haploxerolls.

Typical pedon of Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 49 minutes 05 seconds N. and long. 121 degrees 23 minutes 38 seconds W., in an unsectionized area of the Union Island quadrangle:

Ap—0 to 12 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and nonplastic; many fine, common medium, and few coarse roots; many fine interstitial pores; neutral; clear smooth boundary.

A—12 to 20 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and nonplastic; many fine and medium and few coarse roots; common very fine interstitial pores; neutral; clear wavy boundary.

2C—20 to 31 inches; white (10YR 8/1) loamy fine sand, light gray (10YR 7/1) moist; common medium prominent brown (7.5YR 5/4) and reddish yellow (7.5YR 6/6) mottles, brown (7.5YR 4/4) and strong brown (7.5YR 5/6) moist; massive; soft, very friable,

nonsticky and nonplastic; many very fine and few fine roots; few very fine tubular pores; neutral; clear wavy boundary.

3C—31 to 43 inches; gray (5Y 5/1) silt loam, dark gray (5Y 4/1) moist; many coarse prominent brown (7.5YR 5/4) mottles, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; mildly alkaline; gradual wavy boundary.

4C—43 to 60 inches; gray (5Y 5/1) fine sandy loam, dark gray (5Y 4/1) moist; many coarse prominent dark brown (7.5YR 4/2) and brown (7.5YR 5/4) mottles, dark brown (7.5YR 3/2 and 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; common very fine tubular pores; moderately alkaline.

The content of gravel is 0 to 5 percent.

The A horizon has color of 2.5Y 5/2 or 4/2 or 10YR 5/3, 5/2, 5/1, or 4/2. When moist, it has color of 2.5Y 3/2 or 3/3 or 10YR 3/3, 3/2, 3/1, or 2/2. It is fine sandy loam or clay loam. It is neutral or mildly alkaline.

The C horizon has color of 5Y 5/1 or 10YR 5/3 or 8/1. When moist, it has color of 5Y 4/1 or 10YR 4/3 or 7/1. It is stratified loamy sand, loamy fine sand, loam, fine sandy loam, sandy loam, or silt loam. Mottles are distinct or prominent. Reaction is neutral to strongly alkaline.

Guard Series

The Guard series consists of poorly drained soils on basin rims. In some areas these soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Guard series are fine-loamy, mixed (calcareous), thermic Duric Haplaquolls.

Typical pedon of Guard clay loam, drained, 0 to 2 percent slopes; lat. 38 degrees 07 minutes 09 seconds N. and long. 121 degrees 25 minutes 14 seconds W., in an unsectionized area of the Terminous quadrangle:

Ap—0 to 5 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; many very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline; gradual wavy boundary.

A—5 to 15 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common fine distinct pale olive (5Y 6/3) mottles, olive (5Y 5/3) moist; moderate coarse angular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; common very fine tubular and interstitial pores; slightly effervescent; disseminated lime; moderately alkaline; abrupt wavy boundary.

Bkq1—15 to 27 inches; variegated light gray (5Y 7/2) and light olive gray (5Y 6/2) clay loam, gray (5Y 5/1) moist; common fine distinct and prominent yellow (10YR 7/8) and strong brown (7.5YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; massive; hard, brittle, sticky and plastic; few very fine and fine roots; few very fine and fine interstitial and tubular pores; many durinodes; strongly effervescent; disseminated lime and common concretions of lime; moderately alkaline; abrupt smooth boundary.

Bkq2—27 to 72 inches; light gray (5Y 7/2) clay loam, dark gray (5Y 4/1) moist; common fine distinct and prominent strong brown (7.5YR 5/6) and brownish yellow (10YR 6/6) mottles, olive (5Y 4/3) and dark brown (10YR 3/3) moist; massive; hard, weakly cemented, sticky and plastic; few fine and very fine roots; few very fine and fine interstitial pores; many durinodes; strongly effervescent; disseminated lime and concretions of lime; moderately alkaline.

The 10- to 40-inch control section has 20 to 35 percent clay.

The A horizon has color of N 4/0 or 5/0 or 10YR 4/1, 4/2, 5/1, or 5/2. When moist, it has color of N 2/0 or 3/0 or 10YR 2/1, 3/1, or 3/2. It has distinct or prominent mottles in the lower part. The content of gravel is 0 to 5 percent.

The Bkq horizon has color of N 6/0 or 7/0; 10YR 5/1, 5/2, 5/3, 5/4, 6/1, 6/2, 6/3, 6/4, or 7/1; or 5Y 4/1, 6/2, or 7/2. When moist, it has color of N 4/0 or 5/0; 10YR 4/2, 5/1, 5/2, or 6/1; or 5Y 4/1 or 5/1. Mottles are distinct or prominent. Weakly cemented, brittle layers with 30 to 40 percent durinodes by volume are at a depth of 15 to 23 inches. This horizon is clay loam or sandy clay loam.

Hicksville Series

The Hicksville series consists of moderately well drained soils on low stream terraces. These soils are deep and very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Soils of the Hicksville series are fine-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Hicksville gravelly loam, 0 to 2

percent slopes, occasionally flooded; 2,050 feet south and 1,620 feet west of the northeast corner of sec. 28, T. 8 N., R. 5 E., Goose Creek quadrangle:

A—0 to 4 inches; dark brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; 15 percent gravel; slightly acid; clear smooth boundary.

AB—4 to 13 inches; dark brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine tubular and common very fine tubular and interstitial pores; common thin clay films bridging mineral grains; 15 percent gravel; slightly acid; clear smooth boundary.

Bt1—13 to 20 inches; dark brown (10YR 4/3) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; many very fine and common fine tubular pores; common thin clay films lining pores and bridging mineral grains; 15 percent gravel; neutral; clear smooth boundary.

Bt2—20 to 28 inches; dark brown (10YR 4/3) and brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (10YR 3/3) and brown (7.5YR 4/4) moist; massive; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular and few very fine interstitial pores; many moderately thick clay films bridging mineral grains and common moderately thick clay films lining pores; 25 percent gravel and 5 percent cobbles; neutral; gradual wavy boundary.

Bt3—28 to 36 inches; brown (10YR 5/3) gravelly sandy clay loam, dark brown (10YR 4/3) moist; common medium faint yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; massive; very hard, firm, sticky and plastic; common very fine interstitial pores; many thin and few moderately thick clay films bridging mineral grains; 25 percent gravel and 5 percent cobbles; mildly alkaline; clear wavy boundary.

2Bt4—36 to 49 inches; light yellowish brown (10YR 6/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; few fine distinct strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; massive; hard, firm, slightly sticky and slightly plastic; common very fine interstitial pores; many thin and few moderately thick clay films bridging mineral grains; few fine very dark gray (10YR 3/1) iron and manganese stains; 35 percent gravel and 5 percent cobbles; mildly alkaline; clear wavy boundary.

2Bt5—49 to 56 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; massive; hard, firm, sticky and plastic; common very fine interstitial pores; common moderately thick clay films bridging mineral grains; 35 percent gravel and 5 percent cobbles; mildly alkaline; clear wavy boundary.

2Bt6—56 to 60 inches; brown (7.5YR 5/4) very gravelly sandy loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine interstitial pores; many thin clay films bridging mineral grains; 35 percent gravel and 5 percent cobbles; mildly alkaline.

Some pedons have soft sandstone at a depth of 40 to 60 inches.

The A horizon has color of 10YR 4/3, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3. It is loam or gravelly loam. The content of gravel is 0 to 35 percent. Reaction is moderately acid or slightly acid.

Some pedons have an AB horizon. In this horizon color and reaction are similar to those in the A horizon. The content of clay is 1 to 4 percent higher than that in the A horizon.

The Bt horizon has color of 7.5YR 4/4 or 5/4 or 10YR 4/3, 5/2, or 5/3. When moist, it has color of 7.5YR 3/4 or 4/4 or 10YR 3/2, 3/3, or 4/3. It is sandy clay loam, clay loam, gravelly clay loam, or gravelly sandy clay loam. The content of gravel is 5 to 35 percent. Reaction is slightly acid to mildly alkaline.

The 2Bt horizon is 7.5YR 5/4 or 10YR 6/3 or 6/4. When moist, it has color of 7.5YR 4/4 or 10YR 5/3 or 5/2. It is stratified very gravelly sandy loam, very gravelly sandy clay loam, sandy clay loam, sandy loam, gravelly loamy sand, or gravelly clay loam. The content of gravel is 5 to 50 percent, and the content of cobbles is 0 to 5 percent. Reaction is neutral or mildly alkaline.

Hollenbeck Series

The Hollenbeck series consists of moderately well drained soils on basin rims and in interfan basins. These soils are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 3 percent.

Soils of the Hollenbeck series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Hollenbeck silty clay, 0 to 2 percent slopes; 1,280 feet north and 40 feet east of the southwest corner of sec. 16, T. 1 N., R. 8 E., Peters quadrangle:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silty

clay, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; neutral; abrupt smooth boundary.

Bw1—10 to 27 inches; brown (10YR 4/3) clay, very dark grayish brown (10YR 3/2) moist; moderate very coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; many intersecting slickensides and wedge-shaped aggregates; neutral; gradual wavy boundary.

Bw2—27 to 37 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few very fine tubular pores; many intersecting slickensides and wedge-shaped aggregates; few fine manganese concretions; mildly alkaline; clear wavy boundary.

Bk—37 to 42 inches; grayish brown (10YR 5/2) silty clay loam, brown (10YR 4/3) moist; moderate coarse angular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; strongly effervescent; common fine rounded soft masses of lime; moderately alkaline; abrupt smooth boundary.

Bkqm—42 to 60 inches; light yellowish brown (10YR 6/4), strongly cemented duripan, brown (10YR 4/3) moist; massive; brittle; continuous indurated laminar cap 1 to 2 millimeters thick; strongly effervescent; many fine soft masses of lime.

Depth to the duripan is 40 to 60 inches. The combined thickness of the A, Bw, and Bk horizons is 40 to 60 inches.

The A horizon has color of 10YR 5/2, 4/2, 4/3, or 3/2 or 7.5Y 5/2 or 4/2. When moist, it has color of 10YR 3/2 or 3/3 or 7.5YR 3/2. It is clay, silty clay, or silty clay loam. Reaction is neutral to moderately alkaline.

The Bk horizon has color of 10YR 4/2, 4/3, 4/4, 5/2, or 5/3 or 7.5Y 4/4. When moist, it has color of 10YR 3/2, 3/3, or 4/3 or 7.5YR 3/4. It is silty clay loam or clay loam. Reaction is neutral to moderately alkaline. Lime occurs as concretions or soft masses.

The Bkqm horizon has color of 10YR 4/3, 4/4, 5/3, 5/4, or 6/4. When moist, it has color of 10YR 4/2, 4/3, or 5/2.

Honcut Series

The Honcut series consists of well drained soils on alluvial fans. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Honcut series are coarse-loamy, mixed, nonacid, thermic Typic Xerorthents.

Typical pedon of Honcut sandy loam, 0 to 2 percent slopes; 500 feet south and 250 feet east of the northwest corner of sec. 10, T. 2 S., R. 8 E., Avena quadrangle:

Ap—0 to 6 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine roots; slightly acid; abrupt smooth boundary.

A—6 to 21 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable, nonsticky and nonplastic; few very fine and medium roots; common very fine tubular pores; neutral; clear smooth boundary.

C1—21 to 56 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine and common coarse roots; common very fine tubular pores; neutral; clear smooth boundary.

C2—56 to 60 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, nonsticky and nonplastic; few coarse roots; common very fine tubular pores; neutral.

The content of gravel is 0 to 15 percent.

The A horizon has color of 10YR 5/2, 5/3, or 5/4. When moist, it has color of 10YR 3/3, 4/2, or 4/3. Reaction is slightly acid or neutral.

The C horizon has color of 10YR 5/2, 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 10YR 4/2, 4/3, or 4/4. It is sandy loam or coarse sandy loam. Reaction is slightly acid to mildly alkaline.

Honker Series

The Honker series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Soils of the Honker series are fine, mixed, thermic Mollic Palexeralfs.

Typical pedon of Honker loam, in an area of Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes; 1,425 feet north and 2,175 feet west of the southeast corner of sec. 36, T. 4 S., R. 4 E., Lone Tree Creek quadrangle:

A—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine

interstitial pores; 5 percent gravel; neutral; abrupt wavy boundary.

Bt1—5 to 11 inches; brown (7.5YR 5/4) gravelly clay, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and common fine roots; many very fine and common fine tubular pores; common thin clay films on faces of peds and lining tubular pores; 25 percent gravel; mildly alkaline; clear wavy boundary.

Bt2—11 to 23 inches; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) gravelly clay, reddish brown (5YR 4/4) and yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, sticky and very plastic; many very fine and few fine, medium, and coarse roots; common fine tubular pores; common moderately thick clay films on faces of peds and lining tubular pores; 25 percent gravel; neutral; gradual wavy boundary.

Bt3—23 to 33 inches; brown (7.5YR 5/4) gravelly clay, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, very sticky and very plastic; few very fine and fine roots; many very fine and common fine tubular pores; common moderately thick clay films on faces of peds and lining tubular pores; 30 percent gravel; neutral; abrupt wavy boundary.

R—33 inches; grayish brown (2.5Y 5/2), slightly weathered hard sandstone.

The depth to hard sandstone is 20 to 40 inches.

The A horizon has color of 7.5YR 5/4, 6/2, or 6/4 or 10YR 5/3 or 6/2. When moist, it has color of 7.5YR 3/2 or 3/4 or 10YR 3/2 or 3/3. It is loam or gravelly loam. The content of gravel is 0 to 15 percent. Reaction is slightly acid or neutral.

The Bt horizon has color of 2.5YR 5/4, 5/6, 6/4, or 6/6; 5YR 5/3, 6/3, or 6/4; or 7.5YR 5/4, 5/6, 6/4, or 6/6. When moist, it has color of 5YR 4/4 or 4/6 or 7.5YR 4/4 or 5/6. It is gravelly clay loam or gravelly clay. The content of clay is 35 to 55 percent. The content of gravel is 15 to 30 percent. Reaction is neutral or mildly alkaline.

Itano Series

The Itano series consists of poorly drained soils on flood plains and deltas. These soils are artificially drained. They are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Itano series are fine-silty, mixed, acid, thermic Typic Fluvaquents.

Typical pedon of Itano silty clay loam, partially drained, 0 to 2 percent slopes; lat. 38 degrees 03 minutes 13 seconds N. and long. 121 degrees 32 minutes 45 seconds W., in an unsectionized area of the Bouldin Island quadrangle:

Ap—0 to 15 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, sticky and slightly plastic; many very fine and fine roots; common very fine tubular pores; very strongly acid; clear smooth boundary.

2Ab—15 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark gray (5Y 3/1) moist; many medium prominent reddish brown (5YR 5/4) mottles, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; very strongly acid; gradual smooth boundary.

2Cg1—34 to 44 inches; grayish brown (2.5Y 5/2), stratified silty clay loam, dark olive gray (5Y 3/2) moist; common medium prominent reddish brown (5YR 5/4) mottles, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; very strongly acid; gradual smooth boundary.

2Cg2—44 to 60 inches; grayish brown (2.5Y 5/2), stratified silty clay loam, dark olive gray (5Y 3/2) moist; common medium prominent reddish brown (5YR 5/4) mottles, yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; very strongly acid.

The 10- to 40-inch control section has 20 to 30 percent clay.

The A horizon has color of 10YR 5/1, 5/2, or 6/2 or 2.5Y 5/2 or 6/2. When moist, it has color of 10YR 3/1 or 4/2 or 2.5Y 3/1 or 4/1. Reaction is extremely acid or very strongly acid.

The 2Ab horizon has color of 2.5Y 4/2 or 5/2 or 5Y 5/1 or 6/2. When moist, it has color of 2.5Y 3/1 or 5Y 3/1 or 5/1. It is silt loam or silty clay loam. This horizon is very strongly acid or strongly acid.

The 2Cg horizon has color of 2.5Y 4/2 or 5/2 or 5Y 3/2, 4/2, or 5/2. When moist, it has color of 2.5Y 3/2 or 5Y 3/2. It is stratified very fine sandy loam to silty clay loam. This horizon is extremely acid or very strongly acid.

Jacktone Series

The Jacktone series consists of somewhat poorly drained soils in basins. These soils are artificially drained. They are moderately deep to a hardpan. They

formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Jacktone series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Jacktone clay, 0 to 2 percent slopes; 2,500 feet south and 1,350 feet west of the northeast corner of sec. 10, T. 1 S., R. 7 E., Manteca quadrangle:

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; dominantly moderate coarse prismatic structure but moderate medium subangular blocky structure in the upper 1 inch; very hard, firm, very sticky and very plastic; common very fine roots; common very fine interstitial and tubular pores; few fine black (10YR 2/1) manganese concretions; neutral; clear wavy boundary.

A1—7 to 15 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, very sticky and very plastic; few very fine roots; many very fine interstitial and common very fine tubular pores; few fine black (10YR 2/1) manganese concretions; common intersecting slickensides; slightly effervescent; disseminated lime; neutral; gradual wavy boundary.

A2—15 to 22 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular and interstitial pores; few fine black (10YR 2/1) manganese concretions; common intersecting slickensides; strongly effervescent; disseminated lime and few fine, medium, and coarse soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk1—22 to 28 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common fine yellowish brown (10YR 5/4) mottles, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular and interstitial pores; few fine black (10YR 2/1) manganese concretions; common intersecting slickensides; strongly effervescent; few fine, medium, and coarse soft masses of lime; strongly alkaline; clear irregular boundary.

Bk2—28 to 34 inches; light gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; massive; very hard, firm, very sticky and plastic; common very fine tubular and interstitial pores; few fine black (10YR 2/1) manganese concretions; violently effervescent; disseminated lime and coarse soft masses of lime; strongly alkaline; abrupt wavy boundary.

2Bkqm—34 to 37 inches; light gray (10YR 6/1), strongly cemented or indurated duripan, gray (10YR 5/1) moist; few fine yellowish brown (10YR 5/6) mottles; massive; brittle; common very fine tubular and interstitial pores; few fine black (10YR 2/1) manganese concretions; indurated continuous laminar cap 1 to 5 millimeters thick; 75 percent silica cemented within the matrix; violently effervescent; disseminated lime and coarse soft masses of lime; moderately alkaline; abrupt wavy boundary.

2Bk—37 to 46 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, nonsticky and slightly plastic; many very fine tubular and interstitial pores; few fine black (10YR 2/1) manganese concretions; 15 percent weakly cemented durinodes; strongly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

3Bkq—46 to 60 inches; yellowish brown (10YR 5/4), weakly cemented duripan, dark yellowish brown (10YR 4/4) moist; massive; brittle; few fine black (N 2/0) manganese concretions; 40 to 70 percent silica cemented within the matrix; strongly effervescent; disseminated lime; strongly alkaline.

Depth to the duripan is 20 to 40 inches.

The A horizon has color of N 3/0 or 10YR 3/1, 4/1, or 5/1 mixed in some pedons with 10YR 3/2, 4/2, or 4/3. When moist, it has color of N 2/0 or 3/0 or 10YR 3/1 or 2/1 mixed in some pedons with 10YR 3/2 or 3/3. Reaction is neutral to moderately alkaline within a depth of 15 inches and moderately alkaline or strongly alkaline below a depth of 15 inches.

The Bk and 2Bk horizons have color of 10YR 5/4, 6/1, 6/2, 6/3, 6/4, or 7/2. When moist, they have color of 10YR 4/2, 4/3, 4/4, or 5/1 or 2.5Y 5/2. They are moderately alkaline or strongly alkaline. The Bk horizon is clay loam, silty clay, or clay. The 2Bk horizon is loam, sandy clay loam, or clay loam and has 0 to 15 percent weakly cemented durinodes.

The 2Bkqm horizon has color of 10YR 4/2, 4/3, 4/4, 5/2, 5/4, 5/6, or 6/1 or 7.5Y 5/6 or 6/4. When moist, it has color of 7.5YR 4/4 or 10YR 4/2, 4/3, 4/4, 5/1, 5/2, or 5/4. It is strongly cemented or has thin laminar bands that are indurated below the upper boundary. Carbonates are disseminated or segregated in soft masses.

The 3Bkq horizon has the same colors as the 2Bkqm horizon. It is weakly cemented to strongly cemented

with silica and carbonates in 30 to 70 percent of the matrix. Carbonates are either disseminated or segregated.

Jahant Series

The Jahant series consists of moderately well drained soils on low terraces. These soils are deep to a hardpan. They formed in alluvium derived from mixed but predominantly granitic rock sources. Slope ranges from 0 to 8 percent.

Soils of the Jahant series are fine-loamy, mixed, thermic Mollic Palexeralfs.

Typical pedon of Jahant loam, 0 to 2 percent slopes; 50 feet south and 2,550 feet east of the northwest corner of sec. 22, T. 4 N., R. 6 E., Lodi North quadrangle:

Ap1—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; slightly acid; gradual wavy boundary.

Ap2—5 to 14 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular and interstitial pores; slightly acid; clear wavy boundary.

Bt1—14 to 22 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular and interstitial pores; few thin clay films bridging mineral grains and on faces of peds; slightly acid; gradual wavy boundary.

Bt2—22 to 31 inches; dark brown (7.5YR 4/4) loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular and interstitial pores; common thin clay films bridging mineral grains, lining pores, and on faces of peds; slightly acid; abrupt wavy boundary.

Bt3—31 to 36 inches; variegated brown (7.5YR 5/4) and dark brown (7.5YR 4/4) clay loam, dark brown (7.5YR 4/4) moist; moderate coarse angular blocky structure; extremely hard, firm, sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; many moderately thick clay films lining pores and on faces of peds; neutral; abrupt wavy boundary.

Bt4—36 to 49 inches; variegated brown (7.5YR 5/4) and dark brown (7.5YR 4/4) clay, dark brown (7.5YR 4/4) moist; moderate coarse angular blocky structure; extremely hard, firm, sticky and plastic; many very fine and few fine tubular pores; many moderately thick clay films lining pores and on faces of peds; slightly acid; abrupt wavy boundary.

Bq—49 to 53 inches; variegated brown (7.5YR 5/4) and dark brown (7.5YR 4/4) duripan, dark brown (7.5YR 4/4) moist; extremely hard, brittle; few roots matted on top of the duripan and in fractures; opal coatings on fracture faces; estimated 40 to 60 percent silica cemented within the matrix; neutral; abrupt wavy boundary.

Bqm—53 to 60 inches; variegated light brown (7.5YR 6/4) and brown (7.5YR 5/4), indurated duripan, dark brown (7.5YR 3/4 4/4) moist; extremely hard; estimated 70 to 85 percent silica cemented within the matrix.

Depth to the duripan is 40 to 60 inches. The content of gravel is 0 to 10 percent.

The A horizon has color of 7.5YR 5/2 or 10YR 5/2, 5/3, or 6/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3.

The upper part of the Bt horizon has color of 7.5YR 4/4, 5/4, or 6/4 or 10YR 6/3 or 6/4. When moist, it has color of 7.5YR 4/4 or 10YR 3/3, 4/3, or 4/4. It is loam or clay loam and has 20 to 30 percent clay. The lower part has color of 7.5YR 4/4, 4/6, 5/4, 5/6, or 6/4 or 10YR 5/2, 5/4, 5/6, or 6/4. When moist, it has color of 7.5YR 3/4, 4/2, 4/4, or 4/6 or 10YR 4/4 or 4/6. It is clay loam or clay and has 35 to 60 percent clay. The Bq and Bqm horizons have the same colors as the Bt horizon.

Kaseberg Series

The Kaseberg series consists of well drained or somewhat excessively drained soils on hills. These soils are shallow to a hardpan. They formed in material weathered from weakly consolidated or moderately consolidated sandstone or siltstone. Slope ranges from 2 to 30 percent.

Soils of the Kaseberg series are loamy, mixed, thermic, shallow Typic Durochrepts.

Typical pedon of Kaseberg fine sandy loam, 2 to 15 percent slopes; 710 feet north and 100 feet east of the southwest corner of sec. 25, T. 5 N., R. 8 E., Goose Creek quadrangle:

A1—0 to 3 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 3/3) moist; common fine distinct strong brown (7.5YR 5/6) root stains, strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine roots;

common very fine tubular and few very fine interstitial pores; moderately acid; clear smooth boundary.

A2—3 to 10 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many medium tubular and common very fine interstitial and tubular pores; slightly acid; gradual wavy boundary.

Bw—10 to 17 inches; pinkish gray (7.5YR 6/2) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and tubular and many medium tubular pores; common thin clay films bridging mineral grains and lining pores; 5 percent gravel; slightly acid; abrupt wavy boundary.

Bqm—17 to 20 inches; very pale brown (10YR 7/4), continuously indurated duripan, yellowish brown (10YR 5/6) moist; stratified with light yellowish brown (10YR 6/4) and light gray (10YR 7/2), discontinuous, silica-cemented sandy loam, dark yellowish brown (10YR 4/4) and grayish brown (2.5Y 5/2) moist; laminar silica bands less than ⅜ inch thick; few fine distinct yellowish brown (10YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; few fine distinct very dark gray (10YR 3/1) iron and manganese stains, black (N 2/0) moist; slightly acid; abrupt wavy boundary.

Cr—20 inches; light gray (10YR 7/2) soft sandstone, grayish brown (2.5Y 5/2) moist; very pale brown (10YR 7/4) laminar silica bands along fractures, yellowish brown (10YR 5/6) moist; common fine distinct strong brown (7.5YR 5/6) clay films and iron stains lining pores, strong brown (7.5YR 4/6) moist; slightly acid.

Depth to the duripan is 10 to 20 inches. Reaction is moderately acid to neutral.

The A horizon has color of 7.5YR 4/4 or 6/4 or 10YR 6/2, 6/3, 6/4, or 7/2. When moist, it has color of 7.5YR 3/4 or 10YR 3/3, 4/3, or 4/4. It is fine sandy loam, loam, or loamy sand. The content of gravel is 0 to 15 percent.

The Bw horizon has color of 7.5YR 6/2 or 6/4 or 10YR 6/4, 6/3, or 7/4. When moist, it has color of 7.5YR 3/4 or 4/4 or 10YR 3/4, 4/3, or 4/4. It is fine sandy loam, loam, or loamy sand. The content of gravel is 0 to 25 percent.

The Bqm horizon has color of 10YR 6/4, 7/2, 7/4, or 7/6. When moist, it has color of 7.5YR 4/4 or 5/6, 10YR 4/4 or 5/6, or 2.5Y 5/2.

The Cr horizon has color of 10YR 6/4, 7/2, or 7/4. When moist, it has color of 10YR 4/3 or 5/4 or 2.5Y 5/2. It consists of weakly consolidated or moderately consolidated sandstone or siltstone.

Some pedons have a C horizon below the Bqm horizon. This horizon has color of 10YR 7/2 or 7/3. When moist, it has color of 10YR 6/2 or 6/3. It is stratified sandy loam, loam, or sandy clay loam.

Kaseberg loamy sand, 5 to 15 percent slopes, is a taxadjunct to the series and classifies as a sandy, mixed, thermic, shallow Typic Durochrept. It has a sandy control section and is underlain by dense, weakly cemented sediments.

Keyes Series

The Keyes series consists of moderately well drained soils on terraces and hills. These soils are shallow to a hardpan. They formed in material weathered from gravelly, basic andesitic, tuffaceous sandstone overlain by alluvium derived from mixed rock sources. Slope ranges from 2 to 15 percent.

Soils of the Keyes series are clayey, mixed, thermic, shallow Abruptic Durixeralfs.

Typical pedon of Keyes gravelly loam, in an area of Keyes-Bellota complex, 2 to 15 percent slopes; 575 feet north and 925 feet west of the southeast corner of sec. 30, T. 3 N., R. 9 E., Linden quadrangle:

A—0 to 5 inches; brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and few very fine interstitial pores; 20 percent gravel; moderately acid; clear smooth boundary.

AB—5 to 12 inches; brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; many very fine roots; common very fine tubular and many very fine interstitial pores; common thin clay films bridging mineral grains; 20 percent gravel; moderately acid; stone line of quartzitic, metamorphic, and andesitic gravel at the lower boundary; abrupt smooth boundary.

2Bt1—12 to 15 inches; brown (7.5YR 5/2) gravelly clay, dark brown (7.5YR 3/2) moist; strong very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; common very fine roots between peds; few very fine tubular pores; common moderately thick clay films on faces of peds; 15 percent gravel; neutral; clear smooth boundary.

2Bt2—15 to 19 inches; brown (7.5YR 4/2) gravelly clay, dark brown (7.5YR 3/2) moist; strong very coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; few very fine roots between peds; common moderately thick clay films on faces

of peds; 15 percent gravel; neutral; abrupt smooth boundary.

2Bqm—19 to 34 inches; yellowish brown (10YR 5/4), strongly cemented duripan, dark brown (7.5YR 4/4) moist; iron and manganese coatings on andesitic gravel; duripan resembles conglomerate and has more than 40 percent cemented gravel by volume; gradual smooth boundary.

3Cr—34 inches; light gray (10YR 7/1), weakly consolidated, basic andesitic, tuffaceous sandstone, grayish brown (10YR 5/2) moist; mildly alkaline.

Depth to the duripan is 10 to 20 inches. In the control section, the content of clay is 35 to 50 percent and the content of gravel and cobbles is 15 to 35 percent by weighted average.

The A horizon has color of 7.5YR 5/2 or 5/4 or 10YR 5/2, 5/3, 5/4, or 6/3. When moist, it has color of 7.5YR 3/2 or 3/4 or 10YR 3/2, 3/3, or 4/4. The content of gravel is 15 to 25 percent. The content of cobbles is 0 to 10 percent. Reaction is moderately acid to neutral.

The 2Bt horizon has color of 7.5YR 4/2, 4/4, or 5/2 or 10YR 5/2. When moist, it has color of 7.5YR 3/2, 3/4, or 4/4 or 10YR 3/3. Reaction is slightly acid or neutral.

The 2Bqm horizon has color of 5YR 5/6, 7.5YR 5/6, or 10YR 5/4. When moist, it has color of 5YR 4/6, 7.5YR 4/4 or 4/6, or 10YR 4/4. The duripan is moderately cemented with silica to indurated.

Kingdon Series

The Kingdon series consists of moderately well drained soils on low fan terraces. These soils are very deep. They formed in alluvium derived from granitic mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Kingdon series are coarse-loamy, mixed, thermic Typic Argixerolls.

Typical pedon of Kingdon fine sandy loam, 0 to 2 percent slopes; 1,875 feet south and 1,350 feet west of the northeast corner of sec. 30, T. 4 N., R. 7 E., Lockeford quadrangle:

Ap1—0 to 5 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular and interstitial and common fine tubular pores; moderately acid; abrupt wavy boundary.

Ap2—5 to 14 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine tubular and interstitial and common fine tubular pores; slightly acid; clear wavy boundary.

BA—14 to 19 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; many very fine tubular and interstitial pores; slightly acid; gradual wavy boundary.

Bt1—19 to 28 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; many very fine tubular and interstitial pores; few thin clay films bridging mineral grains; neutral; gradual wavy boundary.

Bt2—28 to 36 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular and common very fine interstitial pores; common thin clay films bridging mineral grains and lining pores; neutral; clear wavy boundary.

Bt3—36 to 42 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; many very fine tubular and interstitial pores; few thin clay films bridging mineral grains and lining pores; neutral; clear wavy boundary.

C1—42 to 51 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine and fine and common medium roots; many very fine tubular and interstitial pores; neutral; clear wavy boundary.

C2—51 to 61 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; neutral.

The A horizon has color of 10YR 5/3 or 5/2. When moist, it has color of 10YR 3/3 or 3/2. It generally is slightly acid or neutral, but in some pedons it is moderately acid in the upper part as a result of long-term applications of sulfur for the control of disease.

The Bt horizon has color of 10YR 5/3, 6/3, or 6/4. When moist, it has color of 10YR 3/3, 3/4, 4/3, or 4/4. The content of clay in the control section generally is 15 to 18 percent but ranges to 20 percent in the lower part. This horizon is sandy loam, fine sandy loam, or loam. Reaction is slightly acid to mildly alkaline.

The C horizon has color of 10YR 6/2, 6/3, 6/4, or 7/2.

When moist, it has color of 10YR 4/2, 4/3, 4/4, or 5/4. It is sandy loam, fine sandy loam, or coarse sandy loam. Reaction is neutral to moderately alkaline.

Kingile Series

The Kingile series consists of very poorly drained soils on deltas. These soils are artificially drained. They are very deep. They formed in hydrophytic plant remains derived from reeds and tules and are underlain by alluvium derived from mixed sources. Slope ranges from 0 to 2 percent.

Soils of the Kingile series are clayey, mixed, euic, thermic Terric Medisaprists.

Typical pedon of Kingile muck, partially drained, 0 to 2 percent slopes; lat. 38 degrees 03 minutes 37 seconds N. and long. 121 degrees 26 minutes 44 seconds W., in an unsectionized area of the Terminous quadrangle:

Oap—0 to 12 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, dark gray (10YR 4/1) dry; less than 5 percent fibers, none rubbed; moderate very fine and fine granular structure; slightly hard, slightly sticky and slightly plastic; strongly acid; abrupt smooth boundary.

Oa—12 to 17 inches; muck, black (10YR 2/1) variegated with yellowish brown (10YR 5/4) moist, black (10YR 2/1) rubbed, very dark brown (10YR 2/2) dry; 10 to 20 percent fibers, less than 5 percent rubbed; massive; soft, slightly sticky and slightly plastic; strongly acid; clear smooth boundary.

2C1—17 to 25 inches; silty clay that is very dark grayish brown (2.5YR 3/2) when moist and has yellowish red (5YR 4/6) bands; massive; hard, firm, sticky and plastic; moderately acid; clear smooth boundary.

2C2—25 to 36 inches; silty clay loam that is very dark grayish brown (2.5Y 3/2) when moist and has variegated yellowish brown (10YR 5/6) and dark reddish brown (5YR 3/2) bands; massive; hard, firm, sticky and plastic; moderately acid; abrupt smooth boundary.

2C3—36 to 61 inches; silty clay that is dark gray (N 4/0) when moist and has yellowish brown (10YR 5/6) and dark reddish brown (5YR 3/2) bands; massive; hard, firm, sticky and plastic; mildly alkaline.

The depth to mineral material ranges from 16 to 36 inches. The mineral portion of the control section has 20 to 50 percent clay. Thin lenses of highly organic mineral material are at a depth of 16 to 36 inches in some pedons.

The Oap horizon has color of 10YR 2/1, 2/2, 3/1, or 3/2. It has 35 to 45 percent organic matter and has a trace of fibers to 5 percent fibers before rubbing. Reaction is very strongly acid to moderately acid.

The Oa horizon has color of N 2/0 or 10YR 2/1 or 2/2. The fibers have color of 10YR 5/4. The content of organic matter generally is 35 to 45 percent but ranges from 30 to 65 percent. This horizon has 5 to 20 percent fibers before rubbing and 0 to 10 percent fibers after rubbing. Reaction is strongly acid to slightly acid.

The 2C horizon has color of N 4/0, 10YR 3/1 or 4/1, or 2.5Y 3/1 or 3/2. It is silty clay loam, silty clay, or clay. Reaction is moderately acid to mildly alkaline.

Lithic Xerorthents

Lithic Xerorthents consist of moderately well drained and well drained soils on the ridges and plateaus of volcanic flows and hills. These soils are very shallow. They formed in material weathered from hard, andesitic tuff breccia or hard, rhyolitic, tuffaceous sediments. About 20 percent of the surface is covered with pebbles and cobbles, and 10 percent is covered with stones and boulders. Slope ranges from 2 to 15 percent.

Reference pedon of Lithic Xerorthents, in an area of Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes; 2,350 feet south and 2,070 feet west of the northeast corner of sec. 7, T. 4 N., R. 9 E., Clements quadrangle:

A1—0 to 1 inch; grayish brown (10YR 5/2) cobbly sandy loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel; moderately acid; abrupt smooth boundary.

A2—1 to 3 inches; grayish brown (10YR 5/2) cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; 10 percent gravel; moderately acid; abrupt wavy boundary.

R—3 inches; light gray (10YR 7/1), hard, andesitic tuff breccia, grayish brown (10YR 5/2) moist.

The depth to hard bedrock is 1 to 4 inches. The content of gravel, cobbles, stones, and boulders is 5 to 35 percent. Reaction is moderately acid or slightly acid.

The A horizon has color of 10YR 5/2, 6/2, 6/3, or 7/3. When moist, it has color of 10YR 2/2, 3/2, 3/3, 4/2, 5/3, or 5/4.

Madera Series

The Madera series consists of moderately well drained soils on low terraces. These soils are

moderately deep to a hardpan. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 5 percent.

Soils of the Madera series are fine, montmorillonitic, thermic Abruptic Durixeralfs.

Typical pedon of Madera sandy loam, 0 to 2 percent slopes; 2,250 feet south and 660 feet west of the northeast corner of sec. 22, T. 1 S., R. 9 E., Escalon quadrangle:

Ap—0 to 9 inches; grayish brown (10YR 5/2) sandy loam, brown (7.5YR 4/2) moist; common fine distinct strong brown (7.5YR 5/6) mottles when moist; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; moderately acid; clear wavy boundary.

A—9 to 19 inches; brown (7.5YR 5/2) sandy loam, brown (7.5YR 4/2) moist; many fine distinct strong brown (7.5YR 5/6) mottles when moist; massive; slightly hard, firm, sticky and slightly plastic; few very fine roots; few very fine tubular and interstitial pores; moderately acid; gradual smooth boundary.

Bt1—19 to 23 inches; brown (7.5YR 5/2) sandy clay loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; few thin clay films bridging sand grains; slightly acid; abrupt wavy boundary.

2Bt2—23 to 29 inches; light reddish brown (5YR 6/3) clay, reddish brown (5YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm, very sticky and plastic; few very fine tubular and common very fine interstitial pores; common thick clay films on faces of peds, lining pores, and bridging sand grains; neutral; abrupt wavy boundary.

2Bkqm—29 to 60 inches; variegated pale brown (10YR 6/3) and brown (7.5YR 5/4), indurated, iron- and silica-cemented duripan, dark yellowish brown (10YR 4/4) and dark brown (7.5YR 4/4) moist; massive; extremely hard; many fine black (N 2/0) manganese stains; strongly effervescent; fine seams of lime.

Depth to the duripan is 20 to 40 inches. Most pedons have distinct or prominent mottles because of the cultural practices used in growing rice.

The A horizon has color of 7.5YR 5/2 or 10YR 5/2, 6/2, or 6/3. When moist, it has color of 7.5YR 4/2 or 10YR 4/2, 4/3, or 4/4. It is sandy loam or loam. Reaction is moderately acid to neutral.

The Bt horizon has color of 5YR 6/3; 7.5YR 5/2, 5/4, or 6/4; or 10YR 5/3, 5/4, or 6/3. When moist, it has color of 5YR 3/4, 4/3, or 4/4; 7.5YR 4/2, 4/4, or 5/4; or 10YR 4/3 or 4/4. Reaction is slightly acid or neutral.

The 2Bt horizon has color of 5YR 6/3; 7.5YR 5/2, 5/4, or 6/4; or 10YR 5/3, 5/4, or 6/3. When moist, it has color of 5YR 3/4, 4/3, or 4/4; 7.5YR 4/2, 4/4, or 5/4; or 10YR 4/3 or 4/4. It is clay, sandy clay, or clay loam. Reaction is neutral to moderately alkaline.

The 2Bkqm horizon has the same colors as the 2Bt horizon. It is strongly cemented or indurated with silica, iron, and calcium carbonate.

Manteca Series

The Manteca series consists of moderately well drained soils on low terraces. These soils are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Manteca series are coarse-loamy, mixed, thermic Haplic Durixerolls.

Typical pedon of Manteca fine sandy loam, 0 to 2 percent slopes; 700 feet north and 1,350 feet west of the southeast corner of sec. 19, T. 1 S., R. 8 E., Manteca quadrangle:

Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine and common medium and coarse roots; few very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

A—7 to 11 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine interstitial pores; strongly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

Bw—11 to 17 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine, and medium roots; common very fine and fine interstitial and tubular pores; strongly effervescent; disseminated lime; moderately alkaline; clear smooth boundary.

Bk—17 to 24 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine,

and medium roots; common very fine and fine interstitial and tubular pores; strongly effervescent; disseminated lime and many coarse seams of lime; moderately alkaline; abrupt wavy boundary.

2Bkqm—24 to 35 inches; light gray (10YR 7/1), indurated hardpan, variegated gray (10YR 5/1) and grayish brown (10YR 5/2) moist; massive; very hard, brittle; few very fine interstitial pores; strongly effervescent; common fine filaments of lime; intermittent thin bands of a discontinuous laminar cap cemented with silica, calcium, and iron throughout the horizon; moderately alkaline; clear wavy boundary.

2Bq—35 to 54 inches; light gray (10YR 7/2), weakly cemented and strongly cemented duripan that crushes to loam, grayish brown (10YR 5/2) moist; massive; hard, brittle; few very fine interstitial pores; moderately alkaline; clear wavy boundary.

3C—54 to 74 inches; variegated light gray (10YR 7/2) and white (10YR 8/2) sandy loam, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine interstitial pores; moderately alkaline.

Depth to the duripan is 20 to 40 inches. Some pedons have distinct or prominent mottles in the lower part of the B horizon. Reaction is mildly alkaline or moderately alkaline.

The A horizon has color of 10YR 5/1 or 5/2. When moist, it has color of 10YR 3/1 or 3/2.

The Bw and Bk horizons have color of 10YR 5/2, 5/4, 6/2, 6/3, or 6/4. When moist, they have color of 10YR 3/2, 4/2, 4/3, or 4/4. Texture is sandy loam, fine sandy loam, or loam.

The 2Bkqm and 2Bq horizons have color of 10YR 6/1, 7/1, or 7/2. When moist, they have color of 10YR 5/1, 5/2, 6/1, or 6/2. They have a thin, indurated laminar cap over weakly cemented to strongly cemented material. In some pedons the cemented material has interbedded horizons that vary in texture and are not cemented.

The 3C horizon has color of 10YR 6/1, 7/1, 7/2, or 8/2. When moist, it has color of 10YR 5/1, 5/2, 6/1, or 6/2. It is stratified loamy sand to loam. It is mildly alkaline or moderately alkaline.

Merritt Series

The Merritt series consists of very deep, poorly drained soils on flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Merritt series are fine-silty, mixed, thermic Fluvaquentic Haploxerolls.

Typical pedon of Merritt silty clay loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 52 minutes 03 seconds N. and long. 121 degrees 24 minutes 15 seconds W., in an unsectionized area of the Union Island quadrangle:

Ap—0 to 7 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; many fine roots; common fine tubular pores; moderately alkaline; abrupt wavy boundary.

A—7 to 17 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate coarse subangular blocky structure; hard, friable, sticky and slightly plastic; many fine roots; few fine tubular pores; neutral; clear wavy boundary.

Bk1—17 to 27 inches; light brownish gray (10YR 6/2) silt loam, dark brown (10YR 3/3) moist; many fine distinct strong brown (7.5YR 5/8) and pale yellow (2.5Y 7/4) mottles, yellowish brown (10YR 5/4), yellowish red (5YR 5/6), and light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common fine and medium tubular pores; slightly effervescent; disseminated lime and few fine filaments of lime; moderately alkaline; clear wavy boundary.

Bk2—27 to 31 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; many fine prominent reddish yellow (7.5YR 6/8) mottles, yellowish red (5YR 5/6) and brown (7.5YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common medium tubular pores; slightly effervescent; disseminated lime and few fine filaments of lime; moderately alkaline; abrupt wavy boundary.

C—31 to 40 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; many fine prominent strong brown (7.5YR 5/8) and reddish yellow (7.5YR 6/6) mottles, strong brown (7.5YR 5/6) and brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few fine and medium tubular pores; moderately alkaline; clear wavy boundary.

Ab—40 to 49 inches; gray (10YR 5/1) silty clay loam, black (10YR 2/1) moist; many fine and medium prominent strong brown (7.5YR 5/8) and yellowish red (5YR 4/6) mottles when moist; moderate very

coarse angular blocky structure; hard, friable, sticky and slightly plastic; few fine and medium roots; common fine and few medium tubular pores; moderately alkaline; clear wavy boundary.

C′—49 to 60 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; many fine prominent strong brown (7.5YR 5/8) and yellowish red (5YR 4/6) mottles when moist; massive; soft, very friable, nonsticky and nonplastic; few medium roots; common fine tubular pores; moderately alkaline.

The A and Ab horizons have color of 10YR 4/1, 5/1, or 5/2 or 2.5Y 5/2. When moist, they have color of 10YR 2/1, 3/1, or 3/2, 2.5Y 3/2, or 5Y 3/2. Reaction is neutral to moderately alkaline.

The Bk horizon has color of 10YR 5/2 or 6/2 or 2.5Y 6/2. When moist, it has color of 10YR 3/3, 4/2, 4/3, or 5/2; 2.5Y 4/2 or 5/2; or 5Y 4/2 or 5/2. It has distinct or prominent mottles. It is silt loam or silty clay loam. This horizon contains disseminated and segregated lime.

The C and C′ horizons have color of 10YR 5/2 or 6/2. When moist, they have color of 10YR 3/3, 4/2, or 4/3 or 2.5Y 4/2. Mottles are distinct or prominent. These horizons are stratified fine sandy loam, silt loam, or silty clay loam.

Montpellier Series

The Montpellier series consists of moderately well drained soils on dissected terraces. These soils are deep to dense, weakly cemented sediments. They formed in old alluvium derived from granitic rock sources. Slope ranges from 5 to 15 percent.

Soils of the Montpellier series are fine-loamy, mixed, thermic Typic Haploxeralfs.

Typical pedon of Montpellier coarse sandy loam, in an area of Montpellier-Cometa complex, 5 to 8 percent slopes; 100 feet south and 1,980 feet west of the northeast corner of sec. 35, T. 3 N., R. 8 E., Linden quadrangle:

A1—0 to 4 inches; brown (10YR 5/3) coarse sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and common very fine tubular pores; moderately acid; abrupt wavy boundary.

A2—4 to 11 inches; brown (10YR 5/3) coarse sandy loam, brown (10YR 4/3) moist; weak medium angular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial and many very fine, fine, and medium tubular pores; moderately acid; gradual wavy boundary.

BA—11 to 20 inches; light reddish brown (5YR 6/4) coarse sandy loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine interstitial and many very fine, fine, and medium tubular pores; moderately acid; abrupt smooth boundary.

Bt1—20 to 34 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few fine tubular pores; common thin clay films bridging sand grains, on faces of peds, and lining pores; common fine black (N 2/0) manganese stains; moderately acid; gradual smooth boundary.

Bt2—34 to 43 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few fine tubular pores; common thin clay films bridging sand grains, on faces of peds, and lining pores; common fine black (N 2/0) manganese stains; moderately acid; abrupt smooth boundary.

Bt3—43 to 55 inches; light reddish brown (5YR 6/4) coarse sandy loam, reddish brown (5YR 5/4) moist; massive; loose, nonsticky and nonplastic; many very fine interstitial pores; few thin clay films bridging sand grains; common fine black (N 2/0) manganese stains; slightly acid; abrupt smooth boundary.

Btq—55 to 60 inches; yellowish red (5YR 5/6) and reddish yellow (5YR 6/6), weakly cemented sandy loam, reddish brown (5YR 4/4 and 5/4) moist; very hard and dense, brittle, nonsticky and nonplastic; cementation decreases slightly with increasing depth; few very fine interstitial pores; common thin clay films in pores and bridging sand grains; 5 percent pebbles; slightly acid.

The depth to a weakly cemented, dense and brittle layer is 40 to 60 inches. By weighted average, the content of clay in the upper 20 inches of the argillic horizon is 25 to 35 percent.

The A horizon has color of 5YR 4/4; 7.5YR 4/4, 5/2, or 5/4; or 10YR 5/2, 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 7.5YR 3/4 or 4/4 or 10YR 4/2, 4/3, or 4/4. The content of gravel is 0 to 5 percent. Texture is coarse sandy loam or sandy loam. Reaction is moderately acid to neutral.

The Bt horizon has color of 2.5YR 5/4, 5/5, or 5/6 or 5YR 4/4, 5/4, 5/6, 6/4, or 6/6. When moist, it has color

of 2.5YR 3/4, 4/4, or 4/6 or 5YR 4/4, 4/6, or 5/4. Texture ranges from coarse sandy loam to sandy clay loam. Reaction is moderately acid to neutral.

The Btq horizon has color of 5YR 4/4, 5/4, 5/6, or 6/6. When moist, it has color of 5YR 4/4 or 5/4. Texture is coarse sandy loam or sandy loam. Reaction is slightly acid or neutral.

Nord Series

The Nord series consists of well drained soils on alluvial fans. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Nord series are coarse-loamy, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Nord loam, 0 to 2 percent slopes; 2,275 feet north and 1,750 feet west of the southeast corner of sec. 22, T. 2 S., R. 8 E., Salida quadrangle:

Ap—0 to 8 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; common fine tubular and interstitial pores and common very fine tubular pores; 5 percent gravel; mildly alkaline; clear wavy boundary.

A—8 to 25 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; very hard, friable, sticky and slightly plastic; few very fine roots; common very fine and few fine tubular pores; 5 percent gravel; mildly alkaline; gradual wavy boundary.

C1—25 to 41 inches; variegated brown (10YR 5/3) and yellowish brown (10YR 5/4) loam, dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and few fine tubular pores; 5 percent gravel; mildly alkaline; gradual wavy boundary.

C2—41 to 48 inches; pale brown (10YR 6/3) loam, brown (7.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; 5 percent gravel; slightly effervescent; few fine filaments of lime; moderately alkaline; clear smooth boundary.

Ck—48 to 60 inches; light yellowish brown (10YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; 5 percent gravel; strongly effervescent; common fine filaments of lime; moderately alkaline.

The content of gravel is 0 to 5 percent.

The A horizon has color of 10YR 4/3, 5/2, or 5/3. When moist, it has color of 10YR 3/1, 3/2, or 3/3. Reaction is neutral or moderately alkaline.

The C horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 7.5YR 4/4 or 10YR 4/3, 4/4, or 5/3. Distinct or prominent mottles are below a depth of 50 inches in some pedons. This horizon is mildly alkaline or moderately alkaline. It is stratified loam, sandy loam, or fine sandy loam. Disseminated or segregated lime is below a depth of 40 inches.

The Nord soils in this survey area are outside the range of the series because they have lime below a depth of 40 inches and have as much as 5 percent gravel throughout. These differences, however, do not significantly affect the use or management of the soils.

Orognen Series

The Orognen series consists of well drained soils on uplifted, dissected terraces. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 15 to 50 percent.

Soils of the Orognen series are fine, mixed, thermic Typic Palexeralfs.

Typical pedon of Orognen gravelly clay loam, in an area of Carbona-Orognen complex, 15 to 30 percent slopes; 2,125 feet north and 2,225 feet east of the southwest corner of sec. 18, T. 4 S., R. 6 E., Solyo quadrangle:

A1—0 to 6 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate very coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots; many very fine tubular and interstitial pores; 20 percent gravel; neutral; clear wavy boundary.

A2—6 to 11 inches; brown (10YR 5/3) gravelly clay loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots; many very fine tubular and interstitial pores; 30 percent gravel; neutral; abrupt wavy boundary.

Bt1—11 to 30 inches; reddish brown (5YR 5/3) gravelly clay, reddish brown (5YR 4/3) moist; strong coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; 20 percent gravel; mildly alkaline; clear wavy boundary.

2Bt2—30 to 43 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; strong coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine tubular pores; few thin clay films on faces of peds and lining pores; 10 percent gravel; moderately alkaline; gradual wavy boundary.

2BCt—43 to 60 inches; strong brown (7.5YR 5/6) clay, strong brown (7.5YR 5/6) moist; massive; extremely hard, very firm, very sticky and very plastic; few very fine tubular pores; few thin clay films lining pores; 10 percent gravel; moderately alkaline.

The A horizon has color of 7.5YR 4/4 or 5/4 or 10YR 5/3. When moist, it has color of 7.5YR 3/4 or 10YR 3/3 or 4/3. The content of gravel is 15 to 35 percent. This horizon is neutral or mildly alkaline.

The Bt and 2Bt horizons have color of 5YR 4/4 or 4/6 or 7.5YR 4/4, 4/6, or 5/4. When moist, it has color of 5YR 4/3 or 4/4 or 7.5YR 4/4 or 4/6. The content of gravel is 10 to 35 percent. This horizon is gravelly clay or clay. It is neutral to moderately alkaline.

The 2BC horizon has color of 7.5YR 5/4 or 5/6. When moist, it has color of 7.5YR 4/6 or 5/6. It is clay loam or clay. The content of gravel is 0 to 15 percent. This horizon is mildly alkaline or moderately alkaline.

The Orognen soils in this survey area are a taxadjunct to the series and classify as fine, mixed, thermic Mollic Palexeralfs. They have more than 1 percent organic matter in the upper 6 inches and have a surface layer of gravelly clay loam. These differences, however, do not significantly affect the use or management of the soils.

Pardee Series

The Pardee series consists of well drained soils on hills or high terrace remnants. These soils are shallow. They formed in alluvium derived from mixed rock sources and are underlain by andesitic, tuffaceous conglomerate. Slope ranges from 0 to 15 percent.

Soils of the Pardee series are loamy-skeletal, mixed, thermic Lithic Mollic Haploxeralfs.

Typical pedon of Pardee gravelly loam, 0 to 3 percent slopes; lat. 38 degrees 16 minutes 51 seconds N. and long. 121 degrees 01 minute 57 seconds W., in an unsectionized area of the Goose Creek quadrangle:

A1—0 to 3 inches; yellowish red (5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; many medium distinct pink (7.5YR 7/4) mottles; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; 20 percent gravel; strongly acid; clear smooth boundary.

A2—3 to 9 inches; yellowish red (5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular and interstitial pores; 20 percent gravel; slightly acid; clear wavy boundary.

Bt—9 to 18 inches; reddish brown (5YR 5/4) and yellowish red (5YR 4/6) very gravelly clay loam, dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) moist; massive; hard, friable, sticky and slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common moderately thick clay films bridging mineral grains and lining pores; 35 percent gravel and 10 percent cobbles; slightly acid; abrupt wavy boundary.

2R—18 inches; light gray (10YR 7/2) and brown (10YR 5/3), andesitic conglomerate, very pale brown (10YR 7/3) and brown (10YR 5/3) moist.

The depth to hard bedrock is 10 to 20 inches. Reaction is strongly acid to slightly acid.

The A horizon has color of 5YR 5/4 or 5/6 or 7.5YR 5/4, 5/6, or 6/4. When moist, it has color of 5YR 3/4 or 7.5YR 3/4 or 4/4. It is gravelly loam or cobbly loam. The content of rock fragments is 15 to 35 percent.

The Bt horizon has color of 5YR 4/4, 4/6, 5/4, or 5/6 or 7.5YR 5/4 or 5/6. When moist, it has color of 2.5YR 3/4, 3/6, or 4/6; 5YR 3/4, 4/4, or 4/6; or 7.5YR 4/4 or 4/6. It is very gravelly loam, very cobbly loam, or very gravelly clay loam. The content of rock fragments ranges from 35 to 80 percent in individual subhorizons, but it is 35 to 60 percent by weighted average.

Peltier Series

The Peltier series consists of poorly drained soils on deltas and flood plains. These soils are artificially drained. They are very deep. They formed in mixed hydrophytic plant remains derived from reeds and tules and alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Peltier series are fine, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Peltier mucky clay loam, partially drained, 0 to 2 percent slopes; lat. 38 degrees 12 minutes 5 seconds N. and long. 121 degrees 29 minutes 44 seconds W., in an unsectionized area of the Thornton quadrangle:

Ap—0 to 14 inches; gray (10YR 5/1) mucky clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine, fine, medium, and coarse roots; many very fine and fine tubular

and interstitial pores; moderately acid; abrupt smooth boundary.

A—14 to 22 inches; dark gray (10YR 4/1) mucky clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; many very fine, fine, and medium and few coarse roots; many very fine and fine tubular and interstitial pores; moderately acid; abrupt wavy boundary.

BA—22 to 24 inches; brown (10YR 5/3) and very dark gray (10YR 3/1) silty clay, dark brown (10YR 4/3) and black (10YR 2/1) moist; common fine prominent strong brown (7.5YR 5/6) mottles when moist; weak coarse prismatic structure; slightly hard, very friable, sticky and slightly plastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; common fine very dark gray (N 3/0) stains on mineral grains; slightly acid; abrupt wavy boundary.

Bw1—24 to 32 inches; very dark gray (10YR 3/1) mucky clay loam, black (10YR 2/1) and very dark gray (10YR 3/1) moist; common fine prominent strong brown (7.5YR 5/6) mottles when moist; weak coarse prismatic structure; slightly hard, very friable, sticky and plastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; many fine very dark gray (N 3/0) stains on mineral grains; neutral; clear smooth boundary.

Bw2—32 to 45 inches; grayish brown (2.5Y 5/2) mucky clay loam, dark grayish brown (2.5Y 4/2) moist; many medium distinct very dark grayish brown (10YR 3/2) and many medium prominent reddish brown (5YR 4/4) mottles when moist; weak coarse prismatic structure; slightly hard, very friable, sticky and plastic; common very fine and fine roots; many fine very dark gray (N 3/0) colloid stains on mineral grains; neutral; abrupt wavy boundary.

2Cg—45 to 60 inches; olive gray (5Y 5/2) clay, dark greenish gray (5BG 4/1) moist; many coarse prominent olive (5Y 4/3) and dark reddish brown (5YR 3/4) mottles when moist; massive; hard, very firm, very sticky and very plastic; slightly acid.

The content of organic matter ranges from 10 to 25 percent. Strata of silty clay or clay are between depths of 10 and 40 inches. Because of burning, some pedons have an ash layer about 1 to 2 inches thick in the upper 24 inches.

The A horizon has color of N 3/0 or 4/0 or 10YR 2/2, 3/1, 4/1, or 5/1. When moist, it has color of N 2/0 or 3/0 or 10YR 2/1 or 3/1. Reaction is moderately acid to neutral.

The Bw horizon has color of 10YR 3/1, 4/1, 5/2, or 5/3 or 2.5Y 4/2 or 5/2. When moist, it has color of 10YR 2/1, 3/1, 4/1, or 4/2 or 2.5Y 3/2 or 4/2. It is dominantly clay loam, silty clay loam, silty clay, clay, or the mucky analogs of those textures. In some pedons, however, it has thin strata of muck. Reaction is moderately acid to mildly alkaline.

The 2Cg horizon has color of 10YR 3/3, 5Y 5/2, or 5BG 5/1. When moist, it has color of 10YR 3/2, 5Y 4/2, or 5BG 4/1. It is clay loam, silty clay, clay, or the mucky analogs of those textures. Reaction is moderately acid to mildly alkaline.

Some pedons have an organic substratum of muck or mucky peat below a depth of 40 inches. This substratum has color of 10YR 2/1, 2/2, 3/1, or 3/3. When moist, it has color of 10YR 2/1 or 3/1. The content of organic matter ranges from 35 to 65 percent. Reaction is very strongly acid to slightly acid.

Pentz Series

The Pentz series consists of well drained soils on hills. These soils are shallow. They formed in material weathered from basic andesitic, tuffaceous sandstone. Slope ranges from 2 to 50 percent.

Soils of the Pentz series are loamy, mixed, thermic, shallow Ultic Haploxerolls.

Typical pedon of Pentz sandy loam, 2 to 15 percent slopes; 1,650 feet south and 2,600 feet west of the northeast corner of sec. 35, T. 2 N., R. 9 E., Farmington quadrangle:

A—0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; 2 percent cobbles and 10 percent gravel; moderately acid; gradual wavy boundary.

Bw1—4 to 10 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 2 percent cobbles and 8 percent gravel; slightly acid; gradual wavy boundary.

Bw2—10 to 15 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 10 percent cobbles and 3 percent gravel; slightly acid; abrupt smooth boundary.

Cr—15 inches; light gray (10YR 7/1), moderately consolidated, basic andesitic, tuffaceous sandstone, light brownish gray (10YR 6/2) moist; slightly acid.

The depth to soft sandstone is 10 to 20 inches. The content of gravel is 0 to 35 percent. The content of cobbles is 0 to 25 percent.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3. It is sandy loam, loam, gravelly sandy loam, or cobbly sandy loam. Reaction is strongly acid to slightly acid.

The Bw horizon has color of 10YR 4/3, 5/2, 5/3, 5/4, or 6/4. When moist, it has color of 7.5YR 3/2 or 10YR 3/2, 3/3, 4/3, or 4/4. It is fine sandy loam, cobbly sandy loam, sandy loam, loam, or gravelly sandy loam. Reaction is moderately acid to neutral.

Pescadero Series

The Pescadero series consists of poorly drained, saline-sodic soils in basins. These soils are artificially drained. They are very deep. They formed in alluvium derived from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Soils of the Pescadero series are fine, montmorillonitic, thermic Aquic Natrixeralfs.

Typical pedon of Pescadero clay loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 46 minutes 35 seconds N. and long. 121 degrees 25 minutes 35 seconds W., in an unsectionized area of the Union Island quadrangle:

Ap—0 to 10 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, friable, sticky and plastic; common very fine roots; few fine tubular pores; violently effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

Btn—10 to 21 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; common fine distinct olive (5Y 5/4) mottles, olive (5Y 4/4) moist; strong very coarse prismatic structure; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; common thin clay films and pressure faces on peds; strongly effervescent; disseminated lime; moderately alkaline; gradual wavy boundary.

Btkn—21 to 42 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; common fine distinct olive (5Y 5/4 and 5/6) mottles, olive (5Y 4/4) moist; strong very coarse prismatic structure; very hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; common thin clay films and pressure faces on peds; strongly effervescent; common fine soft masses of lime; moderately alkaline; clear wavy boundary.

C1—42 to 52 inches; gray (5Y 6/1) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct strong brown (7.5YR 5/6 and 5/8) mottles, reddish brown (5YR 4/4) and yellowish red (5YR 4/6) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline; gradual wavy boundary.

C2—52 to 60 inches; gray (5Y 6/1) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct strong brown (7.5YR 5/6 and 5/8) mottles, reddish brown (5YR 5/4) and yellowish red (5YR 4/6) moist; massive; slightly hard, friable, sticky and slightly plastic; common very fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline.

The depth to distinct or prominent mottles is 10 to 20 inches.

The A horizon has color of 10YR 5/2, 6/2, or 7/2 or 2.5Y 5/2, 6/2, or 7/2. When moist, it has color of 10YR 4/2 or 5/2 or 2.5Y 3/2 or 4/2. Electrical conductivity is 4 to 8 millimhos per centimeter, and the percentage of exchangeable sodium is 10 to 18. This horizon is slightly effervescent to violently effervescent and has disseminated lime. Reaction is mildly alkaline or moderately alkaline.

The upper part of the B horizon has color of 10YR 4/2 or 5/2, 2.5Y 4/2 or 5/2, or 5Y 5/1. When moist, it has color of 10YR 3/2 or 4/2, 2.5Y 3/2 or 4/2, or 5Y 3/1. The lower part has color or 5Y 5/1, 5/2, or 6/1. When moist, it has color of 5Y 3/2, 4/1, or 4/2. The B horizon is silty clay loam, silty clay, or clay. The content of clay is 40 to 60 percent. Electrical conductivity is 4 to 16 millimhos per centimeter, and the percentage of exchangeable sodium is 15 to 25. This horizon is strongly effervescent or violently effervescent and has soft masses or seams of segregated lime in the lower part. Reaction is moderately alkaline or strongly alkaline.

The C horizon has color of 2.5Y 5/2 or 5Y 6/1 or 6/2. When moist, it has color of 2.5Y 4/2 or 5Y 4/2. It is silty clay loam or clay loam. Electrical conductivity is 4 to 16 millimhos per centimeter, and the percentage of exchangeable sodium is 15 to 25. This horizon is slightly effervescent to strongly effervescent and has disseminated lime. Reaction is moderately alkaline or strongly alkaline.

Peters Series

The Peters series consists of well drained soils on hills. These soils are shallow. They formed in material weathered from andesitic, tuffaceous sandstone. Slope ranges from 2 to 8 percent.

Soils of the Peters series are clayey, montmorillonitic,

thermic, shallow Typic Haploxerolls.

Typical pedon of Peters clay, 2 to 8 percent slopes; 2,300 feet north and 1,150 feet west of the southeast corner of sec. 35, T. 2 N., R. 9 E., Farmington quadrangle:

A1—0 to 5 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong medium subangular blocky structure; extremely hard, firm, sticky and plastic; many very fine roots; few very fine tubular and interstitial pores; 6 percent cobbles and 4 percent gravel; neutral; abrupt wavy boundary.

A2—5 to 15 inches; very dark brown (10YR 2/2) clay, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, sticky and plastic; common very fine roots; few very fine tubular and interstitial pores; few weak intersecting slickensides; 5 percent gravel; neutral; abrupt smooth boundary.

Cr—15 inches; white (10YR 8/1), moderately consolidated, andesitic sandstone, light brownish gray (10YR 6/2) moist.

The depth to soft sandstone is 10 to 20 inches. The content of gravel ranges from 0 to 10 percent, and the content of cobbles ranges from 0 to 5 percent. Reaction is moderately acid to neutral.

The A horizon has color of 7.5YR 4/2 or 5/2 or 10YR 2/1, 2/2, 3/1, 3/2, 4/1, 4/2, 5/1, or 5/2. When moist, it has color of 7.5YR 3/2 or 4/2 or 10YR 2/1, 2/2, or 3/1.

The Cr horizon has color of 10YR 5/1, 6/1, 6/2, 6/3, 7/2, or 8/1 or 2.5Y 7/2 or 7/4. When moist, it has color of 7.5YR 4/2; 10YR 4/4, 5/2, 5/3, or 6/2; or 2.5Y 5/2.

Piper Series

The Piper series consists of poorly drained soils on old natural levees and deltas. These soils are artificially drained. They are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Piper series are coarse-loamy, mixed (calcareous), thermic Aeric Haplaquents.

Typical pedon of Piper sandy loam, partially drained, 0 to 2 percent slopes; lat. 38 degrees 06 minutes 04 seconds N. and long. 121 degrees 32 minutes 22 seconds W., in an unsectionized area of the Bouldin Island quadrangle:

Ap1—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, friable, nonsticky and nonplastic; many very fine, fine, and medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Ap2—4 to 15 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; many fine prominent strong brown (7.5YR 5/8) mottles, yellowish red (5YR 4/8) moist; massive; hard, friable, nonsticky and nonplastic; common very fine, fine, and medium roots; few very fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bkq1—15 to 27 inches; light brownish gray (2.5Y 6/2), weakly cemented sandy loam, olive gray (5Y 5/2) moist; many coarse prominent strong brown (7.5YR 5/8) mottles, yellowish red (5YR 4/8) moist; massive; very hard, firm, nonsticky and nonplastic; few very fine and common fine and medium roots; common very fine and fine tubular pores; violently effervescent; disseminated lime and common fine soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bkq2—27 to 39 inches; light brownish gray (2.5Y 6/2), weakly cemented sandy loam, olive gray (5Y 5/2) moist; many medium prominent reddish yellow (7.5YR 6/8) mottles, yellowish red (5YR 4/8) moist; massive; hard, very firm, slightly sticky and slightly plastic; few very fine and common fine and medium roots; few very fine and common fine tubular pores; few thick colloid stains on mineral grains; violently effervescent; disseminated lime and common fine soft masses of lime; moderately alkaline; clear wavy boundary.

2C—39 to 60 inches; light brownish gray (2.5Y 6/2) loamy sand, olive brown (2.5Y 4/4) moist; many fine prominent reddish yellow (7.5YR 7/8) mottles, yellowish red (5YR 4/8) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; violently effervescent; moderately alkaline.

Distinct or prominent mottles are below a depth of 4 inches. Reaction is mildly alkaline or moderately alkaline.

The A horizon has color of 10YR 4/2, 4/3, 5/2, 6/2, 7/1, or 7/2 or 2.5Y 5/2, 6/2, or 7/2. When moist, it has color of 10YR 3/2, 3/3, 4/2, or 5/2 or 2.5Y 3/2, 4/2, or 5/2.

The Bk horizon has color or 10YR 6/2, 6/3, or 6/4 or 2.5Y 6/2 or 6/4. When moist, it has color of 10YR 5/2, 5/3, or 5/4; 2.5Y 4/2, 4/4, or 5/2; or 5Y 5/3. Texture is weakly cemented sandy loam or fine sandy loam. This horizon has few to many seams or soft masses of lime.

The 2C horizon has color of 10YR 6/2, 6/3, or 6/4 or 2.5Y 6/2 or 6/4. When moist, it has color of 10YR 5/2,

5/3, or 5/4 or 2.5Y 4/2, 4/4, or 5/2. It is stratified loamy sand or sand.

Pleito Series

The Pleito series consists of well drained soils on dissected terraces. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 2 to 30 percent.

Soils of the Pleito series are fine-loamy, mixed, thermic Calcic Pachic Haploxerolls.

Typical pedon of Pleito clay loam, in an area of Calla-Pleito complex, 8 to 30 percent slopes; 1,250 feet north and 1,100 feet east of the southwest corner of sec. 28, T. 3 S., R. 5 E., Tracy quadrangle:

A1—0 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; 2 percent gravel; slightly effervescent; disseminated lime and few fine filaments of lime; moderately alkaline; gradual smooth boundary.

A2—8 to 16 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine tubular pores; 2 percent gravel; slightly effervescent; disseminated lime and few fine filaments of lime; moderately alkaline; gradual smooth boundary.

Bk1—16 to 28 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; 2 percent gravel; violently effervescent; disseminated lime and common fine filaments of lime; moderately alkaline; gradual smooth boundary.

Bk2—28 to 35 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; 2 percent gravel; violently effervescent; disseminated lime and common fine filaments and soft masses of lime; moderately alkaline; gradual smooth boundary.

Ck1—35 to 45 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; many very fine tubular pores; 5 percent gravel; violently effervescent; disseminated lime and common fine soft masses of lime; moderately alkaline; gradual smooth boundary.

Ck2—45 to 60 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; many fine tubular pores; 5 percent gravel; violently effervescent; disseminated lime and many fine filaments and soft masses of lime; moderately alkaline.

The depth to calcareous material ranges from 0 to 10 inches. The content of gravel is 0 to 10 percent.

The A horizon has color of 10YR 4/2, 5/1, 5/2, or 5/3. When moist, it has color of 10YR 3/1, 3/2, or 3/3. Reaction is mildly alkaline or moderately alkaline.

The Bk horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. When moist, it has color of 10YR 4/2, 4/3, or 4/4.

The Ck horizon has color of 10YR 5/3, 6/3, 6/4, 7/3, or 7/4. When moist, it has color of 10YR 4/3, 4/4, 5/3, or 5/4.

The Pleito soils in this survey area are a taxadjunct to the series and classify as fine-loamy, mixed, thermic Calcic Haploxerolls. They have a mollic epipedon that is less than 20 inches thick. This difference, however, does not significantly affect the use or management of the soils.

Ramoth Series

The Ramoth series consists of well drained soils on dissected terraces. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 5 to 30 percent.

Soils of the Ramoth series are coarse-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Ramoth sandy loam, 5 to 8 percent slopes; 2,200 feet north and 575 feet east of the southwest corner of sec. 7, T. 4 N., R. 9 E., Clements quadrangle:

Ap1—0 to 4 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; many very fine roots; many very fine and common fine interstitial pores; moderately acid; abrupt irregular boundary.

Ap2—4 to 8 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial and few very fine tubular pores; moderately acid; clear wavy boundary.

A—8 to 14 inches; light brown (7.5YR 6/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine roots; many very fine interstitial and common very fine tubular pores; moderately acid; gradual wavy boundary.

Bt1—14 to 22 inches; light brown (7.5YR 6/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine roots; many very fine interstitial and common very fine and fine and few medium tubular pores; common thin clay films bridging mineral grains and few thin clay films lining pores; moderately acid; gradual wavy boundary.

Bt2—22 to 32 inches; light brown (7.5YR 6/4) sandy loam that has pink (7.5YR 7/4) coatings on faces of peds; brown (7.5YR 4/4) moist; weak medium prismatic structure; hard, friable, slightly sticky and slightly plastic; few very fine and medium roots; many very fine interstitial and tubular and common fine tubular pores; common thin clay films bridging mineral grains and few thin clay films on faces of peds and lining pores; slightly acid; gradual wavy boundary.

Bt3—32 to 40 inches; reddish yellow (7.5YR 6/6) sandy clay loam that has pink (7.5YR 7/4) coatings on faces of peds; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; common very fine interstitial and tubular and common fine tubular pores; many thin clay films bridging mineral grains, common thin clay films lining pores, and few moderately thick clay films on faces of peds; slightly acid; clear wavy boundary.

Bt4—40 to 54 inches; strong brown (7.5YR 5/6) and light brown (7.5YR 6/4) sandy clay loam that has pink (7.5YR 7/4) coatings on faces of peds; strong brown (7.5YR 5/6 and 4/6) moist; weak coarse subangular blocky structure; very hard, friable, sticky and slightly plastic; few very fine and medium roots; few very fine interstitial and many very fine and few medium tubular pores; many thin clay films bridging mineral grains and lining pores, common moderately thick clay films on faces of peds, and few thick reddish brown (5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt5—54 to 60 inches; strong brown (7.5YR 5/6) coarse sandy loam that has pink (7.5YR 7/4) coatings on faces of peds; yellowish red (5YR 5/6) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine interstitial and tubular pores; common thin clay films bridging mineral grains and lining pores and few moderately thick clay films bridging mineral grains; slightly acid.

The A horizon has color of 7.5YR 6/2 or 6/4 or 10YR 5/2, 5/3, 5/4, or 6/3. When moist, it has color of 7.5YR 4/4 or 10YR 3/2, 3/3, or 3/4. The content of clay is 9 to 15 percent. Reaction is moderately acid or slightly acid.

The Bt horizon has color of 5YR 5/6 or 7.5YR 5/4, 5/6, 6/4, or 6/6. When moist, it has color of 5YR 4/6 or 5/6 or 7.5YR 4/4, 4/6, 5/4, 5/6, or 6/6. It is sandy loam, coarse sandy loam, or sandy clay loam. The upper part has 12 to 20 percent clay, and the lower part has 20 to 27 percent clay. This horizon is moderately acid or slightly acid in the upper part and slightly acid or neutral in the lower part.

The BCt horizon has color of 7.5YR 5/4 or 5/6. When moist, it has color of 5YR 4/6 or 5/6 or 7.5YR 4/6, 5/6, or 6/6. It is sandy loam, coarse sandy loam, or loamy coarse sand. The content of clay is 5 to 15 percent. Reaction is slightly acid or neutral.

Redding Series

The Redding series consists of moderately well drained soils on high terraces. These soils are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 30 percent.

Soils of the Redding series are fine, mixed, thermic Abruptic Durixeralfs.

Typical pedon of Redding gravelly loam, 2 to 8 percent slopes; 2,175 feet north and 1,900 feet east of the southwest corner of sec. 34, T. 2 N., R. 9 E., Farmington quadrangle:

A—0 to 7 inches; strong brown (7.5YR 5/6) gravelly loam; dominantly reddish brown (5YR 4/3) moist but pale brown (10YR 6/3) and dark brown (10YR 4/3) in the upper 2 inches; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few medium and common very fine tubular pores; 15 percent gravel; moderately acid; abrupt smooth boundary.

AB—7 to 16 inches; reddish yellow (7.5YR 6/6) gravelly loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and fine tubular and interstitial pores; 15 percent gravel; moderately acid; abrupt smooth boundary.

2Bt—16 to 22 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; 10 percent gravel; strongly acid; abrupt smooth boundary.

3Bqm—22 to 60 inches; reddish yellow (5YR 6/6) and yellowish red (5YR 5/6) duripan; massive;

moderately cemented to strongly cemented with iron and silica; 75 percent gravel and 5 percent cobbles.

Depth to the duripan is 20 to 40 inches. Reaction is strongly acid to slightly acid.

The A horizon has color of 5YR 5/6, 6/3, or 6/4 or 7.5YR 5/4, 5/6, 6/4, or 6/6. When moist, it has color of 5YR 3/6, 4/2, 4/3, or 4/4 or 7.5YR 4/4. It is loam, gravelly sandy loam, gravelly loam, or cobbly loam. The content of clay is 10 to 30 percent. The content of gravel is 5 to 30 percent. The content of cobbles is 0 to 20 percent.

The 2Bt horizon has color of 2.5YR 4/6; 5YR 5/4, 5/6, 5/8, or 6/6; or 7.5YR 5/4 or 6/4. When moist, it has color of 2.5YR 3/6; 5YR 4/3, 4/4, or 4/6; or 7.5YR 4/4 or 4/2. It is clay loam, clay, gravelly clay loam, or gravelly clay. The content of gravel is 0 to 35 percent. The content of cobbles is 0 to 5 percent. The content of clay is 35 to 60 percent.

The 3Bqm horizon has color of 5YR 6/6; 7.5YR 6/6, 7/4, or 7/6; or 10YR 5/3. When moist, it has color of 5YR 4/6, 5/4, or 5/6; 7.5YR 4/4 or 5/4; or 10YR 4/3.

The Redding soils in the Corning-Redding complex, 2 to 8 percent slopes, and the Corning-Redding complex, 8 to 15 percent slopes, are outside the range of the series because they have 0 to 5 percent gravel or cobbles in the 2Bt and 3Bqm horizons. This difference, however, does not significantly affect the use or management of the soils.

Reiff Series

The Reiff series consists of well drained soils on flood plains and alluvial fans. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Reiff series are coarse-loamy, mixed, nonacid, thermic Mollic Xerofluvents.

Typical pedon of Reiff loam, 0 to 2 percent slopes; 2,050 feet south and 2,550 feet west of the northeast corner of sec. 29, T. 2 S., R. 5 E., Tracy quadrangle:

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine and fine granular structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; 5 percent gravel; mildly alkaline; abrupt smooth boundary.

A—7 to 26 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; mildly alkaline; clear wavy boundary.

C1—26 to 49 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores; 10 percent gravel; mildly alkaline; abrupt wavy boundary.

C2—49 to 55 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose, slightly sticky and nonplastic; few very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

C3—55 to 60 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine tubular pores; mildly alkaline.

By weighted average, the content of clay in the 10- to 40-inch control section is 8 to 18 percent. The content of gravel is 0 to 15 percent.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 10YR 2/2, 3/2, 3/3, or 3/4. It is fine sandy loam or loam. Reaction is slightly acid to mildly alkaline.

The C horizon has color of 7.5YR 3/2, 5/4, or 6/4 or 10YR 4/2, 4/3, 5/2, 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 7.5YR 3/2, 3/4, or 4/4 or 10YR 3/2, 3/3, 3/4, 4/2, 4/3, or 4/4. It is stratified loamy fine sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam, or loam. Reaction is neutral or mildly alkaline.

Rindge Series

The Rindge series consists of very poorly drained soils on deltas. These soils are artificially drained. They are very deep. They formed in hydrophytic plant remains derived from reeds and tules and alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Rindge series are euic, thermic Typic Medisaprists.

Typical pedon of Rindge muck, partially drained, 0 to 2 percent slopes; lat. 38 degrees 02 minutes 08 seconds N. and long. 121 degrees 28 minutes 33 seconds W., in an unsectionized area of the Terminous quadrangle:

Oap—0 to 13 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, very dark gray (10YR 3/1) dry; less than 5 percent tule and reed fibers, none rubbed; moderate very fine, fine, and medium granular structure; slightly hard, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

Oa1—13 to 36 inches; mucky peat, black (10YR 2/1)

moist, variegated yellowish brown (10YR 5/4) and black (10YR 2/1) rubbed, very dark brown (10YR 2/2) dry; 35 percent tule and reed fibers, less than 5 percent rubbed; massive; soft; moderately acid; clear smooth boundary.

Oa2—36 to 60 inches; mucky peat, very dark brown (10YR 2/2) moist, variegated yellowish brown (10YR 5/4) and black (10YR 2/1) rubbed, very dark gray (10YR 3/1) dry; 45 percent tule and reed fibers, less than 10 percent rubbed; massive; soft; slightly acid.

Before rubbing, the content of fibers is less than 5 percent in the upper 12 inches and increases to as much as 80 percent at a depth of 51 inches. After rubbing, it is less than 2 percent in the upper 12 inches and increases to 10 to 15 percent at a depth of 51 inches.

The Ap horizon, if it occurs, and the Oap and Oa1 horizons have color of N 2/0 or 10YR 2/1 or 4/1. When dry, they have color of N 2/0; 7.5YR 2/2; or 10YR 2/1, 2/2, 3/1, or 4/1. They are muck or mucky silt loam and have 10 to 55 percent organic matter. Reaction is very strongly acid to neutral.

The Oa2 horizon has color of N 2/0 or 10YR 2/1, 2/1, 3/1, 3/2, or 5/2. When dry, it has color of N 2/0 or 10YR 2/1 or 3/1. It is mucky peat or peat and has 25 to 65 percent organic matter. Reaction is very strongly acid to slightly acid.

Rioblancho Series

The Rioblancho series consists of somewhat poorly drained soils on basin rims. These soils are artificially drained. They are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Rioblancho series are fine-loamy, mixed (calcareous), thermic Typic Duraquolls.

Typical pedon of Rioblancho clay loam, drained, 0 to 2 percent slopes; 2,650 feet south and 2,325 feet east of the northwest corner of sec. 6, T. 2 N., R. 6 E., Lodi South quadrangle:

Ap—0 to 7 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots; few very fine tubular and common very fine interstitial pores; mildly alkaline; gradual smooth boundary.

Bk1—7 to 16 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common fine distinct brown (10YR 5/3) mottles when moist; moderate very coarse angular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine tubular and common very fine interstitial pores; strongly effervescent; disseminated lime and common fine soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bk2—16 to 28 inches; variegated light gray (10YR 7/1) and very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) and dark grayish brown (10YR 4/2) moist; common fine distinct light olive brown (2.5Y 5/6) mottles when moist; massive; hard, firm, slightly sticky and slightly plastic; common very fine tubular pores; violently effervescent; 20 percent calcium carbonate; disseminated lime and common fine soft masses of lime; moderately alkaline; abrupt wavy boundary.

Bk3—28 to 39 inches; variegated very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist; common faint yellowish brown (10YR 5/6) mottles when moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; weakly cemented in the lower part; slightly effervescent; disseminated lime and few fine seams of lime; moderately alkaline; abrupt smooth boundary.

2Bkqm—39 to 44 inches; variegated light gray (10YR 7/2) and light yellowish brown (10YR 6/4), strongly silica-cemented duripan, yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist; common fine distinct light olive brown (2.5Y 5/6) mottles when moist; massive; hard and brittle; strongly cemented continuous laminar cap 2 to 5 millimeters thick; strongly effervescent; disseminated lime and segregated lime in seams; moderately alkaline; gradual smooth boundary.

2Bkq—44 to 80 inches; variegated light gray (10YR 7/2) and light yellowish brown (10YR 6/4), strongly silica-cemented sandy loam, yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist; common fine distinct light olive brown (2.5Y 5/6) mottles when moist; massive; hard and brittle; strongly cemented in 25 percent of the matrix and weakly cemented in the remainder; strongly effervescent; disseminated lime and segregated seams of lime; moderately alkaline.

Depth to the duripan is 20 to 40 inches.

The A horizon has color of N 5/0 or 4/0; 10YR 4/1, 4/2, 5/1, or 5/2; or 2.5Y 4/2 or 5/2. When moist, it has color of N 3/0 or 10YR 3/1 or 3/2. It has distinct or prominent mottles in the lower part.

The B horizon has color of N 8/0; 10YR 6/4, 7/1, 7/3, or 7/4; 2.5Y 6/2, 7/2, or 8/2; or 5Y 6/2, 6/3, or 7/2. When moist, it has color of N 7/0; 10YR 4/2, 4/4, 5/4, 6/1, 6/2, or 6/3; 5Y 5/2; or 2.5Y 5/2 or 6/2. Mottles are

faint or distinct. This horizon is clay loam or loam in the upper part and loam, silt loam, or sandy loam in the lower part. The content of calcium carbonate is 15 to 22 percent in the lower part.

The 2Bkqm and 2Bkq horizons have a strongly cemented or indurated laminar cap over weakly cemented to strongly cemented material. These horizons have color of 10YR 6/2, 6/3, 6/4, or 7/2; 2.5Y 7/2 or 7/4; or 5Y 5/2 or 6/2. When moist, they have color of 10YR 4/4 or 5/4, 2.5Y 4/2 or 4/4, or 5Y 4/2 or 5/2.

Rocklin Series

The Rocklin series consists of moderately well drained soils on dissected terraces. These soils are moderately deep to a hardpan. They formed in old alluvium derived from granitic rock sources. Slope ranges from 0 to 5 percent.

Soils of the Rocklin series are fine-loamy, mixed, thermic Typic Durixeralfs.

Typical pedon of Rocklin sandy loam, 2 to 5 percent slopes; 1,525 feet north and 150 feet west of the southeast corner of sec. 16, T. 3 N., R. 8 E., Linden quadrangle:

A1—0 to 7 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial and tubular pores; slightly acid; abrupt wavy boundary.

A2—7 to 15 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine, fine, and medium tubular pores; slightly acid; gradual smooth boundary.

BAt—15 to 25 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine, fine, and medium tubular pores; few thin clay films bridging sand grains; neutral; gradual smooth boundary.

Bt1—25 to 30 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium angular blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; many very fine, fine, and medium tubular pores; few thin clay films bridging sand grains; neutral; abrupt wavy boundary.

Bt2—30 to 36 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; neutral; abrupt wavy boundary.

Bqm—36 to 40 inches; light brown (7.5YR 6/4), indurated duripan, brown (7.5YR 4/4) moist; light reddish brown (5YR 6/4), indurated laminar bands, reddish brown (5YR 4/4) moist; common fine black (N 2/0) iron and manganese stains; abrupt wavy boundary.

BCq—40 to 60 inches; reddish yellow (5YR 6/6), weakly cemented sandy loam, yellowish red (5YR 5/6) moist; massive; very hard and dense, brittle, nonsticky and nonplastic; strongly cemented laminar bands in vertical cracks; neutral.

Depth to the duripan is 20 to 40 inches. The duripan is underlain by dense, weakly cemented layers that crush to sandy loam.

The A horizon has color of 7.5YR 5/4, 5/6, or 6/4 or 10YR 5/2, 5/3, or 6/3. When moist, it has color of 7.5YR 4/4 or 10YR 3/3 or 4/3. It is sandy loam or fine sandy loam. Reaction is moderately acid or slightly acid.

The BAt horizon has color of 7.5YR 5/4 or 6/4 or 10YR 5/3. When moist, it has color of 7.5YR 4/4 or 10YR 3/4. It is sandy loam or fine sandy loam. Reaction is slightly acid or neutral.

The Bt horizon has color of 7.5YR 4/4, 5/4, or 6/4. When moist, it has color of 5YR 4/4 or 7.5YR 4/4. It is loam, sandy clay loam, or clay loam. The content of clay is 18 to 30 percent. Reaction is slightly acid or neutral.

The Bqm horizon has color of 5YR 4/4, 5/4, 5/6, or 6/6 or 7.5YR 6/4 or 6/6. When moist, it has color of 5YR 4/4 or 4/6 or 7.5YR 4/4. It is strongly cemented or indurated.

The BCq horizon has the same colors as the Bqm horizon. It consists of weakly cemented or moderately cemented sediments that are dense and brittle, but it is not a duripan. The sediments crush to sandy loam or coarse sandy loam.

Ryde Series

The Ryde series consists of very poorly drained soils on flood plains and deltas. These soils are artificially drained. They are very deep. They formed in hydrophytic plant remains and in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Ryde series are fine-loamy, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Ryde clay loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 53 minutes 41 seconds N. and long. 121 degrees 26 minutes 21

seconds W., in an unsectionized area of the Holt quadrangle:

Ap—0 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong coarse granular structure; hard, friable, sticky and plastic; strongly acid; clear smooth boundary.

A—8 to 24 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; few fine prominent reddish yellow (7.5YR 6/6 and 6/8), brown (7.5YR 4/4), and strong brown (7.5YR 4/6) mottles when moist; moderate coarse subangular blocky structure; extremely hard, firm, sticky and plastic; many fine roots; common tubular pores; strongly acid; abrupt wavy boundary.

2Ab—24 to 32 inches; very dark gray (10YR 3/1) mucky clay loam, black (10YR 2/1) moist; common fine distinct dark brown (7.5YR 3/4) and strong brown (7.5YR 4/6) mottles when moist; massive; slightly hard, firm, sticky and nonplastic; many fine roots; common very fine tubular pores; very strongly acid; clear wavy boundary.

2Cg—32 to 63 inches; very dark gray (N 3/0) and dark grayish brown (2.5Y 4/2), stratified silty clay loam and muck, black (N 2/0) and very dark grayish brown (2.5Y 3/2) moist; few fine prominent dark brown (7.5YR 3/4), brown (7.5YR 4/4), and strong brown (7.5YR 4/6) mottles when moist; massive; hard, firm, sticky and plastic; very strongly acid.

The depth to distinct or prominent mottles is 8 to 20 inches. By weighted average, the content of organic matter is 10 to 30 percent in the 10- to 40-inch control section. Subhorizons with 27 to 35 percent clay and less than 10 percent organic matter are in the control section.

The A horizon has color of 10YR 4/1, 5/1, or 5/2 or 5Y 4/1 or 5/2. When moist, it has color of 10YR 3/1 or 3/2 or 5Y 2/1 or 3/2. It is clay loam or silty clay loam. Reaction is strongly acid to neutral.

The 2Ab horizon, if it occurs, has color of N 3/0, 10YR 3/1, or 2.5Y 4/2. When moist, it has color of N 2/0, 10YR 2/1, or 2.5Y 3/2. It is mucky clay loam, mucky silty clay loam, or mucky loam. Reaction is very strongly acid to moderately acid.

The 2Cg horizon has color of N 2/0, 3/0, or 4/0; 10YR 3/1, 4/1, 5/1, or 7/1; or 2.5Y 3/2, 4/2, 5/2, or 7/2. When moist, it has color of N 2/0; 10YR 2/1, 3/1, 3/2, 4/1, or 4/2; 2.5Y 2/2, 3/2, or 4/2; or 5Y 2/1, 3/1, 4/1, or 4/2. It is stratified silty clay loam, loam, or clay loam. Reaction is very strongly acid to moderately acid. Some pedons have lenses of muck or layers of ash (burned peat) ½ inch to 5 inches thick.

Some pedons have stratified fine sandy loam, sandy loam, loamy fine sand, loamy sand, sand, muck, or mucky peat below a depth of 40 inches. Reaction is very strongly acid to mildly alkaline in these layers.

Sailboat Series

The Sailboat series consists of somewhat poorly drained soils on flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Sailboat series are fine-loamy, mixed, nonacid, thermic Aquic Xerofluvents.

Typical pedon of Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded; 1,900 feet north and 3,050 feet west of the southeast corner of sec. 35, T. 5 N., R. 6 E., Lodi North quadrangle:

A—0 to 8 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; common fine distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/4) moist; strong medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine tubular and interstitial pores; slightly acid; abrupt wavy boundary.

C1—8 to 15 inches; variegated grayish brown (10YR 5/2) and brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; common fine distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, sticky and plastic; many very fine and common fine roots; many very fine and few fine tubular pores; neutral; abrupt smooth boundary.

C2—15 to 23 inches; variegated gray (10YR 5/1) and grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; common fine distinct yellowish brown (10YR 5/4) mottles, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and few fine roots; many very fine and few fine tubular pores; neutral; abrupt smooth boundary.

Ab—23 to 38 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; common fine distinct brownish yellow (10YR 6/6) and light yellowish brown (2.5Y 6/4) mottles, dark brown (10YR 3/3) moist; massive; hard, friable, sticky and plastic; many very fine and few fine roots; common very fine and few fine tubular pores; many very fine dark gray (10YR 4/1) silt lenses; slightly effervescent; moderately alkaline; clear smooth boundary.

C'1—38 to 49 inches; brown (10YR 5/3) silty clay loam,

dark grayish brown (10YR 4/2) moist; common fine distinct strong brown (7.5YR 5/6) and dark brown (7.5YR 4/2) mottles, dark brown (10YR 3/3) moist; massive; very hard, firm, sticky and plastic; many very fine and few fine roots; common very fine and few fine tubular pores; many very dark gray (10YR 4/1) silt lenses; moderately alkaline; abrupt smooth boundary.

C′2—49 to 61 inches; pale brown (10YR 6/3) and brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; common fine distinct strong brown (7.5YR 5/6) and dark brown (7.5YR 4/2) mottles, dark brown (10YR 3/3) moist; massive; extremely hard, very firm, sticky and plastic; common very fine roots; common very fine and few fine tubular pores; moderately alkaline.

The content of clay in the 10- to 40-inch control section is 18 to 35 percent. These soils have distinct or prominent mottles.

The A horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3. When moist, it has color of 10YR 4/2 or 4/3. The content of clay is 15 to 27 percent. Reaction is slightly acid or neutral.

The Ab horizon has color of 10YR 4/1, 5/1, or 5/2. When moist, it has color of 10YR 3/1, 3/2, or 4/1. Texture is loam, clay loam, or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

The C and C′ horizons have color of 10YR 4/2, 4/3, 5/1, 5/2, 5/3, or 6/3. When moist, they have color of 10YR 3/1, 3/2, 3/3, 4/2, 4/3, or 4/4. They are stratified sandy loam, silt loam, loam, clay loam, or silty clay loam. The C horizon is neutral or mildly alkaline. The C′ horizon is mildly alkaline or moderately alkaline.

San Joaquin Series

The San Joaquin series consists of moderately well drained soils on low terraces and dissected terraces. These soils are moderately deep to a hardpan (fig. 12). They formed in alluvium derived from dominantly granitic rock sources. Slope ranges from 0 to 8 percent.

Soils of the San Joaquin series are fine, mixed, thermic Abruptic Durixeralfs.

Typical pedon of San Joaquin loam, 0 to 2 percent slopes; 1,700 feet north and 2,600 feet east of the southwest corner of sec. 3, T. 4 N., R. 6 E., Lodi North quadrangle:

Ap—0 to 6 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular and interstitial and few fine tubular pores; few very dark gray (10YR 3/1) iron and manganese concretions and stains; neutral; clear wavy boundary.

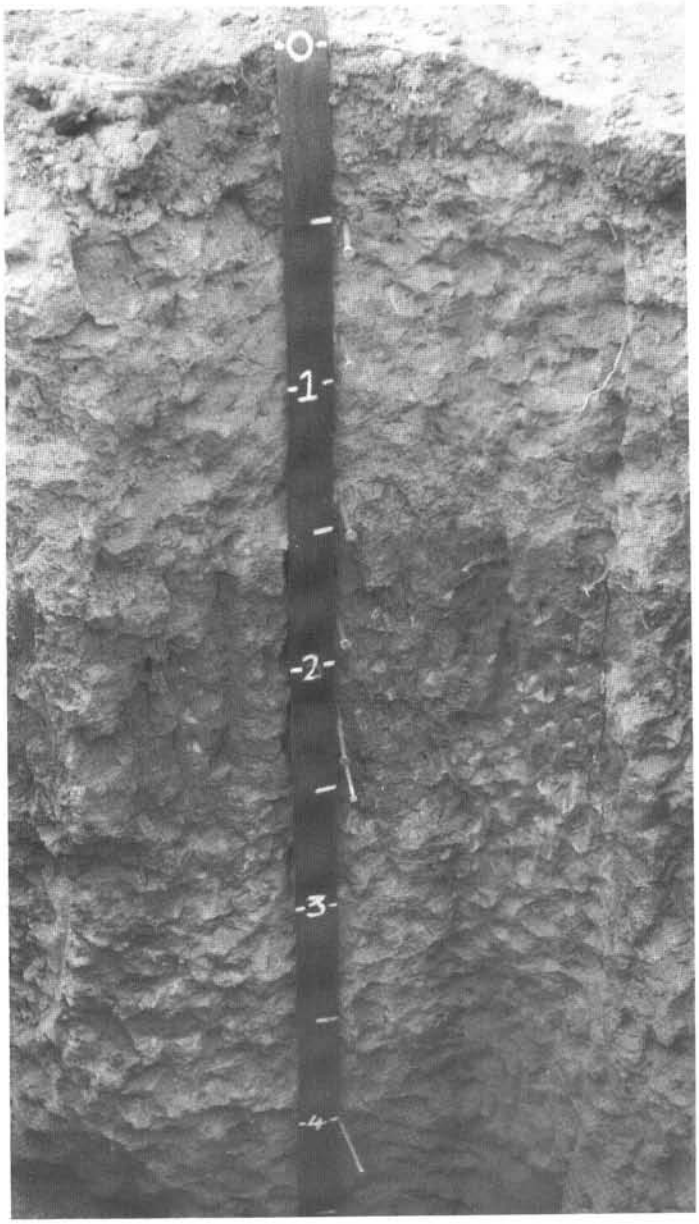

Figure 12.—Profile of a San Joaquin loam. A claypan is at a depth of 16 inches, and a duripan is at a depth of 26 inches. Both layers restrict root penetration and water movement. Depth is marked in feet.

Bt1—6 to 10 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular and common very fine

interstitial pores; few thin clay films on faces of peds and bridging mineral grains; very dark gray (10YR 3/1) iron and manganese concretions and stains; moderately acid; clear wavy boundary.

Bt2—10 to 16 inches; brown (7.5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; many very fine and few fine tubular and common very fine interstitial pores; few thin clay films on faces of peds and common thin clay films bridging mineral grains; common light gray (10YR 7/2) fine sand or silt grains on faces of peds and lining pores; few fine very dark gray (10YR 3/1) iron and manganese concretions; moderately acid; abrupt wavy boundary.

2Bt3—16 to 21 inches; brown (7.5YR 5/4) clay, strong brown (7.5YR 4/6) moist; moderate medium prismatic structure; extremely hard, firm, sticky and very plastic; few very fine, fine, and medium roots; common very fine tubular and few very fine interstitial pores; common moderately thick clay films on faces of peds and many thin clay films bridging mineral grains; common slickensides that do not intersect; about 3 percent fine very dark gray (10YR 3/1) iron and manganese concretions; neutral; gradual wavy boundary.

2Bt4—21 to 26 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; moderate medium prismatic structure; extremely hard, firm, sticky and plastic; few very fine, fine, and medium roots; common very fine tubular and few very fine interstitial pores; common moderately thick clay films on faces of peds and common thin clay films bridging mineral grains; about 3 percent very dark gray (10YR 3/1) iron and manganese concretions and stains; neutral; abrupt wavy boundary.

2Bqm1—26 to 29 inches; variegated brown (7.5YR 5/4) and light brown (7.5YR 6/4) duripan, brown (7.5YR 4/4) moist; extremely hard and brittle; silica and sesquioxide cementation in more than 90 percent of the matrix; few fine iron and manganese concretions; common very fine closed tubular pores; strongly effervescent; segregated lime in fractures; moderately alkaline; gradual smooth boundary.

2Bqm2—29 to 48 inches; variegated brown (7.5YR 5/4) and strong brown (7.5YR 4/6) duripan, dark brown (7.5YR 3/4) moist; extremely hard and brittle; silica and sesquioxide cementation in more than 90 percent of the matrix; common very fine closed tubular pores; common fine iron and manganese concretions and stains; strongly effervescent; segregated lime in fractures; moderately alkaline; clear wavy boundary.

2Bq—48 to 60 inches; brown (7.5YR 5/4) duripan, dark brown (7.5YR 3/4) moist; extremely hard and brittle; silica and sesquioxide cementation in 70 to 90 percent of the matrix; many very fine interstitial pores; common fine iron and manganese concretions; moderately alkaline.

Depth to the duripan is 20 to 40 inches.

The A horizon has color of 7.5YR 5/2, 5/4, 6/2, or 6/4 or 10YR 4/3, 5/3, 6/3, or 6/4. When moist, it has color of 7.5YR 3/4, 4/2, 4/4, or 5/2 or 10YR 3/3, 4/3, 5/3, or 5/4. It is sandy loam or loam. Reaction generally is moderately acid or slightly acid but may be neutral in areas that have been limed.

The Bt horizon has color of 5YR 5/6 or 7.5YR 5/4, 5/6, or 6/6. When moist, it has color of 5YR 4/4 or 7.5YR 4/4. It is sandy clay loam or loam. Reaction is moderately acid to neutral.

The 2Bt horizon has color of 2.5YR 3/4, 4/4, 4/6, 4/8, or 5/4; 5YR 3/3, 3/4, 4/3, 4/4, 4/6, 5/4, 5/6, or 5/8; or 7.5YR 4/6, 5/2, 5/4, 5/6, 6/4, or 6/6. When moist, it has color of 7.5YR 4/2, 4/4, 4/6, 5/4, or 5/6; 5YR 3/3, 4/4, or 4/6; or 2.5YR 3/4, 4/4, 3/6, or 4/6. It is clay loam or clay. Reaction is slightly acid to mildly alkaline.

The duripan has color of 5YR 3/3, 4/3, 5/6, or 5/8; 7.5YR 4/6, 5/2, 5/4, 6/4, or 7/2; or 10YR 5/4, 5/6, or 7/3. It is indurated or strongly cemented with iron, silica, or both.

San Timoteo Series

The San Timoteo series consists of somewhat excessively drained soils on mountains. These soils are moderately deep. They formed in material weathered from sandstone or shale. Slope ranges from 30 to 75 percent.

Soils of the San Timoteo series are coarse-loamy, mixed (calcareous), thermic Typic Xerorthents.

Typical pedon of San Timoteo sandy loam, in an area of Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes; 2,500 feet north and 2,300 feet west of the southeast corner of sec. 24, T. 3 S., R. 4 E., Tracy quadrangle:

A—0 to 5 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial and common very fine and fine tubular pores; mildly alkaline; clear smooth boundary.

C1—5 to 10 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine

and few fine roots; common very fine and few fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—10 to 29 inches; light yellowish brown (10YR 6/4) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

Cr—29 inches; light brownish gray (10YR 6/2), highly fractured, medium grained sandstone with lime seams in fractures.

The depth to soft sandstone ranges from 20 to 40 inches. The content of clay is 10 to 17 percent. Reaction is mildly alkaline or moderately alkaline.

The A horizon has color of 10YR 5/2, 5/3, 6/2, 6/3, or 7/2. When moist, it has color of 10YR 4/3 or 5/3.

The C horizon has color of 10YR 6/2, 6/3, 6/4, 7/2, or 7/3 or 2.5Y 6/2. When moist, it has color of 10YR 4/3, 5/2, or 5/3.

Scribner Series

The Scribner series consists of poorly drained soils on flood plains. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Scribner series are fine-loamy, mixed, thermic Cumulic Haplaquolls.

Typical pedon of Scribner clay loam, partially drained, 0 to 2 percent slopes; lat. 37 degrees 55 minutes 22 seconds N. and long. 121 degrees 20 minutes 39 seconds W., in an unsectionized area of the Stockton West quadrangle:

Ap—0 to 11 inches; dark gray (5Y 4/1) clay loam, very dark gray (5Y 3/1) moist; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and common fine roots; common very fine tubular and interstitial pores; neutral; clear wavy boundary.

A—11 to 24 inches; dark gray (5YR 4/1) clay loam, very dark gray (5Y 3/1) moist; common fine distinct dark grayish brown (10YR 4/2) mottles when moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular and interstitial and common fine tubular pores; neutral; abrupt wavy boundary.

C1—24 to 32 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 4/2) moist; many fine distinct dark yellowish brown (10YR 4/4) mottles when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular and common very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

C2—32 to 42 inches; light olive gray (5Y 6/2) loam, olive gray (5Y 4/2) moist; common medium distinct dark yellowish brown (10YR 4/4) mottles when moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few fine tubular and common very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

C3—42 to 49 inches; gray (5Y 6/1) silty clay loam, dark gray (5Y 4/1) moist; many fine distinct dark brown (10YR 3/3) mottles when moist; massive; hard, friable, sticky and plastic; few very fine roots; many very fine and few fine tubular and few very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

2Ab—49 to 58 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2/1) moist; many fine faint dark olive gray (5Y 3/2) mottles when moist; massive; hard, friable, sticky and plastic; few very fine roots; many very fine tubular and few very fine interstitial pores; mildly alkaline; abrupt wavy boundary.

3C—58 to 62 inches; gray (5Y 6/1) loam, dark gray (5Y 4/1) moist; many fine faint olive (5Y 4/3) mottles when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few fine tubular pores; mildly alkaline.

The A horizon is 24 to more than 40 inches thick. It has distinct or prominent mottles in the lower part.

The Ap horizon has color of 10YR 3/1 or 4/1 or 5Y 4/1, 4/2, or 5/1. When moist, it has color of 10YR 2/1 or 3/1 or 5Y 3/1 or 3/2. Reaction is slightly acid to mildly alkaline.

The lower part of the A horizon and the Ab horizon have color of N 2/0; 10YR 3/1, 4/1, 4/2, 5/1, or 5/2; 2.5Y 4/2; or 5Y 3/1, 4/1, 4/2, or 5/1. When moist, they have color of N 2/0; 10YR 2/1, 3/1, or 3/2; 2.5Y 3/2; or 5Y 2/1, 3/1, or 3/2. They are clay loam or silty clay loam stratified with silt loam. Reaction is neutral to moderately alkaline.

The C horizon has color of 10YR 5/1 or 6/1, 2.5Y 6/2, or 5Y 6/1 or 6/2. When moist, it has color of 10YR 4/1, 4/2, or 5/1; 2.5Y 4/2; or 5Y 4/1 or 4/2. It is dominantly stratified silt loam, loam, or silty clay loam. In some areas, however, it is stratified fine sand, sand, or loamy sand below a depth of 40 inches. Reaction is neutral to moderately alkaline.

Shima Series

The Shima series consists of very poorly drained soils on deltas. These soils are artificially drained. They

are very deep. They formed in the highly decomposed remains of reeds and tules underlain by alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Shima series are sandy or sandy-skeletal, mixed, euic, thermic Terric Medisaprists.

Typical pedon of Shima muck, partially drained, 0 to 2 percent slopes; lat. 38 degrees 00 minutes 25 seconds N. and long. 121 degrees 24 minutes 19 seconds W., in an unsectionized area of the Terminous quadrangle:

Oap—0 to 8 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, very dark gray (10YR 3/1) dry; less than 5 percent tule and reed fibers before rubbing and none after rubbing; weak fine granular structure; slightly hard, loose, nonsticky and nonplastic; very strongly acid; gradual smooth boundary.

Oa—8 to 21 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, very dark gray (10YR 3/1) dry; less than 5 percent tule and reed fibers before rubbing and none after rubbing; weak coarse prismatic and weak fine granular structure; soft, very friable, nonsticky and nonplastic; very strongly acid; clear wavy boundary.

2C1—21 to 23 inches; mucky clay loam, black (10YR 2/1) moist, very dark gray (10YR 3/1) dry; many medium prominent yellowish red (5YR 4/8) mottles when moist; massive; slightly hard, firm, sticky and plastic; few fine roots; common fine tubular pores; neutral; abrupt smooth boundary.

3C2—23 to 39 inches; loamy sand, light olive brown (2.5Y 5/4) moist, light brownish gray (2.5Y 6/2) dry; many medium prominent reddish brown (5YR 5/4) and dark gray (N 4/0) mottles when moist; massive; loose, nonsticky and nonplastic; few fine roots; many very fine interstitial pores; slightly effervescent; few fine soft masses of lime; mildly alkaline; abrupt smooth boundary.

3C3—39 to 60 inches; loamy sand, olive brown (2.5Y 4/4) moist, light yellowish brown (2.5Y 6/4) dry; many medium distinct dark gray (N 4/0) and reddish brown (5YR 4/4) mottles when moist; massive; loose, nonsticky and nonplastic; many very fine interstitial pores; moderately alkaline.

The typical pedon has a layer of ashy material (burned peat) ½ inch to 1½ inches thick between the Oa and 2C1 horizons. This layer is brown (7.5YR 4/4) and has many medium prominent yellowish red (5YR 4/8) mottles. It is slightly acid.

The depth to mineral material ranges from 17 to 36 inches. The content of organic matter in the organic layers typically is 40 to 55 percent but ranges from 40 to 65 percent. The content of fibers ranges from a trace to 40 percent before rubbing and from a trace to 10 percent after rubbing.

The Oa horizon has color of 10YR 3/1 or 4/1. When moist, it has color of N 2/0 or 10YR 2/1. The upper part is 40 to 50 percent organic matter and has a trace to 5 percent fibers after rubbing. Reaction is very strongly acid to slightly acid in undried layers.

The 2C horizon is mucky clay loam or mucky silty clay. Reaction is very strongly acid to neutral.

The 3C horizon has color of 2.5Y 6/2 or 6/4. When moist, it has color of 2.5Y 4/4 or 5/4. It is sand or loamy sand. Reaction is very strongly acid to moderately alkaline.

Shinkee Series

The Shinkee series consists of very poorly drained soils on deltas. These soils are artificially drained. They are very deep. They formed in the highly decomposed remains of reeds and tules underlain by alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Shinkee series are loamy, mixed, euic, thermic Terric Medisaprists.

Typical pedon of Shinkee muck, partially drained, 0 to 2 percent slopes; lat. 37 degrees 53 minutes 12 seconds N. and long. 121 degrees 29 minutes 42 seconds W., in an unsectionized area of the Holt quadrangle:

Oap—0 to 10 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, dark gray (10YR 4/1) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; strongly acid; gradual smooth boundary.

Oa—10 to 22 inches; muck, black (10YR 2/1) moist, black (10YR 2/1) rubbed, very dark gray (10YR 3/1) dry; 20 percent tule and reed fibers, less than 5 percent rubbed; weak thick platy structure; slightly hard, friable, slightly sticky and nonplastic; many fine and medium roots; strongly acid; clear wavy boundary.

2Cg1—22 to 26 inches; mucky clay loam, very dark grayish brown (2.5Y 3/2) moist, dark grayish brown (2.5Y 4/2) dry; few fine prominent dark red (2.5YR 3/6) and dark reddish brown (2.5YR 3/4) mottles when moist, yellowish red (5YR 4/6) dry; massive; hard, firm, slightly sticky and plastic; many fine roots; few very fine tubular pores; slightly acid; abrupt wavy boundary.

3Cg2—26 to 60 inches; fine sandy loam, dark grayish brown (2.5Y 4/2) moist, dark grayish brown (2.5Y

5/2) dry; common medium prominent dark red (2.5YR 3/6) mottles when moist, yellowish red (5YR 4/6) dry; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; few very fine tubular pores; strongly acid.

The depth to mineral material ranges from 20 to 35 inches. As determined by the combustion method, the content of organic matter in the Oa horizon typically is 40 to 55 percent, by weight, but ranges from 35 to 65 percent. The content of fibers ranges from a trace to 40 percent before rubbing and from a trace to 10 percent after rubbing. The content of clay in the underlying mineral material ranges from 15 to 35 percent.

The Oa horizon has color of 10YR 3/1 or 4/1. When moist, it has color of N 2/0 or 10YR 2/1. The upper part is 35 to 50 percent organic matter and has less than 5 percent fibers after rubbing. It has weak to strong granular structure. The lower part is 40 to 65 percent organic matter and has a trace to 10 percent fibers after rubbing. Reaction is strongly acid to slightly acid throughout the Oa horizon.

The 2Cg horizon has color of 2.5Y 3/4 or 5Y 4/6. When moist, it has color of 2.5Y 3/2. It is mucky clay loam or mucky silty clay loam. Reaction is strongly acid to moderately alkaline.

The 3Cg horizon has color of 2.5Y 4/2, 5/2, or 6/2 or 5Y 5/2, 5/3, 6/2, or 6/3. When moist, it has color of 2.5Y 3/2, 4/2, or 5/2 or 5Y 3/2, 4/2, 4/3, 5/2, or 5/3. It has distinct or prominent, fine or medium mottles. This horizon is stratified fine sandy loam, very fine sandy loam, silt loam, or silty clay loam. Reaction is strongly acid to moderately alkaline.

Stockton Series

The Stockton series consists of somewhat poorly drained soils in basins. These soils are artificially drained. They are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Stockton series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Stockton clay, 0 to 2 percent slopes; lat. 37 degrees 56 minutes 33 seconds N. and long. 121 degrees 11 minutes 17 seconds W., in an unsectionized area of the Stockton East quadrangle:

Ap—0 to 7 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; very hard, firm, very sticky and plastic; few fine roots; many very fine interstitial and few very fine tubular pores; mildly alkaline; clear smooth boundary.

A1—7 to 15 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; many very fine tubular pores and common very fine interstitial pores; few fine black (10YR 2/1) manganese concretions; moderately alkaline; gradual wavy boundary.

A2—15 to 22 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; massive; very hard, firm, very sticky and plastic; few very fine roots; many very fine tubular and common very fine interstitial pores; intersecting slickensides; few fine black (10YR 2/1) manganese concretions; moderately alkaline; gradual wavy boundary.

A3—22 to 29 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; massive; very hard, firm, very sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; intersecting slickensides; few fine black (10YR 2/1) manganese concretions; moderately alkaline; gradual wavy boundary.

Bk1—29 to 37 inches; dark gray (10YR 4/1) clay, dark gray (10YR 4/1) moist; massive; very hard, firm, very sticky and plastic; few very fine roots; common very fine tubular and interstitial pores; intersecting slickensides; few fine black (10YR 2/1) manganese concretions; strongly effervescent; disseminated lime and few fine soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk2—37 to 42 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; many very fine tubular and interstitial pores; intersecting slickensides; few fine black (10YR 2/1) manganese concretions; violently effervescent; disseminated lime and few fine and medium soft masses of lime; moderately alkaline; gradual wavy boundary.

Bkqm1—42 to 45 inches; variegated dark grayish brown (10YR 4/2) and dark brown (10YR 4/3), weakly cemented duripan, dark grayish brown (10YR 4/2) moist; massive; brittle; strongly cemented laminar cap; 50 to 75 percent silica cementation within the matrix; violently effervescent; few fine seams of lime; moderately alkaline; gradual smooth boundary.

Bkqm2—45 to 60 inches; variegated dark grayish brown (10YR 4/2) and brown (10YR 4/3), strongly cemented duripan, dark brown (10YR 4/3) moist; massive; brittle; 70 to 85 percent silica cementation within the matrix; violently effervescent; few fine seams of lime; moderately alkaline.

Depth to the duripan ranges from 40 to 60 inches.

The A horizon has color of N 3/0, 4/0, or 5/0 or 10YR 3/1, 4/1, or 5/1. When moist, it has color of N 3/0 or 2/0 or 10YR 2/1 or 3/1. It has iron or manganese concretions in most pedons. Reaction is mildly alkaline or moderately alkaline. Areas adjacent to streams or sloughs have overwash of stratified fine sandy loam or silty clay loam.

The Bk horizon has color of 10YR 4/1, 5/1, 5/2, or 6/2. When moist, it has color of 10YR 4/1, 4/2, or 5/2. Texture is clay or silty clay in the upper part and clay loam or silty clay loam in the lower part. Reaction is mildly alkaline or moderately alkaline. This horizon has soft masses or seams of lime.

The Bkqm horizon has color of 10YR 4/2, 4/3, 4/4, 5/4, or 5/6. When moist, it has color of 10YR 4/2, 4/3, 4/4, 5/2, or 5/4. It is strongly cemented in the laminar cap and weakly cemented to strongly cemented below the cap. It has soft masses or seams of lime.

Stomar Series

The Stomar series consists of well drained soils on alluvial fans. In some areas these soils are irrigated. They are very deep. They formed in alluvium derived from sedimentary rock sources. Slope ranges from 0 to 2 percent.

Soils of the Stomar series are fine, montmorillonitic, thermic Mollic Haploxeralfs.

Typical pedon of Stomar clay loam, 0 to 2 percent slopes; 800 feet north and 400 feet west of the southeast corner of sec. 28, T. 2 S., R. 5 E., Tracy quadrangle:

Ap—0 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, sticky and plastic; few very fine and common fine roots; few very fine tubular pores; neutral; clear smooth boundary.

A—8 to 17 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, sticky and plastic; common very fine and fine roots; few very fine and fine tubular pores; neutral; gradual smooth boundary.

Bt—17 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine and few very fine roots; common very fine and fine tubular pores; few thin clay films on faces of peds and lining pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

Btk1—26 to 36 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine and few very fine roots; common very fine and fine tubular pores; common thin clay films on faces of peds and lining pores; strongly effervescent; disseminated lime and few medium soft masses and seams of lime; moderately alkaline; gradual wavy boundary.

Btk2—36 to 47 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; very hard, friable, very sticky and plastic; few very fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds and lining pores; violently effervescent; common medium seams and soft masses of lime; moderately alkaline; gradual wavy boundary.

Btk3—47 to 60 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, very sticky and plastic; few very fine roots; many very fine tubular pores; fine thin clay films on faces of peds; strongly effervescent; common medium seams of lime; moderately alkaline.

The A horizon has color of 10YR 4/1, 4/2, 5/2, or 5/3. When moist, it has color of 10YR 3/1, 3/2, or 3/3.

The Bt horizon has color of 10YR 4/2, 5/2, 5/3, or 6/3. When moist, it has color of 10YR 3/3, 4/2, or 4/3. Texture is clay loam or clay. Reaction is neutral to moderately alkaline.

The Btk horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 10YR 3/3, 4/3, 4/4, 5/3, or 5/4. Texture is clay, clay loam, or silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Timor Series

The Timor series consists of moderately well drained soils on low fan terraces or alluvial fans. These soils are deep to a hardpan. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Timor series are sandy, mixed, thermic Entic Haploxerolls.

Typical pedon of Timor loamy sand, 0 to 2 percent slopes; 1,200 feet south and 500 feet west of the northeast corner of sec. 2, T. 2 S., R. 6 E., Lathrop quadrangle:

Ap—0 to 14 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; neutral; clear smooth boundary.

A—14 to 31 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; neutral; clear wavy boundary.

Bk—31 to 56 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; common medium distinct light brown (7.5YR 6/4) mottles, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; strongly effervescent; few fine soft masses and seams of lime; moderately alkaline; abrupt wavy boundary.

2Bkqm—56 to 60 inches; light gray (10YR 7/2), strongly cemented duripan, grayish brown (2.5Y 5/2) moist; common medium distinct reddish yellow (7.5YR 6/6) mottles, dark brown (7.5YR 4/4) moist; massive; brittle; continuous indurated laminar cap 1 to 2 millimeters thick; strongly cemented in 75 percent of the matrix; strongly effervescent; common fine soft masses of lime; moderately alkaline.

Depth to the duripan is 40 to 60 inches. The depth to distinct and prominent mottles is 30 to 48 inches.

The A horizon has color of 10YR 5/2, 5/3, 4/2, or 4/3. When moist, it has color of 10YR 2/2, 3/2, or 3/3. It is neutral or mildly alkaline.

The Bk horizon has color of 10YR 4/4, 5/3, 5/4, 6/2, 6/3, or 6/4. When moist, it has color of 10YR 5/4, 5/3, 4/4, 4/3, 4/2, or 3/3. It is mildly alkaline or moderately alkaline.

The 2Bkqm horizon has color of 10YR 7/3, 7/2, 7/1, 6/2, or 6/1. When moist, it has color of 10YR 5/2 or 2.5Y 5/2.

Tinnin Series

The Tinnin series consists of well drained soils on low fan terraces and alluvial fans. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Tinnin series are sandy, mixed, thermic Entic Haploxerolls.

Typical pedon of Tinnin loamy coarse sand, 0 to 2 percent slopes; 450 feet north and 500 feet west of the southeast corner of sec. 13, T. 2 S., R. 6 E., Lathrop quadrangle:

Ap—0 to 14 inches; grayish brown (10YR 5/2) loamy coarse sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; 2 percent rounded pebbles; mildly alkaline; diffuse smooth boundary.

A—14 to 28 inches; grayish brown (10YR 5/2) loamy coarse sand, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; 2 percent rounded pebbles; neutral; diffuse wavy boundary.

C1—28 to 53 inches; brown (10YR 5/3) loamy coarse sand, dark brown (10YR 4/3) moist; common medium distinct light brown (7.5YR 6/4) mottles, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; 2 percent rounded pebbles; slightly acid; diffuse wavy boundary.

C2—53 to 75 inches; pale brown (10YR 6/3) loamy coarse sand, brown (10YR 5/3) moist; common medium distinct light brown (7.5YR 6/4) mottles, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine interstitial pores; 2 percent rounded pebbles; neutral.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 10YR 2/2, 3/2, or 3/3. It is loamy coarse sand or loamy sand. The content of gravel is 0 to 5 percent. This horizon has 1 to 3 percent organic matter. Reaction is slightly acid to mildly alkaline.

The C horizon has color of 10YR 4/4, 5/3, 5/4, 6/2, 6/3, 6/4, 7/2, 7/3, or 7/4. When moist, it has color of 10YR 3/3, 3/4, 4/2, 4/3, 4/4, 5/3, or 5/4. Texture is loamy coarse sand, loamy sand, or sand. The content of gravel is 0 to 15 percent. This horizon is slightly acid to mildly alkaline in the upper part and neutral to moderately alkaline in the lower part.

Tokay Series

The Tokay series consists of well drained soils on low fan terraces. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Tokay series are coarse-loamy, mixed, thermic Typic Haploxerolls.

Typical pedon of Tokay fine sandy loam, 0 to 2 percent slopes; 1,275 feet north and 2,600 feet east of the southwest corner of sec. 6, T. 3 N., R. 6 E., Lodi North quadrangle:

Ap1—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure;

slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular and interstitial pores; slightly acid; abrupt wavy boundary.

Ap2—4 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine, medium, and coarse roots; many very fine and few fine tubular and interstitial pores; slightly acid; clear wavy boundary.

A—12 to 19 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and medium and few fine and coarse roots; many very fine and few fine tubular and interstitial pores; slightly acid; clear wavy boundary.

BA—19 to 26 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine and few fine tubular and interstitial pores; slightly acid; clear wavy boundary.

Bt1—26 to 38 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine tubular and interstitial pores; few thin clay films bridging mineral grains; neutral; gradual wavy boundary.

Bt2—38 to 45 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine tubular and interstitial pores; few thin clay films bridging mineral grains; neutral; clear wavy boundary.

C—45 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; very hard, friable, nonsticky and nonplastic; common very fine tubular and interstitial pores; mildly alkaline.

The A horizon has color of 7.5YR 5/2, 10YR 5/2 or 5/3, or 2.5Y 5/2. When moist, it has color of 7.5YR 3/2, 10YR 3/2 or 3/3, or 2.5Y 3/2. Reaction generally is slightly acid to mildly alkaline, but the range includes strongly acid and moderately acid as a result of long-term applications of sulfur for the control of disease.

Some pedons have a Bw horizon. The Bt and Bw horizons have color of 7.5YR 6/4 or 10YR 5/3, 6/3, 6/4, or 7/3. When moist, they have color of 7.5YR 3/4 or 4/4 or 10YR 4/3 or 4/4. They are sandy loam or fine sandy loam. Reaction is slightly acid to moderately alkaline.

The C horizon has color of 10YR 5/4, 6/2, 6/3, 6/4, 7/2, or 7/4. When moist, it has color of 10YR 3/4, 4/2, 4/3, 4/4, or 5/4. Texture is sandy loam, coarse sandy loam, or fine sandy loam. Reaction is slightly acid to moderately alkaline.

Toomes Series

The Toomes series consists of well drained soils on the ridges and plateaus of volcanic flows. These soils are very shallow and shallow. They formed in material weathered from hard, andesitic tuff breccia. About 2 percent of the surface is covered with stones. Slope ranges from 2 to 15 percent.

Soils of the Toomes series are loamy, mixed, thermic Lithic Ruptic-Xerorthentic Xerochrepts.

Typical pedon of Toomes loam, in an area of Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes; 600 feet south and 1,530 feet east of the northwest corner of sec. 5, T. 4 N., R. 9 E., Clements quadrangle:

A—0 to 5 inches; pale brown (10YR 6/3) loam, dark brown (7.5YR 3/4) moist; common medium distinct strong brown (7.5YR 5/6) root stains, strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; hard, friable, nonsticky and slightly plastic; many very fine roots; few very fine interstitial and common very fine tubular pores; 10 percent gravel; slightly acid; clear smooth boundary.

Bw1—5 to 11 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine interstitial and many very fine tubular pores; 10 percent gravel; slightly acid; clear wavy boundary.

Bw2—11 to 15 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and tubular pores; few thin clay films on faces of peds; 10 percent gravel and 5 percent cobbles; slightly acid; abrupt wavy boundary.

R—15 inches; light gray (10YR 7/1), hard, andesitic tuff breccia, grayish brown (10YR 5/2) moist.

The depth to hard bedrock is 4 to 20 inches. The content of gravel, cobbles, and boulders is 5 to 15 percent in individual horizons but averages 10 to 15 percent throughout the solum. Reaction is slightly acid or neutral.

The A horizon has color of 7.5YR 5/4 or 10YR 5/4 or 6/3. When moist, it has color of 7.5YR 3/4 or 10YR 3/4.

The Bw horizon has color of 7.5YR 5/4 or 6/4. When moist, it has color of 7.5YR 3/4 or 4/4.

Trahern Series

The Trahern series consists of somewhat poorly drained, sodic soils on low terraces. These soils are artificially drained. They are moderately deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Trahern series are fine, montmorillonitic, thermic Natric Duraquolls.

Typical pedon of Trahern clay loam, partially drained, 0 to 2 percent slopes; 475 feet south and 150 feet east of the northwest corner of sec. 5, T. 3 S., R. 7 E., Ripon quadrangle:

Ap—0 to 7 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial and few very fine tubular pores; mildly alkaline; clear smooth boundary.

A—7 to 14 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common fine distinct brown (10YR 5/3) mottles, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; few very fine tubular and interstitial pores; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

Btn1—14 to 20 inches; variegated light brownish gray (10YR 6/2) and gray (10YR 6/1) clay, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular and few fine interstitial pores; common thin clay films on faces of peds and lining pores; light gray (10YR 7/1) uncoated sand grains occurring as coatings less than 2 millimeters thick on the tops and sides of some peds in the upper part of the horizon; slightly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

Btn2—20 to 28 inches; variegated pale brown (10YR 6/3) and light brownish gray (10YR 6/2) clay, brown (10YR 4/3) and dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular and few fine tubular and interstitial pores; many thin clay films on faces of peds and lining pores; slightly effervescent; disseminated lime; strongly alkaline; gradual wavy boundary.

Btn3—28 to 33 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, friable, very sticky and plastic; few very fine and fine roots; common very fine tubular and few fine tubular and interstitial pores; common thin clay films on faces of peds and lining pores; slightly effervescent; disseminated lime; strongly alkaline; clear wavy boundary.

Bk—33 to 38 inches; light grayish brown (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; few fine distinct light yellowish brown (10YR 6/4) mottles, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; very few very fine and fine roots; common very fine tubular and few fine tubular and interstitial pores; strongly effervescent; common fine filaments and soft masses of lime; moderately alkaline; abrupt irregular boundary.

Bkqm—38 to 60 inches; light brownish gray (2.5Y 6/2) duripan, dark grayish brown (2.5Y 4/2) moist; common fine distinct light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/6) mottles, olive brown (2.5Y 4/4) moist; moderate medium platy structure in the upper 1 to 2 inches and massive in the lower part; indurated in the upper part and strongly cemented in the lower part.

Depth to the duripan is 20 to 40 inches.

The A horizon has color of 10YR 4/1, 5/1, or 5/2. When moist, it has color of 10YR 3/1 or 3/2. It has distinct or prominent mottles in the lower part.

The Btn horizon has color of 10YR 5/3, 6/1, 6/2, or 6/3 or 2.5Y 6/2. When moist, it has color of 10YR 3/2, 3/3, 4/1, 4/2, or 4/3 or 2.5Y 4/2. It has columnar or prismatic structure in the upper part. The percentage of exchangeable sodium is 15 to 25 percent. Some part of this horizon has disseminated or segregated lime. The content of clay is 35 to 60 percent.

The Bk horizon has the same colors as the Bt horizon. It is clay loam or silty clay loam. The content of clay is 30 to 40 percent. Reaction is moderately alkaline or strongly alkaline. This horizon has disseminated or segregated lime throughout.

The Bkqm horizon has color of 10YR 6/1, 6/2, or 6/3 or 2.5Y 6/2. When moist, it has color of 10YR 4/1 or 4/2, 2.5Y 4/2, 5Y 5/1 or 5/2, or 5GY 5/2 or 6/2. This horizon has distinct or prominent mottles.

Tujunga Series

The Tujunga series consists of somewhat excessively drained soils on flood plains or in remnants of channels. These soils are very deep. They formed in alluvium derived from granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Tujunga series are mixed, thermic Typic Xeropsamments.

Typical pedon of Tujunga loamy sand, 0 to 2 percent slopes; 1,000 feet south and 1,300 feet west of the northeast corner of sec. 36, T. 4 N., R. 6 E., Lodi North quadrangle:

Ap—0 to 7 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial pores; slightly acid; abrupt smooth boundary.

A—7 to 22 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and many very fine interstitial pores; slightly acid; clear wavy boundary.

C1—22 to 28 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and many very fine interstitial pores; slightly acid; clear wavy boundary.

C2—28 to 57 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and many very fine interstitial pores; slightly acid; diffuse wavy boundary.

C3—57 to 67 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; very few very fine and fine roots; few very fine tubular and many very fine interstitial pores; mildly alkaline.

The content of gravel is 0 to 15 percent.

The A horizon has color of 10YR 5/3 or 6/2. When moist, it has color of 10YR 4/2 or 4/3. Reaction is slightly acid or neutral.

The C horizon has color of 10YR 5/3, 6/3, 6/4, or 7/2. When moist, it has color of 10YR 4/3, 4/4, or 5/3. Texture is loamy sand, sand, or fine sand. Reaction is slightly acid to mildly alkaline.

Valdez Series

The Valdez series consists of poorly drained soils on flood plains and deltas. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Valdez series are fine-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Typical pedon of Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes; lat. 38 degrees 11 minutes 15 seconds N. and long. 121 degrees 30 minutes 01 second W., in an unsectionized area of the Isleton quadrangle:

Ap—0 to 14 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; many medium distinct red (2.5YR 4/8) mottles when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine tubular and interstitial pores; moderately acid; abrupt wavy boundary.

A—14 to 18 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; many medium distinct strong brown (7.5YR 5/6) mottles, light reddish brown (2.5YR 6/4) and yellowish red (5YR 4/6) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; slightly acid; clear wavy boundary.

Cg—18 to 40 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; many medium distinct yellowish red (5YR 4/6) mottles, red (2.5YR 4/8) moist; massive; hard, friable, sticky and plastic; few very fine and fine roots; common very fine and fine tubular and interstitial pores; moderately acid; clear wavy boundary.

2C1—40 to 50 inches; dark gray (10YR 4/1) mucky silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, friable, slightly sticky and nonplastic; slightly acid; clear wavy boundary.

3C2—50 to 60 inches; very dark gray (10YR 3/1) mucky peat, black (10YR 2/1) moist; massive; slightly hard, friable, slightly sticky and nonplastic; slightly acid.

The A horizon has color of 10YR 6/2, 6/3, 7/1, or 7/2. When moist, it has color of 10YR 4/1 or 4/2 or 2.5Y 4/2. This horizon has distinct or prominent mottles. Reaction is moderately acid to neutral.

The Cg horizon has color of 10YR 6/2 or 2.5Y 6/2. When moist, it has color of 10YR 4/2 or 2.5Y 4/2. This horizon has distinct or prominent mottles. It is silt loam or silty clay loam. Reaction is slightly acid or neutral.

The 2C1 and 3C2 horizons are stratified mucky silty clay loam, mucky silt loam, muck, or mucky peat. Reaction is moderately acid to neutral.

Vallecitos Series

The Vallecitos series consists of well drained soils on mountains. These soils are shallow. They formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Soils of the Vallecitos series are clayey, montmorillonitic, thermic Lithic Ruptic-Xerochreptic Haploxeralfs.

Typical pedon of Vallecitos gravelly loam, in an area of Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes; 1,425 feet south and 600 feet west of the northeast corner of sec. 21, T. 4 S., R. 4 E., Cedar Mountain quadrangle:

A—0 to 4 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; moderate medium platy structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine interstitial and few very fine tubular pores; 25 percent gravel; neutral; abrupt wavy boundary.

Bt1—4 to 14 inches; pale brown (10YR 6/3) gravelly clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine interstitial and many very fine tubular pores; few thin clay films on faces of peds and lining pores; 25 percent gravel; neutral; abrupt wavy boundary.

Bt2—14 to 20 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine interstitial and tubular pores; common thin clay films on faces of peds and lining pores; 25 percent gravel; neutral; abrupt wavy boundary.

R—20 inches; pale brown (10YR 6/3), fractured, hard sandstone.

The depth to hard sandstone ranges from 10 to 20 inches.

The A horizon has color of 7.5YR 5/2 or 6/2 or 10YR 5/3, 5/4, or 6/3. When moist, it has color of 7.5YR 3/2 or 4/2 or 10YR 3/3, 4/2, or 4/3. The content of gravel is 15 to 25 percent.

The Bt horizon has color of 5YR 5/4, 5/6, 6/3, or 6/4; 7.5YR 5/4, 6/2, or 6/4; or 10YR 6/2 or 6/3. When moist, it has color of 5YR 4/3 or 4/4; 7.5YR 4/2 or 4/4; or 10YR 3/3, 4/2, or 4/3. It is gravelly clay loam or gravelly clay. The content of gravel is 15 to 30 percent.

Vaquero Series

The Vaquero series consists of well drained soils on mountains. These soils are moderately deep. They formed in material weathered from sandstone. Slope ranges from 8 to 50 percent.

Soils of the Vaquero series are fine, montmorillonitic, thermic Entic Chromoxererts.

Typical pedon of Vaquero clay, in an area of Vaquero-Carbona complex, 8 to 30 percent slopes; 1,150 feet south and 2,450 feet east of the northwest corner of sec. 25, T. 3 S., R. 4 E., Tracy quadrangle:

A—0 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; many very fine roots; few very fine tubular pores; few fine crystals of gypsum; mildly alkaline; abrupt wavy boundary.

Ak—10 to 21 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very coarse prismatic structure; extremely hard, firm, very sticky and very plastic; common very fine tubular pores; wedge-shaped aggregates with intersecting slickensides; few fine crystals of gypsum; slightly effervescent; common fine soft masses of lime; moderately alkaline; clear wavy boundary.

Bk—21 to 25 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong coarse subangular blocky structure; extremely hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many intersecting slickensides; few fine crystals of gypsum; slightly effervescent; common fine soft masses of lime; moderately alkaline; abrupt wavy boundary.

Cr—25 inches; light brownish gray (2.5Y 6/2) and light olive brown (2.5Y 5/4), highly fractured, calcareous sandstone that has soil in the fractures; common medium crystals of gypsum; slightly effervescent; common fine soft masses of lime; moderately alkaline.

The depth to soft sandstone ranges from 20 to 40 inches.

The A horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. When moist, it has color of 10YR 4/2 or 5/3 or 2.5Y 4/2 or 5/2. The lower part of this horizon is slightly effervescent to violently effervescent and has disseminated lime or common fine soft masses of lime. The calcium carbonate equivalent ranges from 1 to 2 percent. Reaction is neutral to moderately alkaline.

The Bk horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3 or 2.5Y 5/2 or 6/2. When moist, it has color of 10YR

4/2 or 5/3 or 2.5Y 4/2, 4/4, or 5/4. It is clay or silty clay. It is slightly effervescent or moderately effervescent. The calcium carbonate equivalent ranges from 1 to 3 percent. The percentage of exchangeable sodium is 15 to 25, and electrical conductivity is 4 to 16 millimhos per centimeter. Reaction is mildly alkaline to strongly alkaline.

Venice Series

The Venice series consists of very deep, very poorly drained soils on deltas. These soils are artificially drained. They formed in hydrophytic plant remains derived from reeds and tules and in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Venice series are euic, thermic Typic Medihemists.

Typical pedon of Venice muck, partially drained, 0 to 2 percent slopes; lat. 38 degrees 04 minutes 51 seconds N. and long. 121 degrees 33 minutes 15 seconds W., in an unsectionized area of the Bouldin Island quadrangle:

Oap—0 to 12 inches; muck, black (10YR 2/1) moist, very dark gray (10YR 3/1) dry; less than 5 percent tule and reed fibers before rubbing and none after rubbing; moderate medium and coarse granular structure; nonsticky and nonplastic; strongly acid; abrupt wavy boundary.

Oe1—12 to 32 inches; mucky peat, very dark brown (10YR 2/2) moist, dark brown (10YR 3/3) rubbed, black (N 2/0) dry; 60 percent tule and reed fibers before rubbing and 25 percent after rubbing; massive; nonsticky and nonplastic; very strongly acid; abrupt wavy boundary.

Oe2—32 to 60 inches; mucky peat, very dark brown (10YR 2/2) moist, very dark grayish brown (10YR 3/2) rubbed, black (N 2/0) dry; 40 percent tule and reed fibers before rubbing and 18 percent after rubbing; massive; nonsticky and nonplastic; very strongly acid.

As determined by the combustion method, the content of organic matter in the control section ranges from 35 to 75 percent by weight and is more than 45 percent below the Oap horizon. The content of fibers in the control section ranges from 30 to 65 percent before rubbing and from 16 to 35 percent after rubbing. Reaction is very strongly acid to slightly acid.

The Oap horizon has color of N 3/0 or 10YR 3/2 or 3/1. When moist, it has color of N 2/0 or 10YR 2/2 or 2/1. It is mucky silt loam or muck. The content of organic matter is 35 to 55 percent. The content of fibers is 2 to 20 percent before rubbing and less than 10 percent after rubbing.

The Oe horizon has color of N 2/0, 5YR 2.5/1, or 10YR 2/1. When moist, it has color of N 2/0, 5YR 2.5/2, or 10YR 2/2 before rubbing and color of N 3/0, 5YR 3/2, 10YR 3/2, or 2.5Y 3/2 after rubbing. This horizon has 45 to 75 percent organic matter. It has 35 to 70 percent fibers before rubbing and 15 to 35 percent fibers after rubbing.

Veritas Series

The Veritas series consists of moderately well drained soils on low fan terraces. In some areas these soils are artificially drained. They are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Veritas series are coarse-loamy, mixed, thermic Typic Haploxerolls.

Typical pedon of Veritas fine sandy loam, 0 to 2 percent slopes; 150 feet north and 800 feet west of the southeast corner of sec. 25, T. 1 S., R. 6 E., Lathrop quadrangle:

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; moderately alkaline; clear smooth boundary.

A—8 to 15 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline; gradual wavy boundary.

Bw—15 to 40 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak fine angular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine continuous tubular pores; slightly effervescent; disseminated lime; moderately alkaline; gradual smooth boundary.

Bk—40 to 54 inches; variegated light brownish gray (10YR 6/2 and 2.5Y 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few medium distinct dark brown (10YR 3/3) mottles when moist; moderate coarse angular blocky structure parting to weak fine angular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; slightly effervescent; common fine filaments of lime and disseminated lime;

moderately alkaline; abrupt smooth boundary.

2Bqm—54 to 70 inches; variegated light gray (10YR 7/2 and 2.5Y 7/2) and white (10YR 8/2), strongly cemented duripan, light brownish gray (10YR 6/2) moist; many fine prominent dark brown (10YR 3/3) and yellowish brown (10YR 5/4) mottles when moist; massive; brittle; few fine tubular pores; 70 to 85 percent silica cementation within the matrix; slightly effervescent; disseminated lime; moderately alkaline.

Depth to the duripan is 40 to 60 inches. The depth to distinct or prominent mottles is 30 to 40 inches.

The A horizon has color of 10YR 4/2, 5/1, or 5/2. When moist, it has color of 10YR 3/1 or 3/2. It is fine sandy loam or sandy loam. Reaction is neutral to moderately alkaline. Some pedons have overwash of silty clay loam 15 to 19 inches thick.

The Bw and Bk horizons have color of 10YR 5/1, 5/3, 5/4, 6/2, 6/3, or 6/4 or 2.5Y 6/2. When moist, they have color of 10YR 4/1, 4/2, or 4/3 or 2.5Y 4/2. These horizons are fine sandy loam or sandy loam. Reaction is mildly alkaline or moderately alkaline.

The 2Bqm horizon is a duripan that is strongly cemented or indurated in the laminar cap and weakly cemented to strongly cemented below the cap. The extent of silica cementation is 50 to 90 percent within the matrix.

Veritas sandy loam, partially drained, 0 to 2 percent slopes, is a taxadjunct to the series and classifies as a coarse-loamy, mixed, thermic Aquic Haploxeroll. It has mottles higher in the profile than is defined as the range for the series and formed under somewhat poorly drained conditions. These differences, however, do not significantly affect the use or management of the soil.

Vernalis Series

The Vernalis series consists of well drained soils on alluvial fans. In some areas these soils are irrigated. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Vernalis series are fine-loamy, mixed, thermic Calcixerollic Xerochrepts.

Typical pedon of Vernalis clay loam, 0 to 2 percent slopes; 40 feet south and 3,000 feet east of the northwest corner of sec. 3, T. 4 S., R. 6 E., Solyo quadrangle:

Ap—0 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; massive; hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; moderately alkaline; clear smooth boundary.

A—9 to 27 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; few very fine interstitial and tubular pores; moderately alkaline; gradual wavy boundary.

Btk—27 to 37 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial and tubular pores; common thin clay films on faces of peds; strongly effervescent; disseminated lime and few fine soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk1—37 to 47 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak very thick platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine tubular pores; strongly effervescent; common fine filaments and few fine soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk2—47 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; few very fine and common fine roots; common very fine tubular pores; 5 percent gravel; strongly effervescent; disseminated lime and few fine filaments and common medium soft masses of lime; moderately alkaline.

The A horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3. When moist, it has color of 10YR 3/3, 4/2, or 4/3. Reaction is neutral to moderately alkaline.

The Btk horizon has color of 10YR 5/3, 5/4, or 6/3. When moist, it has color of 10YR 4/3 or 4/4. Texture is clay loam, loam, or silt loam. Accumulations of lime occur as filaments or soft masses. Reaction is mildly alkaline or moderately alkaline.

The Bk horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 10YR 4/3 or 4/4. It is loam, clay loam, or silty clay loam in the upper part and loam, fine sandy loam, or sandy loam in the lower part. This horizon is slightly effervescent to strongly effervescent.

Vignolo Series

The Vignolo series consists of moderately well drained soils on low fan terraces. These soils are moderately deep to a hardpan (fig. 13). They formed in

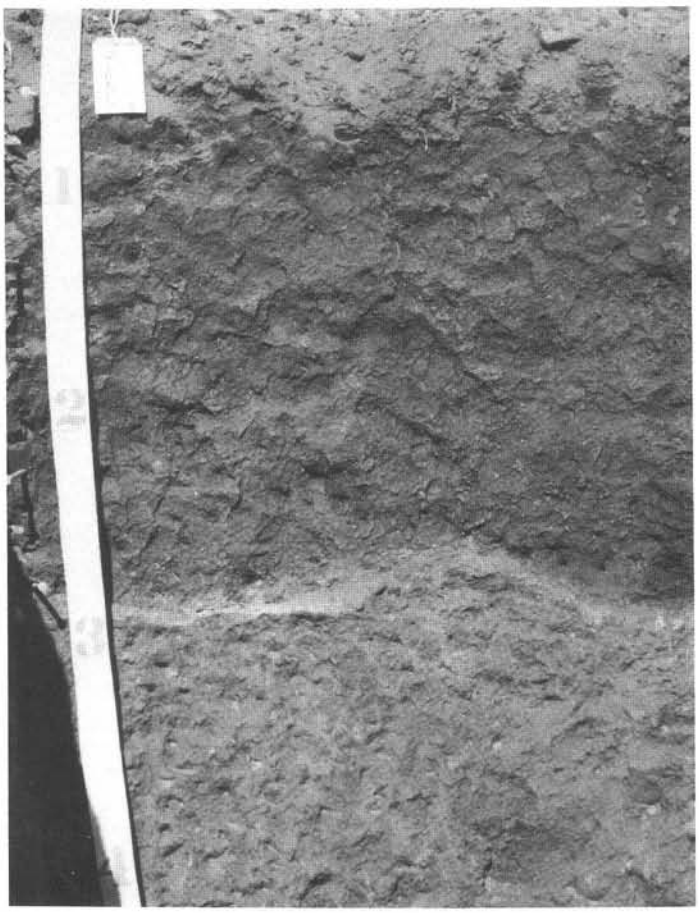

Figure 13.—Profile of Vignolo silty clay loam, 0 to 2 percent slopes. A hardpan is at a depth of 30 to 35 inches. It has a continuous laminar cap, which restricts root penetration and water movement. Depth is marked in feet.

alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Vignolo series are fine-silty, mixed, thermic Haplic Durixerolls.

Typical pedon of Vignolo silty clay loam, 0 to 2 percent slopes; lat. 38 degrees 00 minutes 55 seconds N. and long. 121 degrees 12 minutes 46 seconds W., in an unsectionized area of the Waterloo quadrangle:

Ap—0 to 4 inches; brown (10YR 5/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; few very fine interstitial pores; mildly alkaline; clear smooth boundary.

A—4 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; mildly alkaline; clear smooth boundary.

Bw—14 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; many fine very dark gray (10YR 3/1) manganese stains; moderate medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; mildly alkaline; clear wavy boundary.

Bk—18 to 30 inches; variegated brown (10YR 5/3) and pale brown (10YR 6/3) clay loam, dark brown (10YR 3/3) and brown (10YR 4/3) moist; many fine very dark gray (10YR 3/1) manganese stains; moderate medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; slightly effervescent; disseminated lime and few fine soft masses of lime; weakly cemented in 25 percent of the matrix; mildly alkaline; abrupt wavy boundary.

Bkqm—30 to 33 inches; indurated duripan that has a laminar cap 1 to 4 millimeters thick; abrupt wavy boundary.

Bkq—33 to 60 inches; light gray (10YR 7/2), very pale brown (10YR 7/3), and pale brown (10YR 6/3), weakly cemented to strongly cemented duripan, dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), and dark reddish brown (5YR 3/2, 3/3) moist; massive; brittle; thin strongly cemented continuous laminar cap; strongly cemented in 25 percent of the matrix, weakly cemented in the remainder; violently effervescent; disseminated lime and common fine seams of lime; cemented with silica, iron, and calcium carbonate; moderately alkaline.

Depth to the duripan is 20 to 40 inches. The content of clay in the control section, which extends from a depth of 10 inches to the duripan, generally is 18 to 35 percent but ranges from 20 to 30 percent.

The A horizon has color of 7.5YR 5/2 or 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 7.5YR 3/2 or 10YR 3/2 or 3/3. It is silty clay loam or silt loam

The Bw and Bk horizons have color of 7.5YR 5/4 or 6/4 or 10YR 4/3, 5/2, 5/3, 5/4, 6/3, or 6/4. When moist, they have color of 7.5YR 4/4 or 10YR 3/2, 3/3, 3/4, or 4/3. They are loam, silt loam, silty clay loam, or clay loam.

The Bkqm and Bkq horizons are strongly cemented or indurated in the laminar cap and strongly cemented below the cap. They have color of 7.5YR 5/4, 5/6, 6/4, or 6/6 or 10YR 5/3, 6/3, 6/4, 7/2, or 7/3.

Vina Series

The Vina series consists of well drained soils on flood plains. These soils are very deep. They formed in

alluvium derived from mixed but dominantly granitic rock sources. Slope ranges from 0 to 2 percent.

Soils of the Vina series are coarse-loamy, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Vina fine sandy loam, 0 to 2 percent slopes; 2,350 feet north and 2,000 feet east of the southwest corner of sec. 20, T. 4 N., R. 8 E., Lockeford quadrangle:

Ap—0 to 9 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; slightly acid; abrupt wavy boundary.

A1—9 to 23 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine and common medium and coarse roots; common very fine, fine, and medium tubular pores; slightly acid; clear wavy boundary.

A2—23 to 37 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine, fine, and medium tubular pores; neutral; clear smooth boundary.

C1—37 to 46 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and coarse roots; many very fine, fine, and medium tubular pores; neutral; abrupt smooth boundary.

C2—46 to 60 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine tubular and common very fine interstitial pores; neutral.

By weighted average, the content of clay in the 10- to 40-inch control section ranges from 12 to 18 percent. The content of fine sand or coarser textured material ranges from 15 to 25 percent. The content of gravel is 0 to 15 percent. Reaction is slightly acid or neutral.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 5/3. When moist, it has color of 10YR 3/2 or 3/3.

The C horizon has color of 10YR 4/3, 5/2, or 5/3. When moist, it has color of 10YR 3/3, 4/2, or 4/3. It is sandy loam, loam, or fine sandy loam.

Webile Series

The Webile series consists of very poorly drained soils on deltas. These soils are artificially drained. They are very deep. They formed in the highly decomposed remains of reeds and tules underlain by alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Webile series are clayey, mixed, euic, thermic Terric Medisaprists.

Typical pedon of Webile muck, partially drained, 0 to 2 percent slopes; lat. 37 degrees 53 minutes 35 seconds N. and long. 121 degrees 33 minutes 36 seconds W., in an unsectionized area of the Woodward Island quadrangle:

Oap—0 to 15 inches; muck, black (10YR 2/1) moist (unrubbed and rubbed), dark gray (10YR 4/1) dry; no fibers before rubbing; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; very strongly acid; clear smooth boundary.

Oa—15 to 39 inches; muck, variegated very dark brown (10YR 2/2) and dark yellowish brown (10YR 4/2) moist and dry, very dark brown (10YR 2/2) rubbed; 30 percent tule and reed fibers unrubbed and less than 5 percent fibers rubbed; weak thick platy structure; very friable, slightly sticky and slightly plastic; very strongly acid; clear smooth boundary.

2C1—39 to 51 inches; clay, very dark gray (10YR 3/1) moist, dark gray (10YR 4/1) dry; common medium prominent reddish brown (5YR 5/4 and 4/4) and dark reddish brown (5YR 3/3) mottles when moist; massive; very hard, firm, very sticky and plastic; slightly acid; gradual smooth boundary.

2C2—51 to 60 inches; silty clay, very dark grayish brown (2.5Y 3/2) moist, dark grayish brown (2.5Y 4/2) dry; common medium prominent reddish brown (5YR 4/4 and 5/4) and dark reddish brown (5YR 3/3) mottles when moist; massive; firm, very sticky and plastic; slightly acid.

The depth to mineral material is 36 to 51 inches. As determined by the combustion method, the content of organic matter in the 36- to 51-inch control section ranges from 30 to 70 percent.

The Oap horizon has color of 10YR 3/1, 3/2, or 4/1. When moist, it has color of 10YR 2/1, 2/2, or 3/1. The content of organic matter is 35 to 50 percent. Reaction is very strongly acid or strongly acid.

The Oa horizon has color of 10YR 2/1, 2/2, 3/3, or 4/2. When moist, it has color of 10YR 2/1, 2/2, 3/3, or 4/4. The content of fibers is 20 to 50 percent before rubbing and less than 5 percent after rubbing. Reaction is very strongly acid or strongly acid.

The 2C horizon has color of 10YR 4/1 or 4/2 or 2.5Y 4/2. When moist, it has color of N 4/0 or 3/0; 2.5Y 3/2; or 10YR 3/1, 3/2, or 4/1. It has distinct or prominent

mottles. It is clay or silty clay. Reaction is slightly acid to mildly alkaline.

Willows Series

The Willows series consists of poorly drained, saline-sodic soils in basins. These soils are artificially drained. They are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 2 percent.

Soils of the Willows series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Willows clay, partially drained, 0 to 2 percent slopes; lat. 37 degrees 45 minutes 50 seconds N. and long. 121 degrees 29 minutes 05 seconds W., in an unsectionized area of the Union Island quadrangle:

Ap—0 to 9 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure; very hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; slightly effervescent; few fine soft masses of lime; moderately alkaline; abrupt smooth boundary.

A—9 to 20 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; few fine distinct light olive brown (2.5Y 5/4) mottles, light olive brown (2.5Y 5/6) moist; strong coarse angular blocky structure; very hard, firm, sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; common slickensides; slightly effervescent; few fine soft masses of lime; moderately alkaline; abrupt smooth boundary.

Bk1—20 to 28 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; many coarse distinct light olive brown (2.5Y 5/6) mottles, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure; very hard, firm, sticky and very plastic; common very fine and fine roots; few very fine and fine tubular pores; common fine black (10YR 2/1) stains; violently effervescent; disseminated lime and common fine soft masses of lime; strongly alkaline; clear smooth boundary.

Bk2—28 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; many fine distinct light gray (2.5Y 7/2) mottles, light brownish gray (2.5Y 6/2) moist; moderate coarse angular blocky structure; hard, firm, sticky and very plastic; few very fine and fine roots; few very fine and fine tubular pores; common fine black (10YR 2/1) stains; strongly effervescent; disseminated lime and many fine soft masses of lime; strongly alkaline.

The A horizon has color of 10YR 4/1 or 5/1 or 5Y 4/1 or 5/1. When moist, it has color of 10YR 3/1 or 5Y 3/1. Electrical conductivity is 4 to 8 millimhos per centimeter, and the percentage of exchangeable sodium is 10 to 18. This horizon is slightly effervescent to strongly effervescent and has disseminated or segregated lime. Reaction is moderately alkaline or strongly alkaline.

The Bk horizon has color of 2.5Y 4/2 or 5/2 or 5Y 4/2, 5/1, or 5/2. When moist, it has color of 2.5Y 3/2 or 4/2 or 5Y 4/1 or 4/2. It has distinct or prominent mottles. Electrical conductivity is 4 to 16 millimhos per centimeter, and the percentage of exchangeable sodium is 15 to 25. This horizon is slightly effervescent to strongly effervescent.

Wisflat Series

The Wisflat series consists of well drained soils on mountains. These soils are shallow or very shallow. They formed in material weathered from sandstone. Slope ranges from 30 to 75 percent.

Soils of the Wisflat series are loamy, mixed (calcareous), thermic Lithic Xerorthents.

Typical pedon of Wisflat sandy loam, in an area of Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes; 300 feet north and 2,050 feet west of the southeast corner of sec. 8, T. 4 S., R. 5 E., Lone Tree Creek quadrangle:

A—0 to 3 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; few very fine tubular and interstitial pores; mildly alkaline; gradual wavy boundary.

Ck—3 to 10 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; loose, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine tubular and interstitial pores; strongly effervescent; 5 percent angular gravel and cobbles; mildly alkaline; abrupt wavy boundary.

Cr/R—10 to 26 inches; thin, white (10YR 8/2), slightly weathered sandstone cap over light gray (10YR 7/2), extremely hard sandstone.

The depth to hard sandstone is 10 to 20 inches. The soil depth varies widely within short distances.

The A horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3. When moist, it has color of 10YR 4/2 or 4/3. Reaction is mildly alkaline or moderately alkaline.

The Ck horizon has color of 10YR 5/3, 6/3, 6/4, 7/2, 7/3, or 7/4. When moist, it has color of 10YR 4/4 or 5/4 or 2.5Y 4/4 or 5/4. Reaction is mildly alkaline or moderately alkaline. This horizon is strongly effervescent or violently effervescent. It has 5 to 25 percent angular gravel and cobbles.

Xerofluvents

Xerofluvents consist of well drained and somewhat excessively drained soils in arroyos and in intermittent stream channels. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 8 percent.

Reference pedon of Xerofluvents, in an area of Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded; 1,900 feet north and 1,000 feet east of the southwest corner of sec. 17, T. 3 S., R. 5 E., Tracy quadrangle:

C1—0 to 6 inches; brown (10YR 4/3) very gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; 25 percent gravel and 15 percent cobbles; neutral; abrupt smooth boundary.

C2—6 to 20 inches; brown (10YR 4/3) gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; many very fine interstitial pores; 20 percent gravel and 5 percent cobbles; mildly alkaline; abrupt smooth boundary.

C3—20 to 33 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand, brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 25 percent gravel and 10 percent cobbles; moderately alkaline; abrupt smooth boundary.

C4—33 to 47 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine interstitial pores; 35 percent gravel and 5 percent cobbles; mildly alkaline; abrupt smooth boundary.

C5—47 to 60 inches; pale brown (10YR 6/3) very gravelly loamy coarse sand, brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; many very fine interstitial pores; 40 percent gravel; moderately alkaline.

Texture and color are highly varied. The soils are highly stratified. The content of rock fragments ranges from 5 to 65 percent throughout the profile.

Xerorthents

Xerorthents consist of well drained and somewhat excessively drained soils on alluvial fans and in areas of old gravel tailing deposits. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 1 to 8 percent.

Reference pedon of Xerorthents, in an area of Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded; 1,750 feet south and 3,150 feet west of the northeast corner of sec. 19, T. 3 S., R. 5 E., Tracy quadrangle:

C1—0 to 4 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine roots; common very fine tubular and interstitial pores; 20 percent gravel; mildly alkaline; abrupt wavy boundary.

C2—4 to 26 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine interstitial pores; 25 percent gravel and 15 percent cobbles; mildly alkaline; gradual smooth boundary.

C3—26 to 42 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine interstitial pores; 35 percent gravel and 5 percent cobbles; moderately alkaline; gradual smooth boundary.

C4—42 to 60 inches; light brownish gray (10YR 6/2) gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; many very fine interstitial pores; 20 percent gravel and 5 percent cobbles; mildly alkaline.

Texture and color are highly varied. The content of rock fragments ranges from 5 to 65 percent throughout the profile.

Yellowlark Series

The Yellowlark series consists of moderately well drained soils on fan terraces and stream terraces. These soils are deep to a hardpan. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 5 percent.

Soils of the Yellowlark series are fine-loamy, mixed, thermic Ultic Haploxeralfs.

Typical pedon of Yellowlark gravelly loam, 2 to 5 percent slopes; 1,020 feet south and 350 feet east of the northwest corner of sec. 27, T. 5 N., R. 8 E., Goose Creek quadrangle:

A1—0 to 2 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; common fine distinct strong brown (7.5YR 5/6) mottles, strong brown (7.5YR 4/6) moist; moderate thick platy structure; hard, friable, slightly sticky and nonplastic; many very fine roots; common very fine interstitial and few very fine tubular pores; 15 percent fine subrounded gravel; moderately acid; abrupt smooth boundary.

A2—2 to 8 inches; reddish yellow (7.5YR 6/6) gravelly loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial and medium tubular pores; 15 percent fine subrounded gravel; strongly acid; gradual wavy boundary.

Bt1—8 to 22 inches; reddish yellow (7.5YR 6/8) gravelly loam, strong brown (7.5YR 4/6) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and common medium tubular pores; few thin and moderately thick clay films bridging mineral grains; very dark gray (10YR 3/1) iron and manganese stains; 15 percent fine subrounded gravel; strongly acid; clear wavy boundary.

Bt2—22 to 33 inches; reddish yellow (7.5YR 6/6) and reddish brown (5YR 4/4) gravelly loam, strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, firm, sticky and slightly plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films in seams and lining pores; common fine very dark gray (10YR 3/1) iron and manganese stains; 20 percent fine subrounded gravel; strongly acid; clear wavy boundary.

Bt/E1—33 to 39 inches; strong brown (7.5YR 5/6) gravelly loam, strong brown (7.5YR 4/6) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine interstitial pores; common thin and few moderately thick clay films bridging mineral grains; black (N 2/0) iron and manganese stains; very pale brown (10YR 7/4) zones with bleached coatings, yellowish brown (10YR 5/4) moist; 25 percent fine subrounded gravel; strongly acid; clear wavy boundary.

2Bt/E2—39 to 47 inches; strong brown (7.5YR 5/6) very gravelly clay loam, yellowish red (5YR 5/6) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine interstitial pores; few moderately thick clay films bridging mineral grains and lining pores; white (10YR 8/1) zones of very gravelly loam with bleached coatings, pale brown (10YR 6/3) moist; 30 percent gravel and 5 percent cobbles; strongly acid; abrupt wavy boundary.

3B′t1—47 to 54 inches; strong brown (7.5YR 5/6) and light yellowish brown (10YR 6/4) gravelly clay, dark brown (7.5YR 4/4) and brown (7.5YR 5/4) moist; massive; very hard, very firm, sticky and plastic; few very fine tubular pores; common moderately thick clay films bridging mineral grains; common fine very dark gray (10YR 3/1) iron and manganese stains; 10 percent gravel and 5 percent cobbles; moderately acid; gradual wavy boundary.

3B′t2—54 to 59 inches; very pale brown (10YR 7/4) and strong brown (7.5YR 5/6) clay loam, yellowish brown (10YR 5/4) and strong brown (7.5YR 4/6) moist; weak coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few very fine tubular pores; common moderately thick clay films bridging mineral grains; common medium black (N 2/0) iron and manganese stains; 10 percent fine subrounded gravel; slightly acid; gradual wavy boundary.

3Bqm—59 to 62 inches thick; very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4), weakly cemented duripan, yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist; strong coarse angular blocky structure; common very fine and fine tubular pores; many thin and few moderately thick clay films lining pores; common medium black (N 2/0) iron and manganese stains; thin indurated laminar cap; continuous silica cementation; 10 percent fine subrounded gravel; slightly acid.

Depth to the duripan is 45 to 60 inches. By weighted average, the content of clay in the upper 20 inches of the argillic horizon is 18 to 27 percent.

The A horizon has color of 7.5YR 5/4, 6/4, or 6/6 or 10YR 5/3, 6/3, or 6/4. When moist, it has color of 7.5YR 3/4 or 4/4 or 10YR 4/3 or 4/4. Reaction is strongly acid to slightly acid.

The Bt horizon has color of 5YR 4/4, 4/6, 5/4, 5/6, or 5/8 or 7.5YR 5/4, 5/6, 6/4, 6/6, or 6/8. When moist, it has color of 5YR 4/4 or 4/6 or 7.5YR 4/4, 4/6, or 5/6. It is gravelly loam or gravelly clay loam. It has 18 to 30 percent clay. The content of gravel is 15 to 25 percent. Reaction is strongly acid to slightly acid.

The 2Bt horizon has color of 2.5YR 4/6 or 5/6, 7.5YR 5/6, or 5YR 5/6 or 5/8. When moist, it has color of 2.5YR 3/6 or 4/6, 5YR 4/6 or 5/6, or 7.5YR 5/6. It is very gravelly loam or very gravelly clay loam. It has 20 to 30 percent clay. The content of gravel is 35 to 50 percent, and the content of cobbles is 0 to 10 percent. Reaction is strongly acid to slightly acid.

Bleached zones of E horizon material are in the Bt

and 2Bt horizons. These zones have color of 10YR 7/2, 7/4, or 8/1. When moist, they have color of 10YR 5/2, 5/4, or 6/3.

The 3B't horizon has color of 7.5YR 4/6, 5/6, 7/4, or 7/6 or 10YR 5/3, 6/3, 6/4, or 7/4 and has coatings with color of 5YR 5/4 in some pedons. When moist, it has color of 7.5YR 4/4, 4/6, 5/4, 6/4, or 6/6 or 10YR 4/3, 4/4, 5/3, or 5/4 and has coatings with color of 5YR 4/6 or 7.5YR 4/4 in some pedons. The upper part of this horizon is clay or gravelly clay and has 40 to 50 percent clay, and the lower part is gravelly clay loam or clay loam and has 27 to 35 percent clay. The content of gravel is 5 to 35 percent. The content of cobbles is 0 to 5 percent. Reaction is moderately acid or slightly acid.

The 3Bqm horizon has color of 10YR 6/4, 7/3, 7/4, or 7/6. When moist, it has color of 10YR 4/4 or 5/4. It is indurated in the laminar cap and weakly cemented to strongly cemented below the cap.

Zacharias Series

The Zacharias series consists of well drained soils on alluvial fans and low stream terraces. These soils are very deep. They formed in alluvium derived from mixed rock sources. Slope ranges from 0 to 8 percent.

Soils of the Zacharias series are fine-loamy, mixed, thermic Typic Xerochrepts.

Typical pedon of Zacharias clay loam, 0 to 2 percent slopes; 250 feet north and 300 feet east of the southwest corner of sec. 5, T. 3 S., R. 5 E., Tracy quadrangle:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine and common medium roots; common very fine tubular pores; neutral; clear smooth boundary.

A—6 to 19 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky and plastic; many very fine and fine and common medium roots; common very fine tubular pores; 5 percent gravel; neutral; clear smooth boundary.

Bw—19 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak very coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine, few fine, and common medium roots; common very fine and fine tubular pores; 5 percent gravel; mildly alkaline; gradual wavy boundary.

C1—26 to 53 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; 5 percent gravel; mildly alkaline; clear wavy boundary.

C2—53 to 60 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; 15 percent gravel and 5 percent cobbles; mildly alkaline.

The content of gravel is 0 to 35 percent.

The A horizon has color of 7.5YR 4/2, 4/3, or 5/2 or 10YR 4/2, 4/3, 5/2, 5/3, 5/4, or 6/3. When moist, it has color of 7.5YR 3/2 or 4/4 or 10YR 3/2, 3/3, 4/2, or 4/3. It is clay loam or gravelly clay loam. Reaction is slightly acid or neutral.

The Bw horizon has color of 7.5YR 5/2 or 5/6 or 10YR 4/2, 4/3, 4/4, 5/2, or 5/3. When moist, it has color of 7.5YR 5/4 or 10YR 3/3, 4/2, 4/3, 4/4, or 5/4. It is loam, clay loam, gravelly loam, or gravelly clay loam. Reaction is neutral or mildly alkaline.

The C horizon has color of 10YR 4/3, 4/4, 5/3, 5/4, 6/3, or 6/4. When moist, it has color of 10YR 4/2, 4/3, or 4/4. It is loam, clay loam, gravelly sandy loam, gravelly loam, or gravelly clay loam. The content of cobbles is 0 to 10 percent. Reaction is neutral to moderately alkaline.

Formation of the Soils

Soil is a natural body on the surface of the earth in which plants grow. It consists of a mixture of varying proportions of minerals, organic matter, water, and air. The characteristics of a soil at any given place are determined by the interaction of five soil-forming factors. These factors are the climate, including the temperature and the amount of precipitation, that has existed as the soil has accumulated or weathered; the biological forces of plants and animals living in and on the soil; relief as it affects drainage, aeration, and susceptibility to water erosion and soil blowing; parent material, including its physical properties and chemical composition; and the length of time that the other four soil-forming factors have been working *(19)*. The interaction among all of these factors determines the formation of every soil. The relative importance of individual factors differs from place to place.

Soils are classified, mapped, and interpreted on the basis of various kinds of soil horizons and their arrangement. The degree of expression of the soil horizons is a reflection of the extent of interaction of soil-forming factors with one or more soil-forming processes, including additions, removals, transfers, and transformations *(30)*. The important diagnostic surface horizons in this survey area include mollic epipedons, and the important diagnostic horizons below the surface horizons include cambic and argillic horizons and duripans.

A mollic epipedon is a dark surface horizon that has high base saturation. It formed mainly through additions of organic material to the soil in the form of decomposed roots and organic residue from the surface. It may be the only diagnostic horizon in the more recent soils, or it may occur in combination with subsurface horizons in the older soils. Vina soils, which are Cumulic Haploxerolls, and Cogna soils, which are Calcic Pachic Haploxerolls, have a thick mollic epipedon as a result of constant additions of organic material.

Many soils in the survey area have a cambic or argillic horizon. Cambic horizons are characterized by the redistribution or removal of carbonates to a lower part of the soil profile, by alteration of the original stratification in the parent material to blocky structure, or by the slight addition of illuvial clay.

Argillic horizons are characterized by the accumulation of illuvial clay. They form when primary minerals in the layers above the zone of accumulation transform into silicate clays, which are subsequently removed by eluviation to the subsoil. Some of the clay in the argillic horizons formed in place as a result of the transformation of primary minerals. With increasing age, these horizons become finer textured, become somewhat thicker, and tend to develop abrupt upper boundaries. Keyes and Bellota soils, which are Abruptic Durixeralfs, have an abrupt boundary at the top of or within the argillic horizon and are referred to as claypan soils.

Some horizons below the surface horizon have become strongly cemented to indurated and are called duripans or hardpans. Duripans are massive, platy horizons that are cemented with silica, iron, and manganese and in some areas with accessory calcium carbonate. Many duripans are related to claypan argillic horizons and are probably the oldest duripans in the survey area. San Joaquin soils, which are Abruptic Durixeralfs, have an indurated duripan. Cementation is the result of the transformation in place of primary minerals into silica and iron sesquioxides, which act as cementing agents. Some silica and iron sesquioxides have been translocated to the duripan from overlying horizons. Some duripans in the county do not appear to be related to the overlying soil profiles.

The influences of the soil-forming factors and processes on the genesis and morphology of the soils in the survey area are summarized in the paragraphs that follow. Climate and biological factors are described under one heading. The factors of time, relief, and parent material are described under the heading "Landforms."

Climate and Biological Factors

San Joaquin County has a Mediterranean climate, which is characterized by hot, dry summers and cool, moist winters. Most of the rainfall occurs in the period

November through April. The soil temperature regime is thermic, and the soil moisture regime is either xeric or aquic. The warm temperatures and moist soil conditions in spring permit rapid chemical reactions. During periods of rainfall, water carrying dissolved or suspended solids moves through the soil. Weathering is limited in the cool winter months, but leaching processes become active with the onset of seasonal rainfall. Weathering is most active in spring and least active in summer and late fall. In soils that have a water table throughout most of the year, however, weathering can occur in summer and fall.

The air temperature in the survey area is moderated by the influence of the Pacific Ocean. It is slightly warmer during winter and slightly cooler during summer than is typical in nearby counties that have similar soils. As a result, the organic matter content in the surface layer of many soils in the eastern part of the county is at the higher end of the range that is allowed for their respective series. Examples are Corning soils, which are Typic Palexeralfs, and Redding and San Joaquin soils, which are Abruptic Durixeralfs. The relatively warmer winter temperatures allow for the production of more vegetation on these soils, and the relatively cooler summer temperatures decrease the rate at which organic matter decomposes and enhance the accumulation of organic matter.

The amount of rainfall in the eastern part of San Joaquin County is sufficient to leach the soils of soluble salts. Significant amounts of exchangeable bases, however, have been leached only from soils on the older landforms. This variation may reflect the length of time that leaching has occurred, but it also indicates that the climates in the past may have been wetter and more conducive to leaching. The soils on flood plains commonly have a base saturation of more than 90 percent throughout, whereas San Joaquin soils, which are Abruptic Durixeralfs on the older landforms, have a base saturation as low as 75 percent in some or all parts of the profile above a claypan.

The amount of rainfall in the southwestern part of the county is not sufficient to leach the soils of soluble salts. The soils in this part of the county generally have a lower organic matter content in the surface layer and a higher content of soluble salts in the subsoil than the soils in the parts of the county that receive more rainfall. A rain shadow effect is expressed in the soils on the east side of the Coast Range, where the amount of rainfall decreases from west to east.

Present-day climatic variations are the result of the effects of topography and relief. Temperature decreases with elevation, whereas the amount of precipitation increases with elevation. As the amount of precipitation increases, the extent of leaching and the amount of vegetation also increase, resulting in an increased organic matter content and the cycling of bases. Fluctuations in temperature and moisture affect the rate of organic matter decomposition and accumulation and the weathering of minerals. Also, soils on the older landforms have been affected by climatic conditions different from current climatic conditions. During glacial periods, for example, the climate in the Sierra Nevada was somewhat cooler and more humid *(18)*.

Living organisms, including soil flora, fauna, and vegetation, are important biological forces that have affected soil formation in the survey area. Flora, such as bacteria and fungi, help to decompose organic matter. Some bacteria add atmospheric nitrogen to the soil. Fauna, such as earthworms, small insects, and rodents, mix soil material through burrowing and tunneling. Abandoned tunnels commonly fill with loose soil material from overlying horizons and transmit water more readily than the surrounding undisturbed soil material. The activity of rodents, as evidenced by these krotovinas, is common in Carbona soils, which are Vertic Haploxerolls.

The vegetation in the survey area has stabilized the land surfaces. This stability has allowed the other soil-forming factors to affect the soils. Vegetation increases stability by protecting the surface against erosion. In addition, plant roots help to develop soil structure and aggregate stability.

The survey area has five major types of plant communities—tule marsh, riparian forest, annual grass, oak-grass, and sagebrush. Hydrophytic plants, such as tules and reeds, grow on the tracts or islands in the Sacramento-San Joaquin Delta. They grow, for example, on Fluvaquents that have not been reclaimed. Small remnants of a broadleaf riparian forest remain in uncultivated areas of Columbia soils, which are Aquic Xerofluvents, along the Mokelumne, Stanislaus, and San Joaquin Rivers, and in uncultivated areas of Xerofluvents along Corral Hollow Creek. Annual grasses grow on most of the soils in the survey area that are not cultivated or developed for urban uses. Annual grasses and blue oak grow in both the eastern and southwestern parts of the county, in areas where the oak has not been cleared. Franciscan soils, which are Typic Argixerolls, typically support blue oak, Digger pine, and juniper and an understory of annual grasses. Some areas in the Coast Range have sparse stands or patchy, dense stands of California sagebrush or chamise.

The influence of vegetation on the soils in the county is most strongly evidenced in areas of organic soils, or Histosols, in the Sacramento-San Joaquin Delta. Venice soils, which are Typic Medihemists, and Rindge soils, which are Typic Medisaprists, are in freshwater

marshes. These soils formed in thick deposits of decomposing tules (*Scirpus validus*) and reeds (*Phragmites communis*) that formerly grew at elevations near sea level. The thickness of these deposits results from a slow regional subsidence and a postglacial rise in sea level *(29)*. The content of organic matter in these soils ranges from 35 to 65 percent.

The accumulation of organic matter imparts a dark color to the surface layer of mineral soils. The organic matter content is highest in soils that produce large amounts of vegetation and are subject to periodic saturation, which reduces the rate of decomposition. Commonly, these soils receive additional moisture because of flooding or a high water table. For example, Peltier soils, which are Cumulic Haplaquolls, have a seasonal high water table and are subject to flooding. They produce an abundance of annual grasses and forbs and some hydrophytic plants. They have a mollic epipedon that is more than 22 inches thick.

Landforms

The overall landscape in the survey area, mainly the mountains, terraces, and valleys, is the result of the stratigraphic and structural control exerted by geologic factors. The present topography and landforms, however, are primarily the result of events during Quaternary time. The kinds of soil that formed reflect the stability and age of the surfaces of the landforms on which they occur. The degree of development in diagnostic horizons below the surface horizon indicates that the age of the soils in the survey area ranges from the present day, or the Holocene, to about 2 million years ago, or the Pleistocene. This range in age, the wide diversity of parent materials, and the location of the county are the major reasons for the many kinds of soil in the survey area.

San Joaquin County has a wide variety of landforms, including flood plains, deltas, alluvial fans, basins, basin rims, dunes, terraces, hills, and mountains. The landforms developed as a result of erosional and other processes that acted upon or were affected by the various kinds of geologic material in the county. These processes were a result of alternating changes in climate and fluctuating sea levels and were influenced by tectonic activities.

The youngest landforms are flood plains. These are active surfaces along the San Joaquin, Mokelumne, Stanislaus, and Calaveras Rivers and along the creeks and drainageways. Bar-and-channel topography is evident along the rivers and along Corral Hollow and Hospital Creeks. The flood plains are frequently flooded unless they are protected by levees or upstream dams. The landscape is still altered by the cutting of new channels, the abandonment of old channels, the lateral migration of meanders, and the downstream movement of alluvial deposits. The changes are most noticeable in areas of Xerofluvents where the bar-and-channel topography is most strongly expressed. The Mokelumne and Stanislaus Rivers have deposited Quaternary sediments originating mainly from granitic rock sources in the Sierra Nevada mountains. The Calaveras River and minor creeks on the east side of the county have deposited alluvium derived from mixed rock sources in the Sierra Nevada foothills *(18)*.

The major drainageways were originally confined within broad natural levees sloping away from the rivers or streams, but in recent times they have been confined by manmade levees. The natural levees were made up of alluvium deposited during periods of flooding. The coarser textured material was deposited in the areas nearest the rivers, and the finer textured material settled out in the areas farther from the rivers. Most of the natural levees have been leveled and are not evident on the present landscape. Dello soils, which are Typic Psammaquents, and Grangeville soils, which are Fluvaquentic Haploxerolls, are examples of the coarser textured soils. Merritt soils, which are Fluvaquentic Haploxerolls, and Scribner soils, which are Cumulic Haplaquolls, are examples of the finer textured soils.

Vina soils, which are Cumulic Haploxerolls, are examples of soils on the upper reaches of the flood plain along the Mokelumne River. They have a homogeneous profile and contain more than 1 percent organic matter at a depth of 5 feet or more. On the lower reaches of this flood plain, the dominant soils directly adjacent to the river are Columbia soils, which are Aquic Xerofluvents. These soils are highly stratified. In this area they buried the older Vina soils. Similarly, on the upper reaches of the flood plain along Dry Creek, Coyotecreek soils, which are Cumulic Haploxerolls, are buried by Reiff soils, which are Mollic Xerofluvents.

Remnants of original unleveled flood plains are directly adjacent to the present channels of the Stanislaus, Mokelumne, and San Joaquin Rivers. The Columbia soils in these areas have been stabilized by riparian trees.

The flood plains along Hospital, Lone Tree, and Corral Hollow Creeks dissipate on leveled alluvial fans, as their original terminal drainageways are now leveled or filled. Some areas of Cortina soils, which are Typic Xerofluvents, have been completely excavated for sand and gravel.

Organic soils in the Sacramento-San Joaquin Delta formed in freshwater marshes that remain very poorly drained. Large reclamation levees and pumps have been installed to lower the water table. The present

landscape in the Delta is almost entirely manmade *(29)*. Venice soils, which are Typic Medihemists, formed in the thickest and least decomposed deposits of peat. Rindge soils, which are Typic Medisaprists, formed in deposits of organic material that are as thick as those of the Venice soils but are more decomposed or oxidized. Other organic soils, including Kingile, Webile, Shima, and Shinkee soils, which are Terric Medisaprists, have mineral alluvial layers in the underlying material.

Mineral soils that have a high content of organic matter, such as Peltier and Ryde soils, which are Cumulic Haplaquolls, are closely associated with the organic soils in the Sacramento-San Joaquin Delta. These soils have been in place long enough to have accumulated a considerable amount of organic matter. They formed in moderately fine textured and fine textured sediments and have an aquic moisture regime. Numerous features indicate their wetness. These include a mollic epipedon that is 24 to 50 inches thick, an organic matter content of more than 10 percent in the control section, a high water table throughout the year, and gleyed colors. The gleyed colors commonly are masked by the high content of organic matter. These soils are surrounded by major rivers or channels that are influenced by tides.

The soils in basins include Stockton and Jacktone soils, which are Typic Pelloxererts. The clayey material in these soils is dominantly montmorillonitic. It shrinks when dry and swells when wet. As a result, cracks as much as 3 feet deep form in these soils. The cracks repeatedly receive surface soil containing organic matter. A large amount of organic matter has accumulated and has contributed to the dark colors of these soils. The soils had a water table before they were drained and protected from flooding. The water table resulted in the segregation and accumulation of iron and manganese oxide in the form of stains or small, rounded concretions or pellets. Fluctuation of the water table caused the accumulation of secondary carbonates. These soils have been stable long enough for the formation of intersecting slickensides and wedge-shaped aggregates during alternating periods of wetting and drying. The shrinking and swelling have prevented the development of most other morphological characteristics.

Geographically associated with the Pelloxererts are Hollenbeck and Galt soils, which are Typic Chromoxererts. These soils have properties similar to those of the Stockton and Jacktone soils but have less organic matter and therefore are not so dark.

The soils on basin rims include Guard soils, which are Duric Haplaquolls, and Devries and Rioblancho soils, which are Typic Duraquolls. These soils are slightly higher on the landscape than the soils in the basins and deltas. They have received an increased amount of secondary carbonates derived from the salts remaining after evaporation of the adjacent water areas. In addition, Pescadero soils, which are Aquic Natrixeralfs, have a high content of sodium in the subsoil.

The soils on dunes include Delhi soils, which are Typic Xeropsamments. These soils formed in wind-modified alluvium on the alluvial fan along the Stanislaus River. Much of the survey area originally had undulating dunes that have now been leveled and stabilized.

Alluvial fans intergrade or converge with fan terraces and interfan basins. Archerdale soils, which are Pachic Haploxerolls, and Cogna soils, which are Calcic Pachic Haploxerolls, are on the lower part of the fans (fig. 14). They are subject to rare flooding, whereas the same soils on the higher fan terraces are not flooded. Similarly, the lower part of the interfan basin dominated by Capay soils (Typic Chromoxererts) converges with the alluvial fan and fan terrace dominated by Zacharias soils (Typic Xerochrepts). A broad, nearly level fan terrace dominated by Tokay soils, which are Typic Haploxerolls, and by Kingdon soils, which are Typic Argixerolls, is in an area near Lockeford where the difference in elevation to the flood plain below is more than 35 feet.

Soils on stream terraces are of minor extent in the survey area. They are in positions about 2 to 8 feet higher than the bottom of the adjacent minor drainageways. Examples are Hicksville soils, which are Mollic Haploxeralfs, and Zacharias soils, which are Typic Xerochrepts. Hicksville soils have a massive and hard, dark surface layer and an argillic horizon. Zacharias soils have a massive, lighter colored surface layer and have a lower content of illuviated clay in the subsoil than the Hicksville soils, mainly because they receive less precipitation. The lower amount of precipitation results from the rain shadow effect.

The soils on low terraces include San Joaquin and Madera soils, which are Abruptic Durixeralfs, and Jahant soils, which are Mollic Palexeralfs. These soils generally are nearly level and in extensive areas have slopes of less than 1 percent. Drainage patterns are not integrated in most areas, and patterned ground is still evident in areas that have not been leveled.

The soils on low terraces are paleosols that exhibit evidence of mature profile development. They have a duripan and an argillic horizon (claypan) with an abrupt textural change at or near its upper boundary. The illuviation of clay from the surface and the weathering of clay in place are presumed to be the sources of the clay in the claypan. Other than an abrupt boundary, the

Figure 14.—A cutbank on a fan terrace in an area of Cogna loam, 0 to 2 percent slopes, along the Calaveras River.

soils show no consistent evidence of a lithologic discontinuity at the claypan, such as irregular changes in the distribution of individual sand-sized fractions and changes in mineral composition, although small changes in the amount of some sand-sized fractions are evident. Silica derived from the granitic component of the parent material and volcanic ash are the primary cementing agents in the duripan. Iron and manganese

are accessory cementing agents, along with traces of calcium carbonate in low areas. Although the exact age of the duripan is not known, the majority of the soils formed in material of the Riverbank Formation, which is mid-Pleistocene in age (130,000 to 450,000 years old) *(5)*.

Some areas on the low terraces have been beveled and are mapped as thin surface phases. In areas where severe beveling and subsequent redeposition have occurred, Exeter soils, which are Typic Durixeralfs, have formed. These soils do not have a claypan but have a surface layer and a duripan similar to those in San Joaquin soils. Bruella soils, which are Ultic Palexeralfs, formed in areas of the original major drainageways through the low terraces. These soils do not have a duripan and have base saturation of 50 to 75 percent throughout the argillic horizon.

Soils on undulating to rolling, dissected terraces are slightly higher than the soils on low terraces. Montpellier soils, which are Typic Haploxeralfs, and Cometa soils, which are Typic Palexeralfs, occur as intermingled areas on a complex landform identified as the Turlock Lake Formation of the mid-Pleistocene epoch *(17)*. Both soils are underlain by dense, weakly cemented layers that show evidence of pedogenesis *(31)* but do not qualify as duripans. Montpellier soils are commonly on the shoulders of the higher knolls. Cometa soils generally are on mid slopes and toe slopes in the more dissected areas. They are also on knolls in the less dissected areas. Rocklin soils, which are Typic Durixeralfs, are on the distal ends of the terraces that have been strongly beveled or degraded. Drainage patterns are integrated in nearly all areas, except for those that have been leveled.

The soils on high terraces include Redding soils, which are Abruptic Durixeralfs, and Corning soils, which are Typic Palexeralfs. These are the oldest terraces in the county and consist of the Arroyo-Seco Formation of the early Pleistocene age *(25)*. Consequently, the soils on the high terraces are the oldest in the county. They are mature soils that have a strongly developed profile.

Redding soils have both an argillic horizon (claypan) and a duripan. The argillic horizon is characterized by an abrupt textural change at the claypan. The content of clay increases by 15 to 20 percent at the claypan. The duripan consists of gravel, with or without cobbles, and a sandy granitic matrix indurated by silica and iron. The silica is presumed to be derived from the granitic component of the parent material and may also be derived from volcanic ash. Corning soils do not have a duripan but have other morphological features similar to those of the Redding soils. The horizons above the claypan in both of these soils have base saturation of 35 to 75 percent, although the claypan is not significantly leached of bases. The soils formed in gravelly alluvium consisting of well rounded, dark metamorphic, quartzitic, and andesitic pebbles and cobbles and an iron-rich matrix of granitic sand and clay. Weathering of the parent material provides iron that imparts red and yellowlsh red colors to the soils. Because the parent material was deposited from the east, the size and quantity of the coarse fragments decrease from east to west.

The soils on hills in the eastern part of the county include Pentz soils, which are Ultic Haploxerolls, and Keyes soils, which are Abruptic Durixeralfs. These soils are shallow over basic andesitic, tuffaceous sandstone of the Mehrten Formation, which is a member of the lower Pliocene and upper Miocene epoch *(20)*. Some areas that have been dissected are commonly called "haystacks." Keyes soils have a claypan and a thin duripan, which indicate that these soils were dissected much earlier than the Pentz soils.

The soils on mountains of the Coast Range are closely related to geologic history, including the theory of plate tectonics in the formation of the Diablo Antiform *(24)*. The Coast Range is within the Diablo Range and has soils that formed in material weathered from rocks and sediments ranging in age from the Jurassic period to the Holocene. The Franciscan Formation is the dominant formation. It is a complex of Jurassic and Lower Cretaceous metamorphic assemblages resulting from the interaction between the North American and Pacific plates. Subsequent deposition of marine and nonmarine formations of the Great Valley Sequence, east-west compression, and uplift continued through the middle Pliocene. By the late Pliocene, drainage of the inland sea was complete. Regional uplift and folding during the Pleistocene resulted in the present topography *(27)*.

Some of the older alluvial soils on hills in the southwestern part of the county are elevated as a result of tectonic uplifting of the Coast Range. Some areas of Calla soils, which are Calcixerollic Xerochrepts, and Carbona soils, which are Vertic Haploxerolls, formed in alluvial deposits that were uplifted and dissected. In one uplifted area near Hospital Creek, the difference in elevation is 600 feet between the valley floor and the top, where the alluvial sediments are exposed and inclined at an angle of 35 to 45 degrees. Most areas have the appearance of an uplifted fan terrace with alluvial sediments inclined at an angle of 15 to 25 degrees towards the valley floor. The Black Butte fault traverses this part of the county and is most evident where little of the original terrace tread remains.

All five soil-forming factors have strongly influenced the genesis and morphology of the soils in the mountains of the Coast Range. Wisflat soils, which are

Lithic Xerorthents, and Alo soils, which are Typic Chromoxererts, are examples of soils that formed in material weathered from Tertiary sedimentary rock formations of the Great Valley Sequence and that have been deformed by compression and uplifting. Honker soils, which are Mollic Palexeralfs, and Gonzaga soils, which are Typic Palexerolls, are examples of soils that formed in material weathered from the Franciscan Formation. These soils are moderately deep, have a claypan, and formed in material weathered from metamorphic shale or sandstone. Gonzaga soils have a mollic epipedon. They are dominantly on north-facing slopes that have an overstory of blue oak. Honker soils are dominantly on south-facing slopes.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Andesitic. Referring to material weathered from extrusive masses of volcanic or igneous rock consisting mainly of plagioclase, pyroxene, and hornblende.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 2.5
Low	2.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10.0
Very high	more than 10.0

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Back swamps. Extensive, marshy, depressed areas of flood plains between the natural levee borders of channel belts.

Bar-and-channel topography. The microrelief common on a flood plain. The ridgelike bars commonly consist of coarse textured sediments, and the channels consist of finer textured material.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Basin. A depressed area with a limited surface outlet or no outlet at all.

Basin rim. The outer edge, border, or margin of a basin.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. It increases production of forage, which reduces the hazard of erosion. Brush management may improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs.

Canyon. A long, deep, narrow, very steep-sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A very slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops using a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil. Crop residue management helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium whose surface is nearly flat and fan shaped, deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream or reach of a stream that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

ESP. See Exchangeable sodium percentage.

Evapotranspiration. Water loss caused both by transpiration through plant tissues and by evaporation.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Exchangeable sodium percentage (ESP). The percentage of the cation-exchange capacity of a soil occupied by sodium.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily

runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

High-residue crops. Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Holocene. The second epoch of the Quaternary period of geologic time, from approximately 10,000 years ago to the present.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Hummocky. Refers to areas that have mounds or hills that represent erosional remnants of an old landscape.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Hydrophytic plants. Plantlife growing in water or on a substrate that is periodically deficient in oxygen as a result of excessive water content.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, for various USDA textures is as follows:

Clay, silty clay	0.1
Sandy clay, silty clay loam	0.3
Clay loam, sandy clay loam, silt	0.5
Silt loam	0.7
Loam, very fine sandy loam	1.0
Fine sandy loam, sandy loam, coarse sandy loam, loam	1.5
Very fine sand, loamy sand, loamy coarse sand, fine sand	3.0
Sand, coarse sand	4.0

Interfan. The area between two alluvial fans.

Interfan basin. A depressed area with a limited surface outlet between two alluvial fans.

Intermittent stream. A stream or reach of a stream that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microrelief. Small-scale, local differences in topography, including mounds or swales a few feet in diameter and with elevation differences up to 6 feet.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat. Organic material intermediate in degree of decomposition between muck and peat.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natural levee. An area of wedge-shaped deposits of the coarsest suspended-load material that form long, low ridges on channel banks and slope gently away from the stream.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Organic soil. Soil that is mainly organic material made up of decomposing plant remains. Organic soil has low bulk density and a high water content.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Paleoclimate. A climate of the past.

Paleosol. A soil with distinctive morphological features that formed under a climate different from the one that now exists.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Phenological cycles. Stages of plant activity or growth, such as germination, root and foliage growth, and setting and dissemination of seed, that are related to the sequence of climatic factors.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Pleistocene. The first epoch of the Quaternary period of geologic time, from approximately 2 million to 10,000 years ago.

Pliocene. The last epoch of the Tertiary period of geologic time, from approximately 7 million to 2 million years ago.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil

is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline-sodic soil. A soil containing enough soluble salts to be a saline soil and enough exchangeable sodium to be a sodic soil.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. It has the least amount of plant fiber (after rubbing), the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 to 75 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^+ + Mg^{++}$.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has

properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil blowing. Soil erosion by wind.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Spud ditch. A manmade trench approximately 8 inches wide and 3 feet deep used in organic soils for irrigation and drainage.

Stocker-feeder. Market terms used to describe steers and heifers from weaning age to maturity. These animals are purchased not for breeding purposes but for converting forage to a marketable weight gain.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil. Frequently designated as the "plow layer," or the "Ap horizon."

Tailings. The portions of washed materials that are regarded as too poor to be treated further in mining or dredging operations.

Tailwater. The water just downstream of a structure.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Tertiary. The first period of the Cenozoic Era of geologic time, from approximately 65 million to 2 million years ago.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Underlying material. The part of the soil below the A or AC horizon that is relatively unaffected by the processes of soil formation.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Vernal pool. The depressional area between small mounds that is temporarily inundated by water. The soils associated with vernal pools have an impervious layer, such as a claypan or a hardpan.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Appendixes

Appendix A is an excerpt from California supplement CA-4 to the National Conservation Planning Manual, dated February 1981, United States Department of Agriculture, Soil Conservation Service.

Appendix B is an edited version of the ratings guide described in the National Soils Handbook, Part 603, dated September 22, 1983, United States Department of Agriculture, Soil Conservation Service. These guides provided the basis for the interpretive ratings given in the tables Recreational development, Building site development, Sanitary facilities, Construction materials, and Water management. Soils are rated for the uses expected to be important or potentially important to users of soil survey information. Ratings for proposed uses are given in terms of limitations and restrictive features. Only the most restrictive features are listed in the tables. Therefore, if a soil is rated severe, only those soil features that cause the soil to be rated severe are given. There may be other limitations that should be overcome if the soil is to be used for a specific purpose. The guides in appendix B show in the first column the properties or features used as criteria for rating the soil for the use. The properties are listed in descending order of estimated importance. In the "Limits" column, limits of the properties are given for rating the soils and for recognizing a restrictive property or properties. In the "Restrictive feature" column, a key phrase indicates the feature causing the problem.

Appendix A

Prime Farmlands

Prime Farmland is land best suited for producing food, feed, forage, fiber, and oilseed crops and also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban builtup land or water). It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

Prime Farmland meets all the following criteria:

1. The soils have:

A. Aquic, udic, ustic, or xeric moisture regimes and an available water capacity of at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil to produce the commonly grown cultivated crops (cultivated crops include, but are not limited to, grain, forage, fiber, oilseed, sugarbeets, vegetables, orchard, vineyard, and bush fruit crops) adapted to the region in 7 or more years out of 10; or

B. Xeric, ustic, aridic, or torric moisture regimes in which the available water capacity is at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil and the area has a developed irrigation water supply that is dependable (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown) and of adequate quality; and,

2. The soils have a temperature regime that is frigid, mesic, thermic or hyperthermic (pergelic and cryic regimes are excluded). These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 32° F (0° C). In addition, the mean summer temperature at this depth in soils with an O horizon is higher than 47° F (8° C); in soils that have no O horizon, the mean summer temperature is higher than 59° F (15° C); and,

3. The soils have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter); and,

4. The soils either have no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown; and,

5. The soils can be managed so that, in all horizons within a depth of 40 inches (1 meter), during part of each year the conductivity of the saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15; and,

6. The soils are not flooded frequently during the growing season (less often than once in 2 years); and,

7. The product of K (erodibility factor) x percent slope is less than 2.0; and,

8. The soils have a permeability rate of at least 0.06 inch (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches (50 cm) is less than 59° F (15° C); the permeability rate is not a limiting factor if the mean annual soil temperature is 59° F (15° C) or higher; and,

9. Less than 10 percent of the surface layer [upper 6 inches (15 cm)] in these soils consists of rock fragments coarser than 3 inches (7.6 cm); and,

10. The soils have a minimum rooting depth of 40 inches (1 meter).

Appendix B.—Criteria Used in Rating Soils for Selected Uses

Camp Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	---	Rare, common	Flooding.
3. Slope (percent)	<8	8-15	>15	Slope.
4. USDA texture modifier (surface layer)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
5. Coarse fragments in the surface layer (percent) [1]	<25	25-50	>50	Small stones.
6. Depth to high water table (feet)	--- >2.5	--- 1.5-2.5	+ <1.5	Ponding. Wetness.
7. Permeability in the upper 40 inches (in/hr) [2]	>0.6	0.06-0.6	<0.06	Percs slowly.
8. USDA texture (surface layer) [2]	---	---	SC, SIC, C	Too clayey.
9. Unified (surface layer)	---	---	PT	Excess humus.
10. USDA texture (surface layer)	---	LCOS, VFS, [3] LFS, [3] LS	COS, S, FS	Too sandy.
11. Depth to bedrock (inches)	---	---	<20	Depth to rock.
12. Depth to cemented pan (inches)	---	---	<20	Cemented pan.
13. USDA texture (surface layer) [4]	---	SIL, SI, VFSL, L	---	Dusty.
14. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH of surface layer)	---	---	<3.6	Too acid.
17. Other	---	---	(5)	Fragile.

[1] 100 minus percent passing No. 10 sieve.
[2] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[3] Rate *slight* if finer textured material is within 20 inches of the surface.
[4] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[5] If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Picnic Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Slope (percent)	<8	8-15	>15	Slope.
3. Flooding	None, rare, occasional.	Frequent	---	Flooding.
4. Depth to high water table (feet)	>2.5 ---	1.0-2.5 ---	<1.0 +	Wetness. Ponding.
5. USDA texture modifier (surface layer)	---	STV, BYV, CB, FL	STX, BYX, CBX, FLX, CBV, FLV, CNX, CRX, SHX, SYX	Large stones.
6. USDA texture (surface layer) [1]	---	---	SC, SIC, C	Too clayey.
7. USDA texture (surface layer)	---	LCOS, VFS, [2] LFS, [2] LS	COS, S, FS	Too sandy.
8. Unified (surface layer)	---	---	PT	Excess humus.
9. Coarse fragments in surface layer (percent) [3]	<25	25-50	>50	Small stones.
10. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
11. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
12. Soil reaction (pH of surface layer)	---	---	<3.6	Too acid.
13. Permeability in the upper 40 inches (in/hr) [1]	>0.6	0.06-0.6	<0.06	Percs slowly.
14. USDA texture (surface layer) [4]	---	SIL, SI, VFSL, L	---	Dusty.
15. Depth to bedrock (inches)	---	---	<20	Depth to rock.
16. Depth to cemented pan (inches)	---	---	<20	Cemented pan.
17. Other	---	---	(5)	Fragile.

[1] Rate soils in UST, TOR, BOR, XER, or ARID suborders, great groups, or subgroups one class better.
[2] Rate *slight* if finer textured material is within 20 inches of the surface.
[3] 100 minus percent passing No. 10 sieve.
[4] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[5] If the soil is easily damaged by use or disturbance, rate *severe—fragile.*

Playgrounds

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. USDA texture modifier (surface layer)	---	ST	STV, STX, BYV, BYX, CB, CBV, FL, FLV, BY, CBX, CNX, CRX, FLX, SHX, SYX	Large stones.
3. Slope (percent)	<2	2-6	>6	Slope.
4. Coarse fragments in surface layer (percent) [1]	<10	10-25	>25	Small stones.
5. USDA texture (surface layer) [2]	---	---	SC, SIC, C	Too clayey.
6. USDA texture (surface layer)	---	LCOS, VFS, [3] LFS, [3] LS	COS, S, FS	Too sandy.
7. Unified (surface layer)	---	---	PT	Excess humus.
8. Depth to high water table (feet)	<2.5 ---	1.5-2.5 ---	<1.5 +	Wetness. Ponding.
9. Flooding	None, rare	Occasional	Frequent	Flooding.
10. Depth to bedrock (inches)	>40	[4] 20-40	<20	Depth to rock.
11. Depth to cemented pan (inches)	>40	[4] 20-40	<20	Cemented pan.
12. Permeability in the upper 40 inches (in/hr) [2]	>0.6	0.06-0.6	<0.06	Percs slowly.
13. USDA texture (surface layer) [5]	---	SIL, SI, VFSL, L	---	Dusty.
14. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
15. Salinity in the surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
16. Soil reaction (pH of surface layer)	---	---	<3.6	Too acid.
17. Other	---	---	[6]	Fragile.

[1] 100 minus percent passing No. 10 sieve.
[2] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[3] Rate *slight* if finer textured material is within 20 inches of the surface.
[4] Rate *slight* if slopes are 0 to 2 percent.
[5] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[6] If the soil is easily damaged by use or disturbance, rate *severe—fragile*.

Paths and Trails

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Fraction greater than 3 inches in surface layer (percent by weight)	<25	25-50	>50	Large stones.
3. Depth to high water table (feet)	>2 ---	1-2 ---	<1 +	Wetness. Ponding.
4. USDA texture (surface layer) [1]	---	---	SC, SIC, C	Too clayey.
5. USDA texture (surface layer)	---	LCOS, VFS, [2] LFS, [2] LS	COS, S, FS	Too sandy.
6. Unified (surface layer)	---	---	PT	Excess humus.
7. Slope (percent)	<15	15-25	>25	Slope.
8. Erosion factor K (surface layer)	---	---	[3] >.35	Erodes easily.
9. Coarse fragments in surface layer (percent by weight) [4]	---	---	>65	Small stones.
10. Flooding	None, rare, occasional.	Frequent	---	Flooding.
11. USDA texture (surface layer) [5]	---	SIL, SI, VFSL, L	---	Dusty.
12. Other	---	---	(6)	Fragile.

[1] Rate soils in UST, TOR, ARID, BOR, or XER suborders, great groups, or subgroups one class better.
[2] Rate *slight* if finer textured material is within 20 inches of the surface.
[3] Disregard on slopes of 8 percent or less.
[4] 100 minus percent passing No. 10 sieve.
[5] Disregard unless soil is in TOR, ARID, or XER suborders, great groups, or subgroups.
[6] If the soil is easily damaged by use or disturbance, rate *severe—fragile.*

Lawns, Landscaping, and Golf Fairways

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Salinity of surface layer (mmhos/cm)	<4	4-8	>8	Excess salt.
3. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
4. Soil reaction (pH of surface layer)	---	---	<3.6	Too acid.
5. Sulfidic materials (great group)	---	---	Sulfaquents, Sulfihemists.	Excess sulfur.
6. Coarse fragments in surface layer (percent by weight) [1]	<25	25-50	>50	Small stones.
7. Fraction greater than 3 inches in surface layer (percent by weight)	<5	5-30	>30	Large stones.
8. Depth to high water table (feet)	--- >2	--- 1-2	+ <1	Ponding. Wetness.
9. Available water capacity (in/in) [2]	>.10	05-.10	<.05	Droughty.
10. Flooding	None, rare	Occasional	Frequent	Flooding.
11. Slope (percent)	<8	8-15	>15	Slope.
12. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
13. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
14. USDA texture (surface layer) [3]	---	---	SIC, C, SC	Too clayey.
15. USDA texture (surface layer)	---	---	FB, HM, MUCK, SP, MPT, PEAT	Excess humus.
16. USDA texture (surface layer)	---	LCOS, S	COS	Too sandy.
17. Carbonates	---	---	(4)	Excess lime.

[1] 100 minus percent passing No. 10 sieve.
[2] Weighted average to 40 inches.
[3] Rate one class better if soil is in kaolinitic family and experience confirms.
[4] If the amount of carbonate is so high that plant growth is restricted, rate *severe—excess lime.*

Shallow Excavations

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
4. USDA texture (20 to 60 inches)	---	SI [1]	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, G, SG	Cutbanks cave.
5. USDA texture (20 to 60 inches)	---	C, SIC	---	Too clayey.
6. Soil order	---	---	Vertisols	Cutbanks cave.
7. Bulk density at a depth of 20 to 60 inches (g/cc)	---	>1.8	---	Dense layer.
8. Unified (20 to 60 inches)	---	---	OL, OH, PT	Excess humus.
9. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
10. Depth to high water table (feet)	---	---	+	Ponding.
	>6	2.5-6	<2.5	Wetness.
11. Flooding	None, rare	Common	---	Flooding.
12. Slope (percent)	<8	8-15	>15	Slope.
13. Downslope movement	---	---	(3)	Slippage.

[1] In areas of loess, rating should be *slight*.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

Dwellings With Basements

Property	Limits: Slight	Limits: Moderate	Limits: Severe	Restrictive feature
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	---	Rare, common	Flooding.
3. Depth to high water table (feet)	---	---	+	Ponding.
	>6	2.5-6	<2.5	Wetness.
4. Depth to bedrock (inches):				
Hard	>60	40-60	<40	Depth to rock.
Soft	>40	20-40	<20	Depth to rock.
5. Depth to cemented pan (inches):				
Thick	>60	40-60	<40	Cemented pan.
Thin	>40	20-40	<20	Cemented pan.
6. Slope (percent)	<8	8-15	>15	Slope.
7. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
8. Unified (bottom layer)	---	---	OL, OH, PT	Low strength.
9. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
10. Total subsidence	---	---	>12	Subsides.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

[1] Thickest layer between 10 and 60 inches.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting.*
[5] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Small Commercial Buildings

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	---	Rare, common	Flooding.
3. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.5-2.5	<1.5	Wetness.
4. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
5. Slope (percent)	<4	4-8	>8	Slope.
6. Unified [1]	---	---	OL, OH, PT	Low strength.
7. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
8. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
9. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
10. Total subsidence	---	---	>12	Subsides.
11. Downslope movement	---	---	(3)	Slippage.
12. Formation of pits	---	---	(4)	Pitting.
13. Differential settling	---	---	(5)	Unstable fill.

[1] Thickest layer between 10 and 40 inches.
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting.*
[5] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Local Roads and Streets

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Total subsidence	---	---	>12	Subsides.
3. Depth to bedrock (inches):				
Hard	>40	20-40	<20	Depth to rock.
Soft	>20	<20	---	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	>40	20-40	<20	Cemented pan.
Thin	>20	<20	---	Cemented pan.
5. AASHTO group index number [1 2 3]	<5	5-8	>8	Low strength.
6. Depth to high water table (feet)	---	---	+	Ponding.
	>2.5	1.0-2.5	<1.0	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Flooding	None	Rare	Common	Flooding.
9. Potential frost action	Low	Moderate	High	Frost action.
10. Shrink-swell potential [1]	Low	Moderate	High, very high	Shrink-swell.
11. Fraction greater than 3 inches (percent by weight) [4]	<25	25-50	>50	Large stones.
12. Downslope movement	---	---	(5)	Slippage.
13. Formation of pits	---	---	(6)	Pitting.
14. Differential settling	---	---	(7)	Unstable fill.

[1] Thickest layer between 10 and 40 inches.

[2] GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10) where F = percent passing No. 200 sieve. If F is <35 and PI is >11, use only part 2 of equation. Use median values.

[3] Rate one class better if in kaolinitic family and experience confirms.

[4] Weighted average to 40 inches.

[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

[6] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting*.

[7] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Septic Tank Absorption Fields

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches)	>72	40-72	<40	Depth to rock.
4. Depth to cemented pan (inches)	>72	40-72	<40	Cemented pan.
5. Depth to high water table (feet)	--- >6	--- 4-6	+ <4	Ponding. Wetness.
6. Permeability (in/hr):				
24 to 60 inches	2.0-6.0	[1] 0.6-2.0	<0.6	Percs slowly.
24 to 40 inches	---	---	>6.0	Poor filter.
7. Slope (percent)	<6	8-15	>15	Slope.
8. Fraction greater than 3 inches (percent by weight) [2]	<25	25-50	>50	Large stones.
9. Total subsidence (inches)	---	---	>24	Subsides.
10. Downslope movement	---	---	(3)	Slippage.
11. Formation of pits	---	---	(4)	Pitting.

[1] Recheck to see if rating should be *slight.*
[2] Weighted average to 40 inches.
[3] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*
[4] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting.*

Sewage Lagoons

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 12 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan (inches)	>60	40-60	<40	Cemented pan.
5. Flooding	None, rare	---	Common [1]	Flooding.
6. Slope (percent)	<2	2-7	>7	Slope.
7. Unified (all depths)	---	OL, OH	PT	Excess humus.
8. Depth to high water table (feet) [2]	--- >5	--- [2] 3.5-5	+ [2] <3.5	Ponding. Wetness.
9. Fraction greater than 3 inches (percent by weight) [3]	<20	20-35	>35	Large stones.
10. Downslope movement	---	---	(4)	Slippage.
11. Formation of pits	---	---	(5)	Pitting.
12. Differential settling	---	---	(6)	Unstable fill.

[1] If floodwater will not enter or damage the sewage lagoon because of low velocity and a water depth of less than 5 feet, disregard flooding.

[2] If the floor of the sewage lagoon has a layer at least 20 inches thick with permeability of less than 0.2 in/hr, disregard wetness.

[3] Weighted average to 20 inches.

[4] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*

[5] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting.*

[6] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Sanitary Landfill (Trench)

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches)	---	---	<72	Depth to rock.
4. Depth to cemented pan (inches):				
Thick	---	---	<72	Cemented pan.
Thin	---	<72	---	Cemented pan.
5. Permeability of bottom layer (in/hr) [1]	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	---	---	<6	Wetness.
Perched	>4	2-4	<2	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. USDA texture [1 2 3]	---	CL, SC, SICL	SIC, C	Too clayey.
9. USDA texture [3]	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS, SG	Too sandy.
10. Unified [3]	---	---	OL, OH, PT	Excess humus.
11. Fraction greater than 3 inches (percent by weight) [4]	<20	20-35	>35	Large stones.
12. Sodium adsorption ratio (great group) [1]	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
13. Soil reaction at all depths (pH)	---	---	<3.6	Too acid.
14. Salinity at all depths (mmhos/cm)	---	---	>16	Excess salt.
15. Downslope movement	---	---	(5)	Slippage.
16. Differential settling	---	---	(6)	Unstable fill.

[1] Disregard in all Aridisols except Salorthids and Aquic intergrades, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic.

[2] Rate one class better if soil is in kaolinitic family and experience confirms.

[3] Thickest layer between 10 and 60 inches.

[4] Weighted average to 60 inches.

[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*

[6] If the soil is susceptible to differential settling, rate *severe—unstable fill.*

Sanitary Landfill (Area)

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Flooding	None	Rare	Common	Flooding.
3. Depth to bedrock (inches) [1]	>60	40-60	<40	Depth to rock.
4. Depth to cemented pan (inches) [1]	>60	40-60	<40	Cemented pan.
5. Permeability between 20 and 40 inches (in/hr) [1]	---	---	>2.0	Seepage.
6. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	>5	3.5-5	<3.5	Wetness.
Perched	>3	1.5-3	<1.5	Wetness.
7. Slope (percent)	<8	8-15	>15	Slope.
8. Downslope movement	---	---	(2)	Slippage.
9. Formation of pits	---	---	(3)	Pitting.
10. Differential settling	---	---	(4)	Unstable fill.

[1] Disregard in all Aridisols except Salorthids and Aquic intergrades, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic.

[2] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage*.

[3] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting*.

[4] If the soil is susceptible to differential settling, rate *severe—unstable fill*.

Daily Cover for Landfill

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. Depth to cemented pan (inches)	>60	40-60	<40	Cemented pan.
4. Unified [1]	---	---	SP, SW, SP-SM, SW-SM, GP, GW, GP-GM, GW-GM	Seepage.
5. USDA texture [1 2 3]	---	CL, SICL, SC	SIC, C	Too clayey.
6. USDA texture [1]	---	LCOS, LS, LFS, VFS	S, FS, COS, SG	Too sandy.
7. Unified [1 3]	---	---	OL, OH, CH, MH	Hard to pack.
8. Coarse fragments (percent) [1 4]	<25	25-50	>50	Small stones.
9. Fraction greater than 3 inches (percent by weight) [1 4]	<25	25-50	>50	Large stones.
10. Slope (percent)	<8	8-15	>15	Slope.
11. Depth to high water table (feet)	--- >3.5	--- 1.5-3.5	+ <1.5	Ponding. Wetness.
12. Unified [1]	---	---	PT	Excess humus.
13. Layer thickness (inches)	>60	40-60	<40	Thin layer.
14. Soil reaction (pH) [1]	---	---	<3.6	Too acid.
15. Salinity in the upper 60 inches (mmhos/cm) [2]	---	---	>16	Excess salt.
16. Sodium adsorption ratio (great group) [1 2]	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
17. Carbonates	---	---	[5]	Excess lime.

[1] Thickest layer between 10 and 60 inches.

[2] Disregard in all Aridisols except Salorthids and Aquic intergrades, in all Aridic subgroups, and in all Torri great groups of Entisols except Aquic.

[3] Rate one class better if soil is in kaolinitic family and experience confirms.

[4] 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use dominant condition for restrictive feature.

[5] If amount of carbonete is so high that plant growth is restricted, rate *poor—excess lime.*

Roadfill

Property [1]	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>60	40-60	<40	Depth to rock.
3. AASHTO group index number [2 3 4]	<5	5-8	>8	Low strength.
4. Layer thickness (inches)	>60	30-60	<30	Thin layer.
5. Fraction greater than 3 inches (percent by weight) [5]	<25	25-50	>50	Large stones.
6. Depth to high water table (feet)	>3	1-3	<1	Wetness.
7. Slope (percent)	<15	15-25	>25	Slope.
8. Shrink-swell potential [3]	Low	Moderate	High, very high	Shrink-swell.
9. Depth to thick cemented pan (inches)	>60	40-60	<40	Cemented pan.

[1] If the content of gypsum is 10 to 15 percent, rate *fair—excess gypsum*. If it exceeds 15 percent, rate *poor—excess gypsum*.

[2] GIN = (F-35)[.2 + .005(LL-40)] + .01 (F-15)(PI-10) where F = percent passing No. 200 sieve. If F is <35 and PI is >11, use only part 2 of equation. Use median values.

[3] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on bottom layer, verify thickness.

[4] Rate one class better if in kaolinitic family and experience confirms.

[5] Weighted average to 40 inches.

Sand

Property	Limits		Restrictive feature
	Probable source	Improbable source	
1. USDA texture	---	Ice	Permafrost.
2. Unified [1]	SW, SP, SW-SM, SP-SM	---	---
	GW, GP, GW-GM, GP-GM [2]	---	---
	---	GW, GP, GW-GM, GP-GM [3]	Small stones.
	---	PT	Excess humus.
	---	All other	Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) [4]	<50	>50	Large stones.

[1] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on bottom layer, verify thickness.

[2] Percent passing No. 4 sieve minus percent passing No. 200 sieve is greater than 25.

[3] Percent passing No. 4 sieve minus percent passing No. 200 sieve is less than 25.

[4] Thickest layer between 10 and 60 inches.

Gravel

Property	Limits		Restrictive feature
	Probable source	Improbable source	
1. USDA texture	---	Ice	Permafrost.
2. Unified [1]	GW, GP, GW-GM, GP-GM	---	---
	SW, SP, SW-SM, SP-SM [2]	SW, SP, SW-SM, SP-SM [3]	Too sandy.
	---	PT	Excess humus.
	---	All other	Excess fines.
3. Layer thickness (inches)	>36	<36	Thin layer.
4. Fraction greater than 3 inches (percent by weight) [4]	<50	>50	Large stones.

[1] Evaluate the thickest layer between 10 and 60 inches and also the bottom layer. Choose the best rating. When rating is based on bottom layer, verify thickness.

[2] 100 minus percent passing No. 4 sieve is greater than 25.

[3] 100 minus percent passing No. 4 sieve is less than 25.

[4] Thickest layer between 10 and 60 inches.

Topsoil

Property	Limits			Restrictive feature
	Good	Fair	Poor	
1. USDA texture	---	---	Ice	Permafrost.
2. Depth to bedrock (inches)	>40	20-40	<20	Depth to rock.
3. Depth to cemented pan (inches)	>40	20-40	<20	Cemented pan.
4. Depth to bulk density greater than 1.8 g/cc (inches)	>40	20-40	<20	Area reclaim.
5. USDA texture in the upper 40 inches	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS	Too sandy.
6. USDA texture in the upper 40 inches	---	SCL, CL, SICL [1]	SIC, C, SC	Too clayey.
7. USDA texture in the upper 40 inches	---	---	FB, HM, SP, MPT, MUCK, PEAT, CE	Excess humus.
8. Fraction greater than 3 inches (percent by weight): [2]				
0 to 40 inches	<5	5-25	>25	Large stones.
40 to 60 inches	<15	15-30	>30	Area reclaim.
9. Coarse fragments (percent): [2]				
0 to 40 inches	<5	5-25	>25	Small stones.
40 to 60 inches	<25	25-50	>50	Area reclaim.
10. Salinity in the upper 40 inches (mmhos/cm)	<4	4-8	>8	Excess salt.
11. Layer thickness (inches)	>40	20-40	<20	Thin layer.
12. Depth to high water table (feet)	---	---	<1	Wetness.
13. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (halic, natric, alkali phases)	Excess sodium.
14. Soil reaction in the upper 40 inches (pH)	---	---	<3.6	Too acid.
15. Slope (percent)	<8	8-15	>15	Slope.
16. Carbonates	---	---	(3)	Excess lime.

[1] If the soil has more than 3 percent organic matter and less than 35 percent clay, rate *good*.

[2] 100 minus percent passing No. 10 sieve, plus fraction greater than 3 inches. Use the dominant condition for restrictive feature.

[3] If the amount of carbonate is so high that plant growth is restricted, rate *poor—excess lime*.

Pond Reservoir Areas

Property	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Permeability between 20 and 60 inches (in/hr)	<0.6	0.6-2.0	>2.0	Seepage.
3. Depth to bedrock (inches)	>60	20-60	<20	Depth to rock.
4. Depth to cemented pan (inches)	>60	20-60	<20	Cemented pan.
5. Slope (percent)	<3	3-8	>8	Slope.
6. USDA texture (all depths)	---	---	MARL, GYP	Seepage.
7. Downslope movement	---	---	(1)	Slippage.
8. Formation of pits	---	---	(2)	Pitting.

[1] If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate *severe—slippage.*

[2] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, rate *severe—pitting.*

Embankments, Dikes, and Levees

Property [1]	Limits			Restrictive feature
	Slight	Moderate	Severe	
1. USDA texture	---	---	Ice	Permafrost.
2. Layer thickness (inches)	>60	30-60	<30	Thin layer.
3. Unified [2]	---	---	GW, GP, SW, SP, GW-GM, GP-GM, SW-SM, SP-SM, SM, [3] GM [3]	Seepage.
4. Unified [2]	---	GM, [4] CL [5]	ML, [6] SM, [7] SP, CL-ML	Piping.
5. Unified [2]	---	---	PT, OL, OH	Excess humus.
6. Unified [2]	---	---	MH, CH [8]	Hard to pack.
7. Fraction greater than 3 inches (percent by weight) [9]	<15	15-35	>35	Large stones.
8. Depth to high water table (feet)	---	---	+	Ponding.
Apparent	>4	2-4	<2	Wetness.
Perched	>3	1-3	<1	Wetness.
9. Sodium adsorption ratio in the upper 40 inches (great group)	---	---	>12 (natric, halic, alkali phases)	Excess sodium.
10. Salinity at all depths (mmhos/cm)	<8	8-16	>16	Excess salt.

[1] If the content of gypsum is 5 to 10 percent, rate *moderate—excess gypsum*. If it exceeds 10 percent, rate *severe—excess gypsum*.

[2] Thickest horizon between 10 and 60 inches.

[3] Rate *moderate* if more than 20 percent passing No. 200 sieve and *slight* if more than 30 percent passing No. 200 sieve.

[4] Rate *slight* if less than 35 percent passing No. 200 sieve, less than 50 percent passing No. 40 sieve, and less than 65 percent passing No. 10 sieve. The soil must meet all three criteria before it is rated *slight*.

[5] Rate *slight* if PI is greater than 15.

[6] Rate *moderate* of PI is greater than 10.

[7] Rate *moderate* if less than 70 percent passing No. 40 sieve and less than 90 percent passing No. 10 sieve, and rate *slight* if less than 60 percent passing No. 40 sieve and less than 75 percent passing No. 10 sieve.

[8] Rate *moderate* if PI is less than 40.

[9] Weighted average to 40 inches.

Drainage

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Depth to high water table (feet) [2]	[3] >3 +	Deep to water. Ponding.
3. Permeability in the upper 40 inches (in/hr)	<0.2	Percs slowly.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Flooding	Common	Flooding.
7. Total subsidence	Any entry	Subsides.
8. Fraction greater than 3 inches (percent by weight) [4]	>25	Large stones.
9. Potential frost action	High	Frost action.
10. Slope (percent)	>3	Slope.
11. USDA texture [4]	COS, S, FS, VFS, LCOS, LS, LFS, LVFS, SG, G	Cutbanks cave.
12. Salinity at all depths (mmhos/cm)	>8	Excess salt.
13. Sodium adsorption ratio in the upper 40 inches (great group)	>12 (natric, halic, alkali phases)	Excess sodium.
14. Sulfidic materials (great group)	Sulfaquents, Sulfihemists	Excess sulfur.
15. Soil reaction at all depths (pH)	<3.6	Too acid.
16. Downslope movement	(5)	Slippage.
17. Complex landscape	(6)	Complex slope.
18. Availability of outlets	(7)	Poor outlets.

[1] If the soil has no restrictive features, the rating is *favorable*.
[2] If the soil is deep to water, disregard other properties.
[3] For irrigated areas, consider other restrictive features if the water table is between 3 and 5 feet.
[4] Thickest layer between 10 and 60 inches.
[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.
[6] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[7] If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Irrigation

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Fraction greater than 3 inches (percent by weight) [2]	>25	Large stones.
3. Depth to high water table (feet)	[3] <3 +	Wetness. Ponding.
4. Available water capacity (in/in) [2]	<0.10	Droughty.
5. USDA texture (surface layer)	COS, S, FS, VFS, LS, LFS, LVFS, LCOS	Fast intake.
6. USDA texture (surface layer)	SIC, C, SC	Slow intake.
7. Wind erodibility group	1, 2, 3	Soil blowing.
8. Permeability in the upper 60 inches (in/hr)	<0.2	Percs slowly.
9. Depth to bedrock (inches)	<40	Depth to rock.
10. Depth to cemented pan (inches)	<40	Cemented pan.
11. Fragipan (great group)	All Fragi	Rooting depth.
12. Bulk density in the upper 40 inches (g/cc)	>1.7	Rooting depth.
13. Slope (percent)	>3	Slope.
14. Erosion factor K (surface layer)	>.35	Erodes easily.
15. Flooding	Common	Flooding.
16. Sodium adsorption ratio in the upper 40 inches (great group)	>12 (natric, halic, alkali phases)	Excess sodium.
17. Salinity in the upper 40 inches (mmhos/cm)	>4	Excess salt.
18. Soil reaction at all depths (pH)	<3.6	Too acid.
19. Complex landscape	(4)	Complex slope.
20. Formation of pits	(5)	Pitting.
21. Carbonates	(6)	Excess lime.

[1] If the soil has no restrictive features, the rating is *favorable*.
[2] Weighted average to 40 inches.
[3] If depth to the water table is below 3 feet during the growing season, disregard wetness.
[4] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[5] If the soil is susceptible to the formation of pits caused by the melting of ground ice when ground cover is removed, list *pitting* as a restrictive feature.
[6] If the amount of carbonate is so high that plant growth is restricted, list *excess lime* as a restrictive feature.

Terraces and Diversions

Property [1]	Limits	Restrictive feature [2]
1. USDA texture	Ice	Permafrost.
2. Slope (percent)	>8	Slope.
3. Fraction greater than 3 inches (percent by weight) [3]	>15	Large stones.
4. Depth to bedrock (inches)	<40	Depth to rock.
5. Depth to cemented pan (inches)	<40	Cemented pan.
6. Erosion factor K in the upper 40 inches	>.35	Erodes easily.
7. Depth to high water table (feet)	<3.0 +	Wetness. Ponding.
8. Fragipan (great group)	All Fragi	Rooting depth.
9. USDA texture [4]	COS, S, FS, LS, LCOS, SG	Too sandy.
10. Wind erodibility group	1, 2, 3	Soil blowing.
11. Permeability (in/hr) [4]	<0.2	Percs slowly.
12. Downslope movement	(5)	Slippage.
13. Complex landscape	(6)	Complex slope.
14. Availability of outlets	(7)	Poor outlets.

[1] If the content of gypsum exceeds 5 percent, list *excess gypsum* as a restrictive feature.
[2] If the soil has no restrictive features, the rating is *favorable*.
[3] Weighted average to 40 inches.
[4] Thickest layer between 10 and 60 inches.
[5] If the soil is susceptible to movement downslope when loaded, excavated, or wet, list *slippage* as a restrictive feature.
[6] If complex or irregular slopes cause difficulty in design, installation, or functioning of the system, list *complex slope* as a restrictive feature.
[7] If good outlets are difficult to find, list *poor outlets* as a restrictive feature.

Grassed Waterways

Property	Limits	Restrictive feature [1]
1. USDA texture	Ice	Permafrost.
2. Moisture regime	Aridic, Torric	Too arid.
3. Fraction greater than 3 inches (percent by weight) [2]	>15	Large stones.
4. Depth to high water table (feet)	<1.5	Wetness.
5. Slope (percent)	>8	Slope.
6. Salinity in the surface layer (mmhos/cm)	>4	Excess salt.
7. Sodium adsorption ratio in the upper 40 inches (great group)	>12 (natric, halic, alkali phases)	Excess sodium.
8. Erosion factor K (upper 40 inches)	>.35	Erodes easily.
9. Available water capacity (in/in) [2]	<0.10	Droughty.
10. Depth to bedrock (inches)	<40	Depth to rock.
11. Depth to cemented pan (inches)	<40	Cemented pan.
12. Fragipan (great group)	All Fragi	Rooting depth.
13. Bulk density in the upper 40 inches (g/cc)	>1.7	Rooting depth.
14. Permeability in the upper 40 inches (in/hr)	<0.2	Percs slowly.

[1] If the soil has no restrictive features, the rating is *favorable.*
[2] Weighted average to 40 inches.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature: Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Precipitation: Average	2 years in 10 will have-- Less than--	More than--	Average number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
Recorded in the period 1949-87 at Stockton										
January----	53.0	37.2	45.1	70	23	27	2.93	1.15	4.42	6
February---	60.4	40.2	50.3	73	27	63	2.06	.65	3.20	5
March------	65.3	41.9	53.6	81	28	131	2.16	.74	3.43	5
April------	72.6	45.4	59.0	92	35	273	1.24	.51	1.92	3
May--------	81.0	51.2	66.1	101	40	499	.25	.07	.50	0
June-------	88.7	56.8	72.7	107	47	682	.08	.04	.25	0
July-------	94.5	60.4	77.4	109	52	869	.05	.02	.23	0
August-----	92.6	59.8	76.2	107	51	843	.06	.02	.40	0
September--	87.8	57.0	72.4	104	46	673	.33	.04	.76	0
October----	78.0	50.0	64.0	95	37	433	.72	.13	1.39	1
November---	64.1	42.1	53.1	81	28	125	1.95	.45	3.31	4
December---	53.4	37.5	45.5	68	24	22	2.37	.80	3.67	5
Yearly:										
Average--	74.3	48.3	61.3	---	---	---	---	---	---	---
Extreme--	114.0	10.0	---	110	21	---	---	---	---	---
Total----	---	---	---	---	---	4,640	14.19	8.30	18.92	29
Recorded in the period 1950-87 at Tracy-Carbona										
January----	53.6	36.7	45.1	67	23	19	1.98	0.86	2.93	5
February---	60.6	40.1	50.4	74	29	60	1.39	.48	2.21	4
March------	66.1	42.4	54.2	82	31	151	1.46	.43	2.38	4
April------	72.6	45.3	58.9	91	34	273	.96	.38	1.51	2
May--------	80.7	49.7	65.2	100	38	469	.29	.08	.71	0
June-------	88.2	54.8	71.5	106	43	642	.52	.02	2.09	0
July-------	94.0	56.8	75.4	107	48	778	.04	.05	.28	0
August-----	92.5	55.4	73.9	105	46	737	.12	.09	1.05	0
September--	87.8	53.9	70.9	102	44	620	.26	.09	.84	0
October----	78.4	48.9	63.6	94	38	428	.50	.15	1.06	1
November---	64.8	42.1	53.5	81	29	144	1.23	.42	2.10	3
December---	54.6	37.0	45.8	69	24	22	1.57	.61	2.38	4
Yearly:										
Average--	74.5	46.9	60.7	---	---	---	---	---	---	---
Extreme--	112.0	17.0	---	108	22	---	---	---	---	---
Total----	---	---	---	---	---	4,343	10.33	5.78	13.18	23

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation			
				2 years in 10 will have--				2 years in 10 will have--		
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
Recorded in the period 1948-87 at Lodi										
January----	53.4	36.8	45.1	67	21	24	3.34	1.33	5.04	6
February---	60.7	39.6	50.1	74	26	59	2.55	.79	3.98	5
March------	65.6	41.3	53.5	81	28	128	2.61	.89	4.03	5
April------	72.4	44.3	58.3	91	33	253	1.48	.52	2.34	3
May--------	80.1	48.8	64.4	98	38	447	.37	.09	.72	1
June-------	86.8	53.3	70.1	105	42	602	.13	.04	.35	0
July-------	91.5	55.7	73.6	105	46	731	.06	.02	.32	0
August-----	90.1	54.7	72.4	103	45	694	.06	.03	.34	0
September--	86.8	52.4	69.6	102	41	586	.35	.08	.92	0
October----	77.9	46.3	62.1	95	34	374	.86	.18	1.66	1
November---	64.2	40.5	52.3	80	26	108	2.42	.60	3.98	4
December---	54.1	36.9	45.5	68	23	21	2.93	1.15	4.43	5
Yearly:										
Average--	73.6	45.9	59.8	---	---	---	---	---	---	---
Extreme--	111.0	11.0	---	107	21	---	---	---	---	---
Total----	---	---	---	---	---	4,028	17.16	8.82	23.00	30

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Recorded in the period 1949-90 at Stockton			
Last freezing temperature in spring:			
1 year in 10 later than--	Feb. 20	Feb. 29	Mar. 26
2 years in 10 later than--	Feb. 11	Feb. 20	Mar. 16
5 years in 10 later than--	Jan. 25	Feb. 2	Feb. 27
First freezing temperature in fall:			
1 year in 10 earlier than--	Dec. 9	Nov. 19	Nov. 13
2 years in 10 earlier than--	Dec. 12	Nov. 25	Nov. 18
5 years in 10 earlier than--	Dec. 18	Dec. 6	Nov. 28
Recorded in the period 1950-90 at Tracy-Carbona			
Last freezing temperature in spring:			
1 year in 10 later than--	Jan. 28	Feb. 17	Mar. 22
2 years in 10 later than--	Jan. 22	Feb. 9	Mar. 12
5 years in 10 later than--	Jan. 11	Jan. 24	Feb. 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Dec. 6	Nov. 24	Nov. 13
2 years in 10 earlier than--	Dec. 10	Nov. 29	Nov. 17
5 years in 10 earlier than--	Dec. 18	Dec. 9	Nov. 27

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Recorded in the period 1948-90 at Lodi			
Last freezing temperature in spring:			
1 year in 10 later than--	Feb. 14	Mar. 11	Apr. 2
2 years in 10 later than--	Feb. 5	Feb. 29	Mar. 24
5 years in 10 later than--	Jan. 21	Feb. 9	Mar. 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Nov. 20	Nov. 15	Oct. 30
2 years in 10 earlier than--	Nov. 26	Nov. 22	Nov. 4
5 years in 10 earlier than--	Dec. 7	Dec. 5	Nov. 14

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
Recorded in the period 1949-90 at Stockton			
9 years in 10	313	285	244
8 years in 10	321	296	255
5 years in 10	338	318	275
2 years in 10	355	339	295
1 year in 10	363	350	306
Recorded in the period 1950-90 at Tracy-Carbona			
9 years in 10	323	289	245
8 years in 10	329	300	257
5 years in 10	342	321	279
2 years in 10	355	342	302
1 year in 10	361	353	314
Recorded in the period 1948-90 at Lodi			
9 years in 10	300	263	221
8 years in 10	309	276	232
5 years in 10	326	300	254
2 years in 10	342	324	275
1 year in 10	351	337	287

TABLE 4.--AVERAGE WINDSPEED AND AVERAGE FASTEST WINDSPEED

(Recorded in the period 1964-86 at Stockton)

Month	Average windspeed (mph)	Average fastest windspeed (mph)
January	6.6	30.6
February	6.8	27.6
March	7.5	28.8
April	8.1	26.6
May	9.1	25.4
June	9.0	24.9
July	8.1	22.3
August	7.5	21.5
September	7.0	22.6
October	6.3	26.3
November	5.6	25.9
December	6.1	30.5
Yearly	7.9	26.1

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
101	Acampo sandy loam, 0 to 2 percent slopes	9,540	1.1
102	Alamo clay, 0 to 2 percent slopes	210	*
103	Alo-Vaquero complex, 8 to 30 percent slopes	2,025	0.2
104	Alo-Vaquero complex, 30 to 50 percent slopes	4,450	0.5
105	Amador-Lithic Xerorthents complex, 2 to 15 percent slopes	600	0.1
106	Archerdale very fine sandy loam, 0 to 2 percent slopes, overwashed	590	0.1
107	Archerdale clay loam, 0 to 2 percent slopes	20,520	2.3
108	Arents, saline-sodic, 0 to 2 percent slopes	365	*
109	Bisgani loamy coarse sand, partially drained, 0 to 2 percent slopes	1,385	0.2
110	Boggiano clay loam, 0 to 2 percent slopes	1,675	0.2
111	Bruella sandy loam, 0 to 2 percent slopes	4,125	0.5
112	Bruella sandy loam, hard substratum, 0 to 2 percent slopes	4,125	0.5
113	Calla clay loam, 2 to 8 percent slopes	530	0.1
114	Calla-Carbona complex, 8 to 30 percent slopes	5,370	0.6
115	Calla-Carbona complex, 30 to 50 percent slopes	8,195	0.9
116	Calla-Pleito complex, 8 to 30 percent slopes	1,080	0.1
117	Capay clay loam, 0 to 2 percent slopes	260	*
118	Capay clay, 0 to 2 percent slopes	25,015	2.8
119	Capay clay, 2 to 5 percent slopes	670	0.1
120	Capay clay, saline-sodic, 0 to 2 percent slopes	900	0.1
121	Capay clay, wet, 0 to 2 percent slopes	14,400	1.6
122	Capay-Urban land complex, 0 to 2 percent slopes	2,130	0.2
123	Carbona clay loam, 2 to 8 percent slopes	3,680	0.4
124	Carbona-Orognen complex, 15 to 30 percent slopes	495	0.1
125	Carbona-Orognen complex, 30 to 50 percent slopes	555	0.1
126	Carbona complex, 15 to 50 percent slopes	1,070	0.1
127	Chuloak coarse sandy loam, 0 to 2 percent slopes	1,915	0.2
128	Cogna fine sandy loam, 0 to 2 percent slopes, overwashed	1,390	0.2
129	Cogna loam, 0 to 2 percent slopes	12,970	1.4
130	Columbia fine sandy loam, drained, 0 to 2 percent slopes	10,985	1.2
131	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded	2,535	0.3
132	Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded	2,640	0.3
133	Columbia fine sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes	1,750	0.2
134	Cometa sandy loam, 2 to 5 percent slopes	4,515	0.5
135	Corning-Redding complex, 2 to 8 percent slopes	730	0.1
136	Corning-Redding complex, 8 to 15 percent slopes	1,645	0.2
137	Cortina gravelly sandy loam, 0 to 5 percent slopes	405	*
138	Cosumnes silty clay loam, drained, 0 to 2 percent slopes	770	0.1
139	Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded	660	0.1
140	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded	1,570	0.2
141	Delhi fine sand, 0 to 5 percent slopes	1,685	0.2
142	Delhi loamy sand, 0 to 2 percent slopes	20,450	2.3
143	Delhi-Urban land complex, 0 to 2 percent slopes	3,675	0.4
144	Dello sand, partially drained, 0 to 2 percent slopes, occasionally flooded	375	*
145	Dello loamy sand, drained, 0 to 2 percent slopes	1,180	0.1
146	Dello loamy sand, partially drained, 0 to 2 percent slopes	1,145	0.1
147	Dello sandy loam, clayey substratum, drained, 0 to 2 percent slopes	400	*
148	Dello clay loam, drained, 0 to 2 percent slopes, overwashed	1,290	0.1
149	Devries sandy loam, drained, 0 to 2 percent slopes	9,545	1.1
150	Dumps	560	0.1
151	Dumps, tailings	505	0.1
152	Egbert mucky clay loam, partially drained, 0 to 2 percent slopes	1,495	0.2
153	Egbert silty clay loam, partially drained, 0 to 2 percent slopes	10,140	1.1
154	Egbert silty clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	8,160	0.9
155	Egbert-Urban land complex, partially drained, 0 to 2 percent slopes	355	*
156	El Solyo clay loam, 0 to 2 percent slopes	3,220	0.4
157	Exeter sandy loam, 0 to 2 percent slopes	4,055	0.4
158	Finrod clay loam, 0 to 2 percent slopes	9,130	1.0
159	Fluvaquents, 0 to 2 percent slopes, frequently flooded	4,985	0.6
160	Galt clay, 0 to 2 percent slopes	8,560	0.9

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
161	Galt clay, 2 to 5 percent slopes	350	*
162	Galt-Urban land complex, 0 to 2 percent slopes	1,480	0.2
163	Gonzaga-Franciscan complex, 30 to 50 percent slopes	3,655	0.4
164	Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes	8,130	0.9
165	Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes	3,765	0.4
166	Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes	7,900	0.9
167	Grangeville clay loam, partially drained, 0 to 2 percent slopes	3,075	0.3
168	Guard clay loam, 0 to 2 percent slopes	1,555	0.2
169	Guard clay loam, drained, 0 to 2 percent slopes	14,090	1.6
170	Hicksville loam, 0 to 2 percent slopes, occasionally flooded	2,350	0.3
171	Hicksville loam, bedrock substratum, 2 to 5 percent slopes, occasionally flooded	535	0.1
172	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded	1,305	0.1
173	Hollenbeck silty clay, 0 to 2 percent slopes	24,465	2.7
174	Hollenbeck clay, 1 to 3 percent slopes	740	0.1
175	Honcut sandy loam, 0 to 2 percent slopes	7,555	0.8
176	Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes	7,595	0.8
177	Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes	1,910	0.2
178	Honker-Vallecitos-Honker, eroded, complex, 50 to 75 percent slopes	5,460	0.6
179	Itano silty clay loam, partially drained, 0 to 2 percent slopes	3,855	0.4
180	Jacktone clay, 0 to 2 percent slopes	33,145	3.7
181	Jacktone-Urban land complex, 0 to 2 percent slopes	17,925	2.0
182	Jahant loam, 0 to 2 percent slopes	2,975	0.3
183	Jahant loam, 2 to 8 percent slopes	285	*
184	Kaseberg loamy sand, 5 to 15 percent slopes	660	0.1
185	Kaseberg fine sandy loam, 2 to 15 percent slopes	860	0.1
186	Kaseberg loam, 15 to 30 percent slopes	380	*
187	Keyes-Bellota complex, 2 to 15 percent slopes	2,510	0.3
188	Keyes-Redding complex, 2 to 8 percent slopes	2,270	0.3
189	Kingdon fine sandy loam, 0 to 2 percent slopes	6,760	0.7
190	Kingile muck, partially drained, 0 to 2 percent slopes	17,790	2.0
191	Kingile-Ryde complex, partially drained, 0 to 2 percent slopes	5,590	0.6
192	Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes	610	0.1
193	Madera sandy loam, 0 to 2 percent slopes	16,735	1.9
194	Madera loam, 2 to 5 percent slopes	650	0.1
195	Madera-Alamo complex, leveled, 0 to 1 percent slopes	6,985	0.8
196	Manteca fine sandy loam, 0 to 2 percent slopes	9,680	1.1
197	Merritt silty clay loam, partially drained, 0 to 2 percent slopes	27,985	3.1
198	Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded	1,125	0.1
199	Montpellier sandy loam, 8 to 15 percent slopes	605	0.1
200	Montpellier-Cometa complex, 5 to 8 percent slopes	6,575	0.7
201	Nord loam, 0 to 2 percent slopes	735	0.1
202	Pardee gravelly loam, 0 to 3 percent slopes	2,640	0.3
203	Pardee cobbly loam, 3 to 15 percent slopes	6,745	0.7
204	Peltier mucky clay loam, partially drained, 0 to 2 percent slopes	17,130	1.9
205	Peltier mucky clay loam, organic substratum, partially drained, 0 to 2 percent slopes	1,125	0.1
206	Pentz sandy loam, 2 to 15 percent slopes	3,380	0.4
207	Pentz sandy loam, 15 to 50 percent slopes	6,645	0.7
208	Pentz cobbly sandy loam, 5 to 8 percent slopes	2,205	0.2
209	Pentz-Bellota complex, 2 to 15 percent slopes	5,635	0.6
210	Pentz-Redding complex, 2 to 15 percent slopes	4,195	0.5
211	Pescadero clay loam, partially drained, 0 to 2 percent slopes	1,225	0.1
212	Peters clay, 2 to 8 percent slopes	3,210	0.4
213	Piper sandy loam, partially drained, 0 to 2 percent slopes	470	0.1
214	Pits, gravel	1,970	0.2
215	Pleito clay loam, 2 to 8 percent slopes	455	0.1
216	Ramoth sandy loam, 5 to 8 percent slopes	2,215	0.2
217	Ramoth sandy loam, 8 to 15 percent slopes	595	0.1
218	Ramoth sandy loam, 15 to 30 percent slopes	420	*
219	Redding loam, 0 to 3 percent slopes	2,020	0.2
220	Redding gravelly loam, 2 to 8 percent slopes	22,380	2.5
221	Redding gravelly loam, 8 to 30 percent slopes	3,410	0.4

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
222	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded	735	0.1
223	Reiff loam, 0 to 2 percent slopes	540	0.1
224	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed	4,460	0.5
225	Rindge muck, partially drained, 0 to 2 percent slopes	30,045	3.3
226	Rioblancho clay loam, drained, 0 to 2 percent slopes	5,530	0.6
227	Rioblancho-Urban land complex, drained, 0 to 2 percent slopes	1,275	0.1
228	Rocklin sandy loam, 2 to 5 percent slopes	6,175	0.7
229	Rocklin fine sandy loam, 0 to 2 percent slopes	1,395	0.2
230	Ryde clay loam, partially drained, 0 to 2 percent slopes	8,785	1.0
231	Ryde silty clay loam, organic substratum, partially drained, 0 to 2 percent slopes	3,115	0.3
232	Ryde clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	5,060	0.6
233	Ryde-Peltier complex, partially drained, 0 to 2 percent slopes	5,470	0.6
234	Sailboat silt loam, drained, 0 to 2 percent slopes	2,940	0.3
235	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded	830	0.1
236	San Joaquin sandy loam, 0 to 2 percent slopes	4,975	0.6
237	San Joaquin sandy loam, 2 to 5 percent slopes	4,615	0.5
238	San Joaquin loam, 0 to 2 percent slopes	4,100	0.5
239	San Joaquin loam, 2 to 8 percent slopes, eroded	2,840	0.3
240	San Joaquin loam, thick surface, 0 to 2 percent slopes	10,485	1.2
241	San Joaquin complex, 0 to 1 percent slopes	7,385	0.8
242	San Joaquin-Urban land complex, 0 to 2 percent slopes	1,065	0.1
243	Scribner clay loam, partially drained, 0 to 2 percent slopes	3,245	0.4
244	Scribner clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	450	*
245	Scribner-Urban land complex, partially drained, 0 to 2 percent slopes	430	*
246	Shima muck, partially drained, 0 to 2 percent slopes	965	0.1
247	Shinkee muck, partially drained, 0 to 2 percent slopes	4,725	0.5
248	Stockton fine sandy loam, 0 to 2 percent slopes, overwashed	685	0.1
249	Stockton silty clay loam, 0 to 2 percent slopes, overwashed	2,465	0.3
250	Stockton clay, 0 to 2 percent slopes	17,330	1.9
251	Stockton-Urban land complex, 0 to 2 percent slopes	3,635	0.4
252	Stomar clay loam, 0 to 2 percent slopes	10,960	1.2
253	Stomar clay loam, wet, 0 to 2 percent slopes	865	0.1
254	Timor loamy sand, 0 to 2 percent slopes	3,135	0.3
255	Tinnin loamy coarse sand, 0 to 2 percent slopes	16,800	1.9
256	Tokay fine sandy loam, 0 to 2 percent slopes	31,430	3.5
257	Tokay-Urban land complex, 0 to 2 percent slopes	4,650	0.5
258	Trahern clay loam, partially drained, 0 to 2 percent slopes	1,140	0.1
259	Tujunga loamy sand, 0 to 2 percent slopes	3,185	0.4
260	Urban land	6,250	0.7
261	Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes	9,190	1.0
262	Vaquero-Carbona complex, 8 to 30 percent slopes	1,030	0.1
263	Venice mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed	1,115	0.1
264	Venice muck, partially drained, 0 to 2 percent slopes	3,630	0.4
265	Veritas sandy loam, partially drained, 0 to 2 percent slopes	595	0.1
266	Veritas fine sandy loam, 0 to 2 percent slopes	23,440	2.6
267	Veritas silty clay loam, 0 to 2 percent slopes, overwashed	415	*
268	Vernalis clay loam, 0 to 2 percent slopes	2,700	0.3
269	Vernalis clay loam, wet, 0 to 2 percent slopes	815	0.1
270	Vignolo silt loam, 0 to 2 percent slopes	985	0.1
271	Vignolo silty clay loam, 0 to 2 percent slopes	2,345	0.3
272	Vina fine sandy loam, 0 to 2 percent slopes	1,830	0.2
273	Webile muck, partially drained, 0 to 2 percent slopes	1,345	0.1
274	Willows clay, partially drained, 0 to 2 percent slopes	3,935	0.4
275	Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes	7,425	0.8
276	Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes	3,100	0.3
277	Xerofluvents, 0 to 2 percent slopes, frequently flooded	375	*
278	Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded	1,970	0.2
279	Yellowlark gravelly loam, 0 to 2 percent slopes	1,545	0.2
280	Yellowlark gravelly loam, 2 to 5 percent slopes	2,105	0.2
281	Zacharias clay loam, 0 to 2 percent slopes	2,170	0.2
282	Zacharias gravelly clay loam, 0 to 2 percent slopes	4,625	0.5

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
283	Zacharias gravelly clay loam, 2 to 8 percent slopes	885	0.1
	Total	901,760	100.0

* Less than 0.1 percent.

TABLE 6.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
101	Acampo sandy loam, 0 to 2 percent slopes (where irrigated)
106	Archerdale very fine sandy loam, 0 to 2 percent slopes, overwashed (where irrigated)
107	Archerdale clay loam, 0 to 2 percent slopes (where irrigated)
110	Boggiano clay loam, 0 to 2 percent slopes (where irrigated)
111	Bruella sandy loam, 0 to 2 percent slopes (where irrigated)
112	Bruella sandy loam, hard substratum, 0 to 2 percent slopes (where irrigated)
113	Calla clay loam, 2 to 8 percent slopes (where irrigated)
117	Capay clay loam, 0 to 2 percent slopes (where irrigated)
118	Capay clay, 0 to 2 percent slopes (where irrigated)
119	Capay clay, 2 to 5 percent slopes (where irrigated)
121	Capay clay, wet, 0 to 2 percent slopes (where irrigated)
123	Carbona clay loam, 2 to 8 percent slopes (where irrigated)
127	Chuloak coarse sandy loam, 0 to 2 percent slopes (where irrigated)
128	Cogna fine sandy loam, 0 to 2 percent slopes, overwashed (where irrigated)
129	Cogna loam, 0 to 2 percent slopes (where irrigated)
130	Columbia fine sandy loam, drained, 0 to 2 percent slopes (where irrigated)
131	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
132	Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded (where irrigated and either protected from flooding or not frequently flooded during the growing season)
133	Columbia fine sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes (where irrigated)
138	Cosumnes silty clay loam, drained, 0 to 2 percent slopes (where irrigated)
139	Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
140	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
152	Egbert mucky clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
153	Egbert silty clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
154	Egbert silty clay loam, sandy substratum, partially drained, 0 to 2 percent slopes (where irrigated)
156	El Solyo clay loam, 0 to 2 percent slopes (where irrigated)
158	Finrod clay loam, 0 to 2 percent slopes (where irrigated)
166	Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes (where irrigated)
167	Grangeville clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
168	Guard clay loam, 0 to 2 percent slopes (where irrigated and drained)
169	Guard clay loam, drained, 0 to 2 percent slopes (where irrigated)
170	Hicksville loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
171	Hicksville loam, bedrock substratum, 2 to 5 percent slopes, occasionally flooded (where irrigated)
172	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
173	Hollenbeck silty clay, 0 to 2 percent slopes (where irrigated)
174	Hollenbeck clay, 1 to 3 percent slopes (where irrigated)
175	Honcut sandy loam, 0 to 2 percent slopes (where irrigated)
182	Jahant loam, 0 to 2 percent slopes (where irrigated)
183	Jahant loam, 2 to 8 percent slopes (where irrigated)
189	Kingdon fine sandy loam, 0 to 2 percent slopes (where irrigated)
190	Kingile muck, partially drained, 0 to 2 percent slopes (where irrigated)
191	Kingile-Ryde complex, partially drained, 0 to 2 percent slopes (where irrigated)
197	Merritt silty clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
198	Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
201	Nord loam, 0 to 2 percent slopes (where irrigated)
204	Peltier mucky clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
205	Peltier mucky clay loam, organic substratum, partially drained, 0 to 2 percent slopes (where irrigated)
215	Pleito clay loam, 2 to 8 percent slopes (where irrigated)
222	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
223	Reiff loam, 0 to 2 percent slopes (where irrigated)
224	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed (where irrigated)

TABLE 6.--PRIME FARMLAND--Continued

Map symbol	Soil name
225	Rindge muck, partially drained, 0 to 2 percent slopes (where irrigated)
230	Ryde clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
231	Ryde silty clay loam, organic substratum, partially drained, 0 to 2 percent slopes (where irrigated)
232	Ryde clay loam, sandy substratum, partially drained, 0 to 2 percent slopes (where irrigated)
233	Ryde-Peltier complex, partially drained, 0 to 2 percent slopes (where irrigated)
234	Sailboat silt loam, drained, 0 to 2 percent slopes (where irrigated)
235	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded (where irrigated)
243	Scribner clay loam, partially drained, 0 to 2 percent slopes (where irrigated)
244	Scribner clay loam, sandy substratum, partially drained, 0 to 2 percent slopes (where irrigated)
246	Shima muck, partially drained, 0 to 2 percent slopes (where irrigated)
247	Shinkee muck, partially drained, 0 to 2 percent slopes (where irrigated)
248	Stockton fine sandy loam, 0 to 2 percent slopes, overwashed (where irrigated)
249	Stockton silty clay loam, 0 to 2 percent slopes, overwashed (where irrigated)
250	Stockton clay, 0 to 2 percent slopes (where irrigated)
252	Stomar clay loam, 0 to 2 percent slopes (where irrigated)
253	Stomar clay loam, wet, 0 to 2 percent slopes (where irrigated)
256	Tokay fine sandy loam, 0 to 2 percent slopes (where irrigated)
261	Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes (where irrigated)
263	Venice mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed (where irrigated)
264	Venice muck, partially drained, 0 to 2 percent slopes (where irrigated)
265	Veritas sandy loam, partially drained, 0 to 2 percent slopes (where irrigated)
266	Veritas fine sandy loam, 0 to 2 percent slopes (where irrigated)
267	Veritas silty clay loam, 0 to 2 percent slopes, overwashed (where irrigated)
268	Vernalis clay loam, 0 to 2 percent slopes (where irrigated)
269	Vernalis clay loam, wet, 0 to 2 percent slopes (where irrigated)
272	Vina fine sandy loam, 0 to 2 percent slopes (where irrigated)
273	Webile muck, partially drained, 0 to 2 percent slopes (where irrigated)
281	Zacharias clay loam, 0 to 2 percent slopes (where irrigated)
282	Zacharias gravelly clay loam, 0 to 2 percent slopes (where irrigated)
283	Zacharias gravelly clay loam, 2 to 8 percent slopes (where irrigated)

TABLE 7.--YIELDS PER ACRE OF CROPS

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
101---------- Acampo	9	2,000	2	4	9	25	25
102---------- Alamo	---	---	---	---	7	20	---
103. Alo-Vaquero							
104. Alo-Vaquero							
105. Amador-Lithic Xerorthents							
106, 107---------- Archerdale	8	2,000	2	4	8	30	30
108. Arents							
109---------- Bisgani	6	---	1	3	---	25	18
110---------- Boggiano	8	2,000	2	4	9	30	28
111---------- Bruella	8	---	2	4	9	28	28
112---------- Bruella	7	---	2	3	7	22	22
113. Calla							
114. Calla-Carbona							
115. Calla-Carbona							
116. Calla-Pleito							
117, 118---------- Capay	8	---	2	3	---	28	28
119---------- Capay	7	---	1	3	---	22	28
120---------- Capay	6	---	1	2	---	25	22
121---------- Capay	8	---	2	3	---	30	25

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
122*:							
Capay	8	---	2	3	---	28	28
Urban land.							
123. Carbona							
124. Carbona-Orognen							
125. Carbona-Orognen							
126. Carbona-Carbona, bedrock substratum							
127 Chuloak	10	2,500	2	4	8	28	28
128, 129 Cogna	10	2,400	2	4	9	30	28
130 Columbia	8	2,000	3	4	8	30	26
131 Columbia	8	---	---	3	---	30	24
132 Columbia	8	---	---	---	---	30	22
133 Columbia	8	---	3	4	---	30	24
134 Cometa	---	---	1	---	---	---	---
135, 136. Corning-Redding							
137 Cortina	6	2,000	---	---	3	---	---
138 Cosumnes	9	---	3	5	---	30	28
139 Cosumnes	9	---	3	5	---	30	28
140 Coyotecreek	8	---	3	5	8	30	28
141, 142 Delhi	8	2,400	2	3	8	24	18
143*:							
Delhi	8	2,400	2	3	8	24	18
Urban land.							

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
144---------- Dello	6	---	1	2	---	---	---
145---------- Dello	6	---	1	2	---	---	---
146---------- Dello	6	---	1	2	---	---	---
147---------- Dello	6	---	1	1	---	---	---
148---------- Dello	6	---	1	2	---	---	---
149---------- Devries	6	1,000	1	3	5	25	20
150*, 151*. Dumps							
152, 153---------- Egbert	8	---	2	4	---	28	25
154---------- Egbert	6	---	2	3	---	27	25
155*:							
Egbert----------	8	---	2	4	---	28	25
Urban land.							
156---------- El Solyo	8	2,000	2	3	2	25	27
157---------- Exeter	6	---	1	3	5	25	20
158---------- Finrod	8	2,000	2	4	8	30	30
159. Fluvaquents							
160---------- Galt	6	---	2	3	---	28	18
161---------- Galt	6	---	2	2	---	---	---
162*:							
Galt----------	6	---	2	3	---	28	18
Urban land.							
163. Gonzaga-Franciscan							

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
164, 165. Gonzaga-Honker-Franciscan							
166, 167 Grangeville	7	---	2	3	---	28	24
168 Guard	7	---	2	4	---	25	24
169 Guard	8	---	2	4	---	28	24
170 Hicksville	7	---	3	5	8	27	24
171 Hicksville	6	---	2	4	8	25	20
172 Hicksville	7	---	3	4	8	27	24
173, 174 Hollenbeck	8	---	2	3	---	28	27
175 Honcut	10	3,000	2	2	8	28	20
176. Honker-Vallecitos-Gonzaga							
177, 178. Honker-Vallecitos-Honker, eroded							
179 Itano	6.5	---	2	2	---	---	---
180 Jacktone	6	---	2	4	---	28	25
181*:							
Jacktone	6	---	2	4	---	28	25
Urban land.							
182 Jahant	8	---	2	4	8	25	25
183 Jahant	8	---	2	4	8	25	25
184, 185, 186. Kaseberg							
187. Keyes-Bellota							
188. Keyes-Redding							

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
189 Kingdon	10	3,000	2	4	10	30	30
190 Kingile	8	---	3	4	---	---	---
191 Kingile-Ryde	8	---	2	4	---	---	---
192. Lithic Xerorthents-Toomes							
193 Madera	6	---	2	3	8	---	---
194 Madera	---	---	---	---	8	---	---
195 Madera-Alamo	---	---	1	---	8	---	---
196 Manteca	6	1,500	1	3	6	25	---
197 Merritt	8	---	2	4	---	32	30
198 Merritt	7	---	1	3	---	30	26
199. Montpellier							
200 Montpellier-Cometa	---	---	1	---	---	---	---
201 Nord	8	2,000	2	3	10	---	---
202, 203. Pardee							
204 Peltier	9	---	2	3	7	28	25
205 Peltier	8	---	1	3	7	27	20
206, 207, 208. Pentz							
209. Pentz-Bellota							
210. Pentz-Redding							
211 Pescadero	6	---	1	2	---	25	18

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
212. Peters							
213 Piper	6	---	1	1	---	---	---
214*. Pits							
215 Pleito	7	---	---	---	---	---	---
216, 217, 218. Ramoth							
219, 220, 221 Redding	---	---	1	---	---	---	---
222 Reiff	8	2,000	3	4	10	28	28
223 Reiff	8	2,000	3	4	10	30	28
224, 225 Rindge	8	---	2	5	---	25	---
226 Rioblancho	6	---	2	3	---	25	20
227*:							
Rioblancho	6	---	2	3	---	25	20
Urban land.							
228 Rocklin	6	---	1	---	7	---	---
229 Rocklin	6	---	1	3	7	---	---
230 Ryde	9	---	2	3	8	27	25
231 Ryde	7	---	2	3	7	27	25
232 Ryde	6	---	2	3	5	27	25
233 Ryde-Peltier	9	---	2	3	7	27	20
234 Sailboat	8	---	3	5	---	27	28
235 Sailboat	8	---	3	5	---	27	28

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
236---------- San Joaquin	2	---	1	2	6	---	18
237---------- San Joaquin	---	---	1	---	6	---	---
238---------- San Joaquin	2	---	1	2	6	---	18
239---------- San Joaquin	---	---	---	---	5	---	---
240---------- San Joaquin	3	---	2	3	7	---	18
241---------- San Joaquin-San Joaquin, thick surface	2	---	2	3	6	---	18
242*:							
San Joaquin----------	2	---	1	2	6	---	---
Urban land.							
243---------- Scribner	9	---	3	5	---	30	28
244---------- Scribner	8	---	3	5	---	28	28
245*:							
Scribner----------	9	---	3	5	---	30	28
Urban land.							
246---------- Shima	6	---	2	3	---	25	20
247---------- Shinkee	6	---	3	3	---	25	20
248, 249---------- Stockton	8	---	2	4	---	30	27
250---------- Stockton	8	---	2	5	---	30	28
251*:							
Stockton----------	8	---	2	4	---	30	27
Urban land.							
252---------- Stomar	9	1,000	---	3	8	30	25
253---------- Stomar	8	1,000	---	3	---	30	25
254---------- Timor	7	1,700	---	3	8	---	25

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
255---------- Tinnin	8	2,000	2	3	8	---	25
256---------- Tokay	10	2,500	2	4	10	25	25
257*:							
Tokay----------	10	2,500	2	4	10	25	25
Urban land.							
258---------- Trahern	6	---	1	2	---	21	18
259---------- Tujunga	6	1,700	---	2	7	---	---
260*. Urban land							
261---------- Valdez	6	---	2	2	---	20	22
262. Vaquero-Carbona							
263, 264---------- Venice	---	---	2	4	---	---	---
265---------- Veritas	9	1,000	2	3	---	20	23
266, 267---------- Veritas	10	2,000	2	3	8	20	23
268---------- Vernalis	10	2,000	3	3	---	30	25
269---------- Vernalis	8	1,700	2	3	---	30	25
270, 271---------- Vignolo	6	1,000	2	3	---	25	22
272---------- Vina	8	2,000	3	5	9	30	28
273---------- Webile	8	---	3	4	---	25	22
274---------- Willows	6	---	---	3	---	22	22
275, 276. Wisflat-Arburua-San Timoteo							
277. Xerofluvents							

See footnote at end of table.

TABLE 7.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Alfalfa hay	Almonds	Wheat	Corn	Wine grapes	Sugar beets	Tomatoes
	Tons	Lbs	Tons	Tons	Tons	Tons	Tons
278. Xerofluvents-Xerorthents							
279 Yellowlark	5	---	2	---	7	---	---
280 Yellowlark	---	---	1	---	---	---	---
281 Zacharias	10	1,900	2	3	---	32	30
282 Zacharias	8	1,900	2	3	---	30	25
283 Zacharias	---	1,700	1	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--LAND CAPABILITY

(N means nonirrigated; I means irrigated)

Soil name and map symbol	Land capability	
	N	I
101 Acampo	IVs	IIs
102 Alamo	IVw	IIIw
103 Alo-Vaquero	IVe	---
104 Alo-Vaquero	VIe	---
105 Amador-Lithic Xerorthents	VIIe	---
106, 107 Archerdale	IVs	IIs
108 Arents	IVw	IIIw
109 Bisgani	IVw	IIIw
110 Boggiano	IVs	IIs
111 Bruella	IVc	I
112 Bruella	IVs	IIs
113 Calla	IVe	---
114 Calla-Carbona	IVe	---
115 Calla-Carbona	VIe	---
116 Calla-Pleito	IVe	---
117 Capay	IVs	---
118 Capay	IVs	IIs
119 Capay	IVe	IIe
120, 121 Capay	IVw	IIw

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
122*:		
Capay	IVs	IIs
Urban land.		
123 Carbona	IVe	IIe
124 Carbona-Orognen	IVe	---
125 Carbona-Orognen	VIe	---
126 Carbona-Carbona, bedrock substratum	VIe	---
127 Chuloak	IVc	I
128, 129 Cogna	IVc	I
130 Columbia	IVs	IIs
131 Columbia	IVw	IIw
132 Columbia	IVw	IIIw
133 Columbia	IVw	IIw
134 Cometa	IVe	IIIe
135, 136 Corning-Redding	IVe	IVe
137 Cortina	IVs	IIIs
138 Cosumnes	IVs	IIs
139 Cosumnes	IVw	IIw
140 Coyotecreek	IVw	IIw
141, 142 Delhi	IVe	IIIs
143*:		
Delhi	IVe	IIIs
Urban land.		

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
144, 145, 146, 147, 148--- Dello	IVw	IIIw
149---------- Devries	IVw	IVw
150*, 151*. Dumps		
152, 153, 154---------- Egbert	IVw	IIw
155*:		
Egbert----------	IVw	IIw
Urban land.		
156---------- El Solyo	IVs	IIs
157---------- Exeter	IVs	IIIs
158---------- Finrod	IVs	IIs
159---------- Fluvaquents	VIIw	---
160---------- Galt	IVs	IIIs
161---------- Galt	IVe	IIIe
162*:		
Galt----------	IVs	IIIs
Urban land.		
163---------- Gonzaga-Franciscan	VIe	---
164---------- Gonzaga-Honker-Franciscan	VIe	---
165---------- Gonzaga-Honker-Franciscan	VIIe	---
166, 167---------- Grangeville	IVw	IIw
168---------- Guard	IVw	IIIw
169---------- Guard	IVw	IIw

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
170, 171, 172---------- Hicksville	IVw	IIw
173---------- Hollenbeck	IVs	IIs
174---------- Hollenbeck	IVe	IIe
175---------- Honcut	IVc	I
176---------- Honker-Vallecitos-Gonzaga	VIe	---
177---------- Honker-Vallecitos-Honker, eroded	VIe	---
178---------- Honker-Vallecitos-Honker, eroded	VIIe	---
179---------- Itano	IVw	IIIw
180---------- Jacktone	IVs	IIIs
181*:		
Jacktone----------	IVs	IIIs
Urban land.		
182---------- Jahant	IVs	IIIs
183---------- Jahant	IVe	IIIe
184---------- Kaseberg	VIIe	VIIe
185, 186---------- Kaseberg	VIe	---
187---------- Keyes-Bellota	VIe	---
188---------- Keyes-Redding	VIe	---
189---------- Kingdon	IVc	I
190---------- Kingile	IVw	IIIw
191---------- Kingile-Ryde	IVw	IIIw

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
192 Lithic Xerorthents-Toomes	VIIe	---
193 Madera	IVs	IVs
194 Madera	IVe	IVe
195 Madera-Alamo	IVs	IVs
196 Manteca	IVs	IIIs
197 Merritt	IVw	IIw
198 Merritt	IVw	IIw
199 Montpellier	IVe	IVe
200 Montpellier-Cometa	IVe	IVe
201 Nord	IVc	I
202 Pardee	VIs	---
203 Pardee	VIe	---
204, 205 Peitier	IVw	IIIw
206, 207, 208 Pentz	VIe	---
209 Pentz-Beliota	VIe	---
210 Pentz-Redding	VIe	---
211 Pescadero	IVw	IIIw
212 Peters	VIe	---
213 Piper	IVw	IVw
214*. Pits		

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
215 Pleito	IVe	IIe
216 Ramoth	IVe	IIIe
217 Ramoth	IVe	IVe
218 Ramoth	IVe	---
219 Redding	IVs	IIIs
220 Redding	IVe	IVe
221 Redding	IVe	---
222 Reiff	IVw	IIw
223 Reiff	IVs	IIs
224, 225 Rindge	IVw	IIIw
226 Rioblancho	IVw	IIIw
227*:		
Rioblancho	IVw	IIIw
Urban land.		
228 Rocklin	IVe	IIIe
229 Rocklin	IVs	IIIs
230, 231, 232 Ryde	IVw	IIIw
233 Ryde-Peltier	IVw	IIIw
234 Sailboat	IVc	I
235 Sailboat	IVw	IIw
236 San Joaquin	IVs	IVs

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
237 San Joaquin	IVe	IVe
238 San Joaquin	IVs	IVs
239 San Joaquin	IVe	IVe
240 San Joaquin	IVs	IIIs
241 San Joaquin-San Joaquin, thick surface	IVs	IVs
242*:		
San Joaquin	IVs	IVs
Urban land.		
243, 244 Scribner	IVw	IIw
245*:		
Scribner	IVw	IIw
Urban land.		
246 Shima	IVw	IIIw
247 Shinkee	IVw	IIIw
248, 249, 250 Stockton	IVs	IIs
251*:		
Stockton	IVs	IIs
Urban land.		
252 Stomar	IVs	IIs
253 Stomar	IVw	IIw
254 Timor	IVe	IIIs
255 Tinnin	IVe	IIIs
256 Tokay	IVc	I

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
257*:		
Tokay	IVc	I
Urban land.		
258 Trahern	IVw	IIIw
259 Tujunga	VIe	IIIs
260*. Urban land		
261 Valdez	IVw	IIIw
262 Vaquero-Carbona	VIe	---
263, 264 Venice	IVw	IIIw
265 Veritas	IVw	IIw
266, 267 Veritas	IVs	IIs
268 Vernalis	IVc	I
269 Vernalis	IVw	IIw
270, 271 Vignolo	IVs	IIIs
272 Vina	IVc	I
273 Webile	IVw	IIIw
274 Willows	IVw	IIIw
275, 276 Wisflat-Arburua-San Timoteo	VIIe	---
277 Xerofluvents	VIIw	---
278 Xerofluvents-Xerorthents	VIIw	---

See footnote at end of table.

TABLE 8.--LAND CAPABILITY--Continued

Soil name and map symbol	Land capability	
	N	I
279 Yellowlark	IVs	IIs
280 Yellowlark	IVe	IIIe
281 Zacharias	IVc	I
282 Zacharias	IVs	IIs
283 Zacharias	IVe	IIe

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--STORIE INDEX RATING

(Absence of an entry indicates that the soil was not rated)

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
101	Acampo sandy loam, 0 to 2 percent slopes	60	100	100	95	57	3	Fertility.
102	Alamo clay, 0 to 2 percent slopes	28	50	100	95x90	12	5	Rare flooding, microrelief.
103	Alo-Vaquero complex, 8 to 30 percent slopes					22*	4	
	Alo part	56	60	80	100			None.
	Vaquero part	48	55	80	80			Subsurface saline-sodic.
104	Alo-Vaquero complex, 30 to 50 percent slopes					11*	5	
	Alo part	56	60	40	100			None.
	Vaquero part	48	55	40	80			Subsurface saline-sodic.
105	Amador-Lithic Xerorthents complex, 2 to 15 percent slopes					16*	5	
	Amador part	35	100	85	90			Fertility.
	Lithic Xerorthents part	10	70	85	90			Fertility.
106	Archerdale very fine sandy loam, 0 to 2 percent slopes, overwashed	80	100	100	95	76	2	Rare flooding.
107	Archerdale clay loam, 0 to 2 percent slopes	80	85	100	95	65	2	Rare flooding.
108	Arents, saline-sodic, 0 to 2 percent slopes	50	97	100	60x50x95	14	5	Drainage, saline-sodic, rare flooding.
109	Bisgani loamy coarse sand, partially drained, 0 to 2 percent slopes	90	75	100	50x95x95	30	4	Drainage, fertility, rare flooding.
110	Boggiano clay loam, 0 to 2 percent slopes	75	85	100	95	61	2	Rare flooding.
111	Bruella sandy loam, 0 to 2 percent slopes	90	95	100	90	77	2	Fertility.
112	Bruella sandy loam, hard substratum, 0 to 2 percent slopes	70	95	100	90	60	2	Fertility.
113	Calla clay loam, 2 to 8 percent slopes	70	85	90	100	54	3	None.
114	Calla-Carbona complex, 8 to 30 percent slopes					52*	3	
	Calla part	70	85	80	100			None.
	Carbona part	85	85	80	100			None.
115	Calla-Carbona complex, 30 to 50 percent slopes					26*	4	
	Calla part	70	85	40	100			None.
	Carbona part	85	85	40	100			None.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
116	Calla-Pleito complex, 8 to 30 percent slopes					50*	3	
	Calla part	70	85	80	100			None.
	Pleito part	80	85	80	100			None.
117	Capay clay loam, 0 to 2 percent slopes	85	85	100	95	69	2	Rare flooding.
118	Capay clay, 0 to 2 percent slopes	80	55	100	100	44	3	None.
119	Capay clay, 2 to 5 percent slopes	80	55	93	100	41	3	None.
120	Capay clay, saline-sodic, 0 to 2 percent slopes	80	55	100	80x80	28	4	Drainage, subsurface saline-sodic.
121	Capay clay, wet, 0 to 2 percent slopes	80	55	100	90	40	3	Drainage.
122	Capay-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Capay part	80	55	100	100			None.
	Urban land part.							
123	Carbona clay loam, 2 to 8 percent slopes	85	85	90	100	65	2	None.
124	Carbona-Orognen complex, 15 to 30 percent slopes					39*	4	
	Carbona part	85	85	75	100			None.
	Orognen part	40	70	75	100			None.
125	Carbona-Orognen complex, 30 to 50 percent slopes					20*	4	
	Carbona part	85	85	40	100			None.
	Orognen part	40	70	40	100			None.
126	Carbona complex, 15 to 50 percent slopes					34*	4	
	Carbona clay loam part	85	85	50	100			None.
	Carbona clay loam, bedrock substratum, part	76	85	50	100			None.
127	Chuloak coarse sandy loam, 0 to 2 percent slopes	80	90	100	95	68	2	Fertility.
128	Cogna fine sandy loam, 0 to 2 percent slopes, overwashed	95	100	100	95	90	1	Rare flooding.
129	Cogna loam, 0 to 2 percent slopes	95	100	100	95	90	1	Rare flooding.
130	Columbia fine sandy loam, drained, 0 to 2 percent slopes	100	100	100	90x95	85	1	Drainage, rare flooding.
131	Columbia fine sandy loam, partially drained, 0 to 2 percent slopes, occasionally flooded	100	100	100	60x80	48	3	Drainage, occasional flooding.
132	Columbia fine sandy loam, channeled, partially drained, 0 to 2 percent slopes, frequently flooded	100	100	93	60x40x90	20	4	Drainage, frequent flooding, microrelief (channels).

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
133	Columbia fine sandy loam, clayey substratum, partially drained, 0 to 2 percent slopes	85	100	100	60x95	48	3	Drainage, rare flooding.
134	Cometa sandy loam, 2 to 5 percent slopes	48	95	93	95	40	3	Fertility.
135	Corning-Redding complex, 2 to 8 percent slopes					24*	4	
	Corning part	55	70	90	95			Fertility.
	Redding part	25	70	90	95			Fertility.
136	Corning-Redding complex, 8 to 15 percent slopes					16*	5	
	Corning part	40	60	85	95			Fertility.
	Redding part	25	60	85	95			Fertility.
137	Cortina gravelly sandy loam, 0 to 5 percent slopes	80	60	93	95	42	3	Fertility.
138	Cosumnes silty clay loam, drained, 0 to 2 percent slopes	80	90	100	95	68	2	Rare flooding.
139	Cosumnes silty clay loam, drained, 0 to 2 percent slopes, occasionally flooded	80	90	100	80	58	3	Occasional flooding.
140	Coyotecreek silt loam, 0 to 2 percent slopes, occasionally flooded	100	100	100	80	80	1	Occasional flooding.
141	Delhi fine sand, 0 to 5 percent slopes	85	65	93	95	49	3	Fertility.
142	Delhi loamy sand, 0 to 2 percent slopes	85	80	100	95	65	2	Fertility.
143	Delhi-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Delhi part	85	80	100	95			Fertility.
	Urban land part.							
144	Dello sand, partially drained, 0 to 2 percent slopes, occasionally flooded	85	60	100	50x80	20	4	Drainage, occasional flooding.
145	Dello loamy sand, drained, 0 to 2 percent slopes	85	80	100	80x95	52	3	Drainage, rare flooding.
146	Dello loamy sand, partially drained, 0 to 2 percent slopes	85	80	100	60x95	39	4	Drainage, rare flooding.
147	Dello sandy loam, clayey substratum, drained, 0 to 2 percent slopes	80	95	100	80x95	58	3	Drainage, rare flooding.
148	Dello clay loam, drained, 0 to 2 percent slopes, overwashed	85	85	100	80x95	55	3	Drainage, rare flooding.
149	Devries sandy loam, drained, 0 to 2 percent slopes	25	95	100	80x95	18	5	Drainage, rare flooding.
150	Dumps	---	---	---	---	0	6	---
151	Dumps, tailings	---	---	---	---	0	6	---
152	Egbert mucky clay loam, partially drained, 0 to 2 percent slopes	85	90	100	80x95	58	3	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
153	Egbert silty clay loam, partially drained, 0 to 2 percent slopes	85	90	100	80x95	58	3	Drainage, rare flooding.
154	Egbert silty clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	80	90	100	60x95	41	3	Drainage, rare flooding.
155	Egbert-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Egbert part	80	90	100	80x95			Drainage, rare flooding.
	Urban land part.							
156	El Solyo clay loam, 0 to 2 percent slopes	85	85	100	100	72	2	None.
157	Exeter sandy loam, 0 to 2 percent slopes	35	95	100	95	32	4	Fertility.
158	Finrod clay loam, 0 to 2 percent slopes	50	85	100	95	40	3	Rare flooding.
159	Fluvaquents, 0 to 2 percent slopes, frequently flooded	100	90	100	20x40	7	6	Drainage, frequent flooding.
160	Galt clay, 0 to 2 percent slopes	48	55	100	95	25	4	Rare flooding.
161	Galt clay, 2 to 5 percent slopes	48	55	93	100	25	4	None.
162	Galt-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Galt part	48	55	100	95			Rare flooding.
	Urban land part.							
163	Gonzaga-Franciscan complex, 30 to 50 percent slopes					16*	5	
	Gonzaga part	24	100	40	100			None.
	Franciscan part	59	100	40	100			None.
164	Gonzaga-Honker-Franciscan complex, 30 to 50 percent slopes					13*	5	
	Gonzaga part	24	100	40	100			None.
	Honker part	26	100	40	100			None.
	Franciscan part	59	100	40	100			None.
165	Gonzaga-Honker-Franciscan complex, 50 to 75 percent slopes					7*	6	
	Gonzaga part	24	100	20	100			None.
	Honker part	26	100	20	100			None.
	Franciscan part	59	100	20	100			None.
166	Grangeville fine sandy loam, partially drained, 0 to 2 percent slopes	100	100	100	80x95	76	2	Drainage, rare flooding.
167	Grangeville clay loam, partially drained, 0 to 2 percent slopes	100	85	100	80x95	65	2	Drainage, rare flooding.
168	Guard clay loam, 0 to 2 percent slopes	70	85	100	40x95	23	4	Drainage, rare flooding.
169	Guard clay loam, drained, 0 to 2 percent slopes	70	85	100	80x95	45	3	Drainage, rare flooding.
170	Hicksville loam, 0 to 2 percent slopes, occasionally flooded	80	100	100	90x80	58	3	Drainage, occasional flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
171	Hicksville loam, bedrock substratum, 2 to 5 percent slopes, occasionally flooded	68	100	93	60x80	30	4	Drainage, occasional flooding.
172	Hicksville gravelly loam, 0 to 2 percent slopes, occasionally flooded	80	80	100	90x80	46	3	Drainage, occasional flooding.
173	Hollenbeck silty clay, 0 to 2 percent slopes	36	65	100	95	22	4	Rare flooding.
174	Hollenbeck clay, 1 to 3 percent slopes	80	55	95	80	33	4	Occasional flooding.
175	Honcut sandy loam, 0 to 2 percent slopes	100	95	100	100	95	1	None.
176	Honker-Vallecitos-Gonzaga complex, 30 to 50 percent slopes					9*	6	
	Honker part	26	100	40	100			None.
	Vallecitos part	34	60	40	100			None.
	Gonzaga part	24	100	40	100			None.
177	Honker-Vallecitos-Honker, eroded, complex, 30 to 50 percent slopes					9*	6	
	Honker part	26	100	40	100			None.
	Vallecitos part	34	60	40	100			None.
	Eroded Honker part	30	70	40	80			Erosion.
178	Honker-Vallecitos-Honker, eroded, complex, 50 to 70 percent slopes					4*	6	
	Honker part	26	100	20	100			None.
	Vallecitos part	34	60	20	100			None.
	Eroded Honker part	30	70	20	80			Erosion.
179	Itano silty clay loam, partially drained, 0 to 2 percent slopes	100	90	100	60x80	43	3	Drainage, acidity.
180	Jacktone clay, 0 to 2 percent slopes	48	55	100	95	25	4	Rare flooding.
181	Jacktone-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Jacktone part	48	55	100	95			Rare flooding.
	Urban land part.							
182	Jahant loam, 0 to 2 percent slopes	40	100	100	100	40	3	None.
183	Jahant loam, 2 to 8 percent slopes	27	100	90	100	24	4	None.
184	Kaseberg loamy sand, 5 to 15 percent slopes	25	80	85	95	16	5	Fertility.
185	Kaseberg fine sandy loam, 2 to 15 percent slopes	25	100	85	100	21	4	None.
186	Kaseberg loam, 15 to 30 percent slopes	25	100	75	100	19	5	None.
187	Keyes-Bellota complex, 2 to 15 percent slopes					17*	5	
	Keyes part	20	70	85	100			None.
	Bellota part	30	95	85	95			Fertility.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
188	Keyes-Redding complex, 2 to 8 percent slopes					11*	5	
	Keyes part	12	70	90	100			None.
	Redding part	25	70	90	95			Fertility.
189	Kingdon fine sandy loam, 0 to 2 percent slopes	95	100	100	100	95	1	None.
190	Kingile muck, partially drained, 0 to 2 percent slopes	85	100	100	50x85x95	34	4	Drainage, acidity.
191	Kingile-Ryde complex, partially drained, 0 to 2 percent slopes					36*	4	
	Kingile part	85	100	100	50x85x95			Drainage, acidity, rare flooding.
	Ryde part	100	100	100	50x85x95			Drainage, acidity, rare flooding.
192	Lithic Xerorthents-Toomes complex, 2 to 15 percent slopes					13*	5	
	Lithic Xerorthents part	10	60	85	95			Fertility.
	Toomes part	35	100	85	100			None.
193	Madera sandy loam, 0 to 2 percent slopes	30	95	100	95x90	24	4	Fertility, microrelief (hummocks).
194	Madera loam, 2 to 5 percent slopes	20	100	93	100	19	5	None.
195	Madera-Alamo complex, leveled, 0 to 1 percent slopes					17*	5	
	Madera part	20	95	100	95x95			Fertility, rare flooding.
	Alamo part	20	95	100	95x95			Fertility, rare flooding.
196	Manteca fine sandy loam, 0 to 2 percent slopes	30	100	100	100	30	4	None.
197	Merritt silty clay loam, partially drained, 0 to 2 percent slopes	100	90	100	80x90	68	2	Drainage, rare flooding.
198	Merritt silty clay loam, partially drained, 0 to 2 percent slopes, occasionally flooded	100	90	100	80x80	58	3	Drainage, occasional flooding.
199	Montpellier sandy loam, 8 to 15 percent slopes	80	90	85	95	58	3	Fertility.
200	Montpellier-Cometa complex, 5 to 8 percent slopes					48*	3	
	Montpellier part	80	80	90	95			Fertility.
	Cometa part	48	95	90	95			Fertility.
201	Nord loam, 0 to 2 percent slopes	100	100	100	100	100	1	None.
202	Pardee gravelly loam, 0 to 3 percent slopes	34	70	95	95	21	4	Fertility.
203	Pardee cobbly loam, 3 to 15 percent slopes	34	60	85	95	16	5	Fertility.
204	Peltier mucky clay loam, partially drained, 0 to 2 percent slopes	80	90	100	50x95	34	4	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
205	Peltier mucky clay loam, organic substratum, partially drained, 0 to 2 percent slopes	95	90	100	50x95	41	3	Drainage, rare flooding.
206	Pentz sandy loam, 2 to 15 percent slopes	35	95	85	95	27	4	Fertility.
207	Pentz sandy loam, 15 to 50 percent slopes	35	95	75	95	24	4	Fertility.
208	Pentz cobbly sandy loam, 5 to 8 percent slopes	33	60	90	95	17	5	Fertility.
209	Pentz-Bellota complex, 2 to 15 percent slopes					27*	4	
	Pentz part	35	100	85	100			None.
	Bellota part	24	100	90	100	22		None.
210	Pentz-Redding complex, 2 to 15 percent slopes					16*	5	
	Pentz part	35	60	85	95			Fertility.
	Redding part	24	60	85	95			Fertility.
211	Pescadero clay loam, partially drained, 0 to 2 percent slopes	40	85	100	50x60x75	10	5	Drainage, saline-sodic, rare flooding.
212	Peters clay, 2 to 8 percent slopes	35	55	90	100	17	5	None.
213	Piper sandy loam, partially drained, 0 to 2 percent slopes	90	95	100	50x95x95	38	4	Drainage, rare flooding, fertility.
214	Pits, gravel	---	---	---	---	0	6	---
215	Pleito clay loam, 2 to 8 percent slopes	80	85	90	100	61	2	None.
216	Ramoth sandy loam, 5 to 8 percent slopes	90	95	90	95	73	2	Fertility.
217	Ramoth sandy loam, 8 to 15 percent slopes	90	95	85	95	69	2	Fertility.
218	Ramoth sandy loam, 15 to 30 percent slopes	90	95	75	95	61	2	Fertility.
219	Redding loam, 0 to 3 percent slopes	33	100	95	95	30	4	Fertility.
220	Redding gravelly loam, 2 to 8 percent slopes	23	70	95	95	15	5	Fertility.
221	Redding gravelly loam, 8 to 30 percent slopes	23	70	80	95	12	5	Fertility.
222	Reiff fine sandy loam, 0 to 2 percent slopes, occasionally flooded	95	100	100	80	76	2	Occasional flooding.
223	Reiff loam, 0 to 2 percent slopes	95	100	100	95	90	1	Rare flooding.
224	Rindge mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed	100	100	100	50x95	47	3	Drainage, rare flooding.
225	Rindge muck, partially drained, 0 to 2 percent slopes	100	100	100	50x95	47	3	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
226	Rioblanco clay loam, drained, 0 to 2 percent slopes	45	85	100	85x95	31	4	Drainage, rare flooding.
227	Rioblancho-Urban land complex, drained, 0 to 2 percent slopes					<10**	6	
	Rioblancho part	45	85	100	85x95			Drainage, rare flooding.
	Urban land part.							
228	Rocklin sandy loam, 2 to 5 percent slopes	34	95	93	95	29	4	Fertility.
229	Rocklin fine sandy loam, 0 to 2 percent slopes	34	100	100	95	32	4	Fertility.
230	Ryde clay loam, partially drained, 0 to 2 percent slopes	100	85	100	50x95	40	3	Drainage, rare flooding.
231	Ryde silty clay loam, organic substratum, partially drained, 0 to 2 percent slopes	100	90	100	50x95	43	3	Drainage, rare flooding.
232	Ryde clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	90	85	100	50x95	36	4	Drainage, rare flooding.
233	Ryde-Peltier complex, partially drained, 0 to 2 percent slopes					38*	4	
	Ryde part	100	85	100	50x95			Drainage, rare flooding.
	Peltier part	80	90	100	50x95			Drainage, rare flooding.
234	Sailboat silt loam, drained, 0 to 2 percent slopes	100	100	100	95	95	1	Rare flooding.
235	Sailboat silt loam, drained, 0 to 2 percent slopes, occasionally flooded	100	100	100	80	80	1	Occasional flooding.
236	San Joaquin sandy loam, 0 to 2 percent slopes	25	95	100	95	23	4	Fertility.
237	San Joaquin sandy loam, 2 to 5 percent slopes	18	95	93	95	15	5	Fertility.
238	San Joaquin loam, 0 to 2 percent slopes	25	100	100	90	22	4	Microrelief (hummocks).
239	San Joaquin loam, 2 to 8 percent slopes, eroded	25	100	90	90	20	4	Erosion.
240	San Joaquin loam, thick surface, 0 to 2 percent slopes	32	100	100	100	32	4	None.
241	San Joaquin complex, 0 to 1 percent slopes					28*	4	
	San Joaquin loam part	25	100	100	100			None.
	San Joaquin loam, thick surface, part	32	100	100	100			None.
242	San Joaquin-Urban land complex, 0 to 2 percent slopes					<10**	6	
	San Joaquin part	25	100	100	100			None.
	Urban land part.							
243	Scribner clay loam, partially drained, 0 to 2 percent slopes	100	85	100	50x95	40	3	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
244	Scribner clay loam, sandy substratum, partially drained, 0 to 2 percent slopes	90	85	100	50x95	36	4	Drainage, rare flooding.
245	Scribner-Urban land complex, partially drained, 0 to 2 percent slopes					<10**	6	
	Scribner part	100	85	100	50x95			Drainage, rare flooding.
	Urban land part.							
246	Shima muck, partially drained, 0 to 2 percent slopes	80	100	100	50x90x95	34	4	Drainage, acidity, rare flooding.
247	Shinkee muck, partially drained, 0 to 2 percent slopes	100	100	100	50x90x95	43	3	Drainage, acidity, rare flooding.
248	Stockton fine sandy loam, 0 to 2 percent slopes, overwashed	55	100	100	95	52	3	Rare flooding.
249	Stockton silty clay loam, 0 to 2 percent slopes, overwashed	42	90	100	95	36	4	Rare flooding.
250	Stockton clay, 0 to 2 percent slopes	38	55	100	95	20	4	Rare flooding.
251	Stockton-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Stockton part	38	55	100	95			Rare flooding.
	Urban land part.							
252	Stomar clay loam, 0 to 2 percent slopes	80	85	100	100	68	2	None.
253	Stomar clay loam, wet, 0 to 2 percent slopes	80	85	100	90	61	2	Drainage.
254	Timor loamy sand, 0 to 2 percent slopes	60	80	100	95x95	43	3	Fertility, rare flooding.
255	Tinnin loamy coarse sand, 0 to 2 percent slopes	85	75	100	90	57	3	Fertility.
256	Tokay fine sandy loam, 0 to 2 percent slopes	100	100	100	95	95	1	Fertility.
257	Tokay-Urban land complex, 0 to 2 percent slopes					<10**	6	
	Tokay part	100	100	100	95			Fertility.
	Urban land part.							
258	Trahern clay loam, partially drained, 0 to 2 percent slopes	22	90	100	60x80x95	9	6	Saline-sodic, drainage, rare flooding.
259	Tujunga loamy sand, 0 to 2 percent slopes	85	80	100	95	65	2	Fertility.
260	Urban land	---	---	---	---	0	6	---
261	Valdez silt loam, organic substratum, partially drained, 0 to 2 percent slopes	100	100	100	50x95	47	3	Drainage, rare flooding.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
262	Vaquero-Carbona complex, 8 to 30 percent slopes					27*	4	
	Vaquero part	48	55	80	80			Subsurface saline-sodic.
	Carbona part	85	60	80	100	41		None.
263	Venice mucky silt loam, partially drained, 0 to 2 percent slopes, overwashed	100	100	100	50x95	47	3	Drainage, rare flooding.
264	Venice muck, partially drained, 0 to 2 percent slopes	100	100	100	50x90x95	43	3	Drainage, acidity, rare flooding.
265	Veritas sandy loam, partially drained, 0 to 2 percent slopes	48	95	100	80x95x95	33	4	Drainage, fertility, rare flooding.
266	Veritas fine sandy loam, 0 to 2 percent slopes	60	100	100	95	57	3	Rare flooding.
267	Veritas silty clay loam, 0 to 2 percent slopes, overwashed	50	90	100	95	43	3	Rare flooding.
268	Vernalis clay loam, 0 to 2 percent slopes	100	85	100	100	85	1	None.
269	Vernalis clay loam, wet, 0 to 2 percent slopes	100	85	100	90	76	2	Drainage.
270	Vignolo silt loam, 0 to 2 percent slopes	38	100	100	95	36	4	Rare flooding.
271	Vignolo silty clay loam, 0 to 2 percent slopes	35	90	100	95	30	4	Rare flooding.
272	Vina fine sandy loam, 0 to 2 percent slopes	100	100	100	95	95	1	Rare flooding.
273	Webile muck, partially drained, 0 to 2 percent slopes	85	100	100	50x90x95	36	4	Drainage, acidity, rare flooding.
274	Willows clay, partially drained, 0 to 2 percent slopes	80	55	100	80x80x95	27	4	Drainage, saline-sodic, rare flooding.
275	Wisflat-Arburua-San Timoteo complex, 30 to 50 percent slopes					16*	5	
	Wisflat part	25	95	40	95			Fertility.
	Arburua part	50	85	40	100			None.
	San Timoteo part	70	95	40	95			Fertility.
276	Wisflat-Arburua-San Timoteo complex, 50 to 75 percent slopes					8*	6	
	Wisflat part	25	95	20	95			Fertility.
	Arburua part	50	85	20	100			None.
	San Timoteo part	70	95	20	95			Fertility.
277	Xerofluvents, 0 to 2 percent slopes, frequently flooded	85	60	100	40x95	19	5	Frequent flooding, fertility.

See footnotes at end of table.

TABLE 9.--STORIE INDEX RATING--Continued

Map symbol	Map unit	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
278	Xerofluvents-Xerorthents complex, 1 to 8 percent slopes, occasionally flooded					23*	4	
	Xerofluvents part	85	65	90	80x70x95			Occasional flooding, microrelief (channels), fertility.
	Xerorthents part	80	50	90	80x70x95			Occasional flooding, microrelief (channels), fertility.
279	Yellowlark gravelly loam, 0 to 2 percent slopes	50	80	100	95x90	34	4	Fertility, microrelief (hummocks).
280	Yellowlark gravelly loam, 2 to 5 percent slopes	50	80	93	95x90	32	4	Fertility, microrelief (hummocks).
281	Zacharias clay loam, 0 to 2 percent slopes	95	85	100	100	81	1	None.
282	Zacharias gravelly clay loam, 0 to 2 percent slopes	95	70	100	100	66	2	None.
283	Zacharias gravelly clay loam, 2 to 8 percent slopes	95	70	90	100	60	2	None.

* Index value is a weighted average of the component part ratings.
** Rated "non-agricultural" because of urban land use.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
103*, 104*:					
Alo	Clayey (15e)	Favorable	3,800	Wild oat	40
		Normal	3,000	Soft chess	15
		Unfavorable	1,500	Burclover	5
				Ripgut brome	5
				Clover	5
				Filaree	5
				Foxtail fescue	5
				Red brome	5
Vaquero	Clayey (15e)	Favorable	3,500	Wild oat	35
		Normal	2,800	Soft chess	15
		Unfavorable	1,500	Filaree	10
				Foxtail fescue	10
				Red brome	5
				Burclover	5
				Clover	5
105*:					
Amador	Shallow Loamy (18e)	Favorable	3,000	Soft chess	40
		Normal	1,800	Ripgut brome	15
		Unfavorable	700	Foxtail fescue	10
				Filaree	5
				Wild oat	5
Lithic Xerorthents.					
113 Calla	Loamy (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Red brome	15
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Clover	5
				Burclover	5
				Ripgut brome	5
114*, 115*:					
Calla	Loamy (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Red brome	15
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Clover	5
				Burclover	5
				Ripgut brome	5
Carbona	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
116*:					
Calla	Loamy (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Red brome	15
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Clover	5
				Burclover	5
				Ripgut brome	5
Pleito	Loamy (17e)	Favorable	3,500	Soft chess	30
		Normal	2,800	Red brome	10
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Ripgut brome	5
				Clover	5
117, 119 Capay	Clayey (17e)	Favorable	3,000	Soft chess	20
		Normal	2,000	Barley	10
		Unfavorable	1,200	Red brome	10
				Filaree	10
				Wild oat	10
				Burclover	5
				Clover	5
123 Carbona	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5
124*, 125*:					
Carbona	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5
Orognen	Loamy (17e)	Favorable	2,800	Soft chess	25
		Normal	2,400	Filaree	15
		Unfavorable	1,000	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
126*:					
Carbona	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5
Carbona, bedrock substratum	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5
134 Cometa	Loamy Terrace (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Ripgut brome	15
		Unfavorable	1,200	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
135*:					
Corning	Gravelly Loamy Claypan (17e)	Favorable	2,400	Soft chess	25
		Normal	1,800	Wild oat	10
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Burclover	5
				Annual lupine	5
Redding	Gravelly Loamy Claypan (17e)	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Annual lupine	5
136*:					
Corning	Gravelly Loamy Claypan (17e)	Favorable	2,200	Soft chess	25
		Normal	1,600	Wild oat	10
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Burclover	5
				Annual lupine	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
136*:					
Redding	Gravelly Loamy Claypan (17e)	Favorable	2,200	Soft chess	25
		Normal	1,600	Ripgut brome	15
		Unfavorable	1,000	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Annual lupine	5
				Clover	5
137 Cortina	Very Gravelly Loamy (17e)	Favorable	1,200	Soft chess	30
		Normal	800	Foxtail fescue	15
		Unfavorable	500	Wild oat	5
				Redstem filaree	5
				Burclover	5
				Mediterranean barley	5
				Broadleaf filaree	5
				Red brome	5
163*:					
Gonzaga	Blue Oak/Annual Grass/Loamy (15e).	Favorable	2,800	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Foxtail fescue	10
				Blue oak	5
				California buckeye	5
				Digger pine	5
				Pine bluegrass	5
				Minerslettuce	5
				Blue wildrye	5
Franciscan	Blue Oak/Annual Grass/Loamy (15e).	Favorable	2,800	Soft chess	30
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Minerslettuce	10
				Sanicle	5
				Blue oak	5
				Digger pine	5
				California buckeye	5
				Pine bluegrass	5
				Blue wildrye	5
164*:					
Gonzaga	Blue Oak/Annual Grass/Loamy (15e).	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Blue oak	5
				California buckeye	5
				California sagebrush	5
				Goldenbush	5
				Filaree	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
164*:					
Honker	Clayey (15e)	Favorable	4,000	Wild oat	40
		Normal	3,200	Soft chess	20
		Unfavorable	1,500	Filaree	10
				Red brome	5
				Foxtail fescue	5
				Burclover	5
Franciscan	Blue Oak/Annual Grass/Loamy (15e).	Favorable	3,000	Soft chess	20
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Blue oak	5
				California sagebrush	5
				Goldenbush	5
				Filaree	5
165*:					
Gonzaga	Blue Oak/Annual Grass/Loamy (15e).	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Blue oak	5
				California buckeye	5
				California sagebrush	5
				Goldenbush	5
				Filaree	5
Honker	Clayey (15e)	Favorable	4,000	Wild oat	40
		Normal	3,200	Soft chess	20
		Unfavorable	1,500	Filaree	10
				Red brome	5
				Foxtail fescue	5
				Burclover	5
Franciscan	Blue Oak/Annual Grass/Loamy (15e).	Favorable	3,000	Soft chess	20
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Blue oak	5
				California sagebrush	5
				Goldenbush	5
				Filaree	5
170 Hicksville	Loamy Stream Terrace (17e)	Favorable	4,500	Soft chess	25
		Normal	3,200	Wild oat	10
		Unfavorable	1,500	Ripgut brome	10
				Foxtail fescue	5
				Mouse barley	5
				Needlegrass	5
				Filaree	5
171 Hicksville	Loamy Stream Terrace (17e)	Favorable	4,500	Soft chess	25
		Normal	3,200	Wild oat	10
		Unfavorable	1,500	Ripgut brome	10
				Foxtail fescue	5
				Mouse barley	5
				Needlegrass	5
				Filaree	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
172 Hicksville	Loamy Stream Terrace (17e)	Favorable	4,500	Soft chess	25
		Normal	3,200	Wild oat	10
		Unfavorable	1,500	Ripgut brome	10
				Foxtail fescue	5
				Mouse barley	5
				Needlegrass	5
				Filaree	5
176*:					
Honker	Clayey (15e)	Favorable	4,000	Wild oat	40
		Normal	3,200	Soft chess	20
		Unfavorable	1,500	Filaree	10
				Red brome	5
				Foxtail fescue	5
				Burclover	5
Vallecitos	Loamy (15e)	Favorable	2,500	Wild oat	30
		Normal	2,000	Soft chess	20
		Unfavorable	1,200	Filaree	10
				Ripgut brome	5
				Red brome	5
				Burclover	5
				Needlegrass	5
				Blue oak	5
Gonzaga	Blue Oak/Annual Grass/Loamy (15e).	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Filaree	10
				Blue oak	5
177*, 178*:					
Honker	Clayey (15e)	Favorable	4,000	Wild oat	40
		Normal	3,200	Soft chess	20
		Unfavorable	1,500	Filaree	10
				Red brome	5
				Foxtail fescue	5
				Burclover	5
Vallecitos	Loamy (15e)	Favorable	2,500	Wild oat	30
		Normal	2,000	Soft chess	20
		Unfavorable	1,200	Filaree	10
				Ripgut brome	5
				Red brome	5
				Burclover	5
				Needlegrass	5
				Blue oak	5
Honker, eroded	California Sagebrush/Annual Grass/Clayey (15e).	Favorable	2,200	Soft chess	20
		Normal	1,500	Red brome	20
		Unfavorable	1,000	Foxtail fescue	15
				California sagebrush	15
				Wild oat	5
				Filaree	5
				California buckwheat	5
				Goldenbush	5
				Black sage	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
182, 183 Jahant	Loamy Claypan (17e)	Favorable	2,400	Soft chess	25
		Normal	1,800	Wild oat	15
		Unfavorable	1,000	Filaree	10
				Ripgut brome	10
				Foxtail fescue	5
				Burclover	5
				Clover	5
				Mouse barley	5
184 Kaseberg	Shallow Sandy (17e)	Favorable	2,000	Soft chess	25
		Normal	1,500	Foxtail fescue	15
		Unfavorable	800	Filaree	15
				Wild oat	5
				Ripgut brome	5
				Mouse barley	5
				Clover	5
185, 186 Kaseberg	Shallow Loamy (17e)	Favorable	3,200	Soft chess	25
		Normal	2,000	Wild oat	10
		Unfavorable	1,000	Ripgut brome	10
				Foxtail fescue	10
				Mouse barley	10
				Filaree	10
				Red brome	5
				Clover	5
187*:					
Keyes	Shallow Loamy (18e)	Favorable	3,400	Soft chess	35
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Annual ryegrass	5
Bellota	Loamy (18e)	Favorable	3,500	Soft chess	30
		Normal	2,500	Filaree	15
		Unfavorable	1,000	Mouse barley	10
				Annual ryegrass	10
				Foxtail fescue	5
188*:					
Keyes	Shallow Loamy (18e)	Favorable	3,400	Soft chess	35
		Normal	2,000	Wild oat	20
		Unfavorable	1,000	Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Annual ryegrass	5
Redding	Gravelly Loamy (17e)	Favorable	2,500	Soft chess	25
		Normal	2,000	Ripgut brome	15
		Unfavorable	1,000	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Annual lupine	5
192*: Lithic Xerorthents.					

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
192*:					
Toomes	Shallow Loamy (18e)	Favorable	2,000	Soft chess	20
		Normal	1,500	Filaree	20
		Unfavorable	800	Ripgut brome	15
				Wild oat	10
				Mouse barley	10
193, 194 Madera	Loamy Claypan (17e)	Favorable	3,400	Soft chess	35
		Normal	2,200	Filaree	15
		Unfavorable	1,000	Foxtail fescue	15
				Annual ryegrass	10
				Ripgut brome	5
				Wild oat	5
199 Montpellier	Loamy Terrace (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Ripgut brome	15
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Clover	5
				Burclover	5
200*:					
Montpellier	Loamy Terrace (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Ripgut brome	15
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Clover	5
				Burclover	5
Cometa	Loamy Terrace (17e)	Favorable	3,000	Soft chess	25
		Normal	2,500	Ripgut brome	15
		Unfavorable	1,200	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
202, 203 Pardee	Gravelly Loamy (17e)	Favorable	3,000	Soft chess	35
		Normal	2,000	Wild oat	15
		Unfavorable	1,000	Ripgut brome	10
				Filaree	10
				Foxtail fescue	10
				Mouse barley	5
				Smooth catsear	5
				Clover	5
206, 207 Pentz	Shallow Loamy (18e)	Favorable	3,500	Soft chess	40
		Normal	2,200	Ripgut brome	10
		Unfavorable	1,000	Wild oat	5
				Red brome	5
				Filaree	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
208 Pentz	Shallow Loamy (18e)	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	10
		Unfavorable	1,000	Filaree	10
				Burclover	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Clover	5
				Mouse barley	5
209*:					
Pentz	Shallow Loamy (18e)	Favorable	3,500	Soft chess	40
		Normal	2,200	Ripgut brome	10
		Unfavorable	1,000	Wild oat	5
				Red brome	5
				Filaree	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5
Bellota	Loamy (18e)	Favorable	3,500	Soft chess	30
		Normal	2,500	Filaree	15
		Unfavorable	1,000	Mouse barley	10
				Annual ryegrass	10
				Foxtail fescue	5
210*:					
Pentz	Shallow Loamy (18e)	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oat	10
		Unfavorable	1,000	Filaree	10
				Burclover	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Clover	5
				Mouse barley	5
Redding	Gravelly Loamy (17e)	Favorable	3,000	Soft chess	35
		Normal	2,400	Foxtail fescue	15
		Unfavorable	1,000	Filaree	15
				Mouse barley	10
				Wild oat	5
				Ripgut brome	5
				Clover	5
212 Peters	Shallow Clayey (18e)	Favorable	3,500	Soft chess	25
		Normal	3,000	Wild oat	15
		Unfavorable	1,500	Filaree	10
				Annual ryegrass	10
				Ripgut brome	5
				Red brome	5
				Burclover	5
				Mouse barley	5
				Foxtail fescue	5
				Clover	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
215 Pleito	Loamy (17e)	Favorable	3,500	Soft chess	30
		Normal	2,800	Red brome	10
		Unfavorable	1,200	Wild oat	10
				Filaree	10
				Foxtail fescue	10
				Ripgut brome	5
				Clover	5
216, 217, 218 Ramoth	Loamy Terrace (17e)	Favorable	3,300	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Ripgut brome	10
				Wild oat	10
				Foxtail fescue	5
				Burclover	5
				Clover	5
				Mouse barley	5
219 Redding	Gravelly Loamy (17e)	Favorable	3,000	Soft chess	35
		Normal	2,400	Foxtail fescue	15
		Unfavorable	1,000	Filaree	15
				Mouse barley	10
				Wild oat	5
				Ripgut brome	5
				Clover	5
220, 221 Redding	Gravelly Loamy (17e)	Favorable	2,500	Soft chess	25
		Normal	2,000	Ripgut brome	15
		Unfavorable	1,000	Wild oat	10
				Foxtail fescue	10
				Filaree	10
				Mouse barley	5
				Red brome	5
				Clover	5
				Annual lupine	5
228 Rocklin	Loamy Claypan (17e)	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oat	10
				Red brome	10
				Filaree	10
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Burclover	5
236, 237, 238, 239 San Joaquin	Loamy Claypan (17e)	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Foxtail fescue	10
				Filaree	10
				Wild oat	5
				Mouse barley	5
				Red brome	5
				Clover	5
				Burclover	5
				Annual lupine	5
				Annual ryegrass	5

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
240 San Joaquin	Loamy Claypan (17e)	Favorable	4,500	Soft chess	20
		Normal	3,300	Annual ryegrass	20
		Unfavorable	1,200	Ripgut brome	15
				Foxtail fescue	15
				Filaree	15
				Clover	10
				Mouse barley	5
262*:					
Vaquero	Clayey (15e)	Favorable	3,500	Wild oat	35
		Normal	2,800	Soft chess	15
		Unfavorable	1,500	Filaree	10
				Foxtail fescue	10
				Red brome	5
				Burclover	5
				Clover	5
Carbona	Clayey (17e)	Favorable	3,500	Soft chess	25
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Wild oat	10
				Ripgut brome	10
				Red brome	10
				Clover	5
				Foxtail fescue	5
				Burclover	5
275*, 276*:					
Wisflat	Coarse Loamy (15e)	Favorable	2,000	Soft chess	30
		Normal	1,500	Wild oat	10
		Unfavorable	1,000	Red brome	10
				Filaree	10
				Ripgut brome	10
				Foxtail fescue	5
				Clover	5
				California sagebrush	5
Arburua	Fine Loamy (15e)	Favorable	3,500	Soft chess	35
		Normal	2,800	Foxtail fescue	20
		Unfavorable	1,500	Wild oat	10
				Red brome	10
				Filaree	5
				Mouse barley	5
				Ripgut brome	5
San Timoteo	Coarse Loamy (15e)	Favorable	2,300	Soft chess	30
		Normal	1,800	Wild oat	15
		Unfavorable	1,000	Filaree	15
				Red brome	10
				Ripgut brome	5
				Foxtail fescue	5
279, 280 Yellowlark	Loamy Stream Terrace (17e)	Favorable	4,000	Soft chess	30
		Normal	2,800	Filaree	15
		Unfavorable	1,200	Foxtail fescue	10
				Wild oat	10
				Ripgut brome	5
				Clover	5
				Smooth catsear	5

See footnote at end of table.

TABLE 10.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
283---------- Zacharias	Loamy (17e)----------	Favorable	3,000	Soft chess----------	25
		Normal	2,500	Filaree----------	15
		Unfavorable	1,000	Wild oat----------	10
				Ripgut brome----------	10
				Red brome----------	10
				Clover----------	5
				Foxtail fescue----------	5
				Burclover----------	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
101 Acampo	Slight	Slight	Slight	Slight	Slight.
102 Alamo	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
103*:					
Alo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.
104*:					
Alo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.
105*:					
Amador	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
Lithic Xerorthents.					
106 Archerdale	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
107 Archerdale	Severe: flooding.	Slight	Slight	Slight	Slight.
108. Arents					
109 Bisgani	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
110 Boggiano	Severe: flooding.	Slight	Slight	Slight	Slight.
111, 112 Bruella	Slight	Slight	Slight	Slight	Slight.
113 Calla	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
114*:					
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
115*:					
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
116*:					
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Pleito	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
117 Capay	Severe: flooding.	Slight	Slight	Slight	Slight.
118 Capay	Slight	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
119 Capay	Slight	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
120 Capay	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
121 Capay	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
122*:					
Capay	Slight	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
Urban land.					
123 Carbona	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
124*:					
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Orognen	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
125*:					
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
125*:					
Orognen	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
126*:					
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Carbona, bedrock substratum	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
127 Chuloak	Slight	Slight	Moderate: small stones.	Slight	Slight.
128 Cogna	Severe: flooding.	Slight	Slight	Slight	Slight.
129 Cogna	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
130 Columbia	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
131 Columbia	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
132 Columbia	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
133 Columbia	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
134 Cometa	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.
135*:					
Corning	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, droughty.
Redding	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, large stones.
136*:					
Corning	Moderate: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones, dusty.	Moderate: small stones, large stones, slope.
Redding	Moderate: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones, dusty.	Moderate: small stones, large stones, slope.
137 Cortina	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, large stones.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
138 Cosumnes	Severe: flooding.	Slight	Slight	Slight	Slight.
139 Cosumnes	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
140 Coyotecreek	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
141 Delhi	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
142 Delhi	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
143*:					
Delhi	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
Urban land.					
144 Dello	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, flooding, too sandy.
145, 146 Dello	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
147 Dello	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
148 Dello	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
149 Devries	Severe: flooding.	Slight	Slight	Slight	Moderate: cemented pan.
150*, 151*. Dumps					
152, 153, 154 Egbert	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
155*:					
Egbert	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Urban land.					
156 El Solyo	Slight	Slight	Slight	Slight	Slight.
157 Exeter	Severe: flooding.	Slight	Moderate: small stones.	Slight	Moderate: cemented pan.
158 Finrod	Severe: flooding.	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
159. Fluvaquents					
160 Galt	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
161 Galt	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.	Severe: too clayey.
162*:					
Galt	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
Urban land.					
163*:					
Gonzaga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Franciscan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
164*, 165*:					
Gonzaga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Franciscan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
166, 167 Grangeville	Severe: flooding.	Slight	Slight	Slight	Slight.
168 Guard	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
169 Guard	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
170 Hicksville	Severe: flooding.	Moderate: dusty.	Moderate: small stones, flooding, dusty.	Moderate: dusty.	Moderate: flooding.
171 Hicksville	Severe: flooding.	Moderate: dusty.	Moderate: slope, small stones, flooding.	Moderate: dusty.	Moderate: flooding.
172 Hicksville	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, flooding.
173, 174 Hollenbeck	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
175 Honcut	Slight	Slight	Moderate: small stones.	Slight	Slight.
176*:					
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Gonzaga	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
177*, 178*:					
Honker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vallecitos	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Honker, eroded	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
179 Itano	Severe: flooding, too acid.	Severe: too acid.	Severe: too acid.	Slight	Severe: too acid.
180 Jacktone	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
181*:					
Jacktone	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
Urban land.					
182 Jahant	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: small stones, percs slowly.	Moderate: dusty.	Slight.
183 Jahant	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, small stones, percs slowly.	Moderate: dusty.	Slight.
184 Kaseberg	Severe: percs slowly, cemented pan.	Severe: percs slowly, cemented pan.	Severe: slope, cemented pan, percs slowly.	Slight	Severe: droughty, cemented pan.
185 Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope, depth to rock, cemented pan.	Severe: erodes easily.	Severe: depth to rock.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
186 Kaseberg	Severe: slope, depth to rock, cemented pan.	Severe: slope, depth to rock, cemented pan.	Severe: slope, depth to rock, cemented pan.	Severe: erodes easily.	Severe: slope, depth to rock.
187*:					
Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope, small stones, depth to rock.	Moderate: dusty.	Severe: depth to rock.
Bellota	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: droughty, slope, depth to rock.
188*:					
Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: small stones, depth to rock.	Moderate: dusty.	Severe: depth to rock.
Redding	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, large stones.
189 Kingdon	Slight	Slight	Slight	Slight	Slight.
190 Kingile	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
191*:					
Kingile	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
Ryde	Severe: flooding.	Slight	Slight	Slight	Slight.
192*:					
Lithic Xerorthents.					
Toomes	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
193 Madera	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty, cemented pan.
194 Madera	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: slope, cemented pan, percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
195*:					
Madera	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty, cemented pan.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
195*:					
Alamo	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
196 Manteca	Severe: flooding.	Slight	Slight	Slight	Moderate: cemented pan.
197 Merritt	Severe: flooding.	Slight	Slight	Slight	Slight.
198 Merritt	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
199 Montpellier	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
200*:					
Montpellier	Slight	Slight	Severe: slope.	Slight	Slight.
Cometa	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Moderate: droughty.
201 Nord	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
202 Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Moderate: dusty.	Severe: depth to rock.
203 Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: large stones, dusty.	Severe: large stones, depth to rock.
204, 205 Peltier	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
206 Pentz	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: depth to rock.
207 Pentz	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
208 Pentz	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: large stones.	Severe: large stones, depth to rock.
209*:					
Pentz	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Moderate: dusty.	Severe: depth to rock.
Bellota	Moderate: slope, percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Severe: slope.	Moderate: dusty.	Moderate: droughty, slope, depth to rock.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
210*:					
Pentz	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight	Severe: depth to rock.
Redding	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
211 Pescadero	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight	Severe: excess sodium.
212 Peters	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: too clayey.	Severe: depth to rock.
213 Piper	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
214*. Pits					
215 Pleito	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
216 Ramoth	Slight	Slight	Severe: slope.	Slight	Slight.
217 Ramoth	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
218 Ramoth	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
219 Redding	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: small stones.	Severe: erodes easily.	Moderate: cemented pan.
220 Redding	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, large stones.
221 Redding	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
222 Reiff	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
223 Reiff	Severe: flooding.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.
224 Rindge	Severe: flooding.	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
225 Rindge	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
226 Rioblancho	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: cemented pan.
227*:					
Rioblancho	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: cemented pan.
Urban land.					
228 Rocklin	Slight	Slight	Moderate: slope, cemented pan.	Severe: erodes easily.	Moderate: cemented pan.
229 Rocklin	Slight	Slight	Slight	Severe: erodes easily.	Moderate: cemented pan.
230, 231, 232 Ryde	Severe: flooding.	Slight	Slight	Slight	Slight.
233*:					
Ryde	Severe: flooding.	Slight	Slight	Slight	Slight.
Peltier	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
234 Sailboat	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
235 Sailboat	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
236 San Joaquin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty, cemented pan.
237 San Joaquin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, cemented pan, percs slowly.	Slight	Moderate: droughty, cemented pan.
238 San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
239 San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: slope, cemented pan, percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
240 San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
241*:					
San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
San Joaquin, thick surface	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
242*:					
San Joaquin	Moderate: percs slowly.	Moderate: percs slowly, dusty.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: cemented pan.
Urban land.					
243, 244 Scribner	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
245*:					
Scribner	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Urban land.					
246 Shima	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
247 Shinkee	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
248, 249 Stockton	Severe: flooding.	Slight	Slight	Slight	Slight.
250 Stockton	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
251*:					
Stockton	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
Urban land.					
252 Stomar	Slight	Slight	Slight	Severe: erodes easily.	Slight.
253 Stomar	Slight	Slight	Slight	Slight	Slight.
254 Timor	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
255 Tinnin	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
256 Tokay	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
257*:					
Tokay	Slight	Slight	Slight	Slight	Slight.
Urban land.					
258 Trahern	Severe: flooding, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Moderate: cemented pan.
259 Tujunga	Severe: flooding.	Moderate: too sandy.	Moderate: small stones.	Moderate: too sandy.	Moderate: droughty.
260*. Urban land					
261 Valdez	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
262*:					
Vaquero	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.
Carbona	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope, too clayey.
263 Venice	Severe: flooding.	Slight	Slight	Slight	Slight.
264 Venice	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
265, 266, 267 Veritas	Severe: flooding.	Slight	Slight	Slight	Slight.
268, 269 Vernalis	Slight	Slight	Slight	Slight	Slight.
270 Vignolo	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: cemented pan.
271 Vignolo	Severe: flooding.	Slight	Slight	Slight	Moderate: cemented pan.
272 Vina	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
273 Webile	Severe: flooding, excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.	Severe: excess humus.
274 Willows	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: too clayey.	Severe: excess sodium, too clayey.
275*, 276*:					
Wisflat	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, depth to rock.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
275*, 276*:					
Arburua	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
San Timoteo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
277. Xerofluvents					
278*:					
Xerofluvents.					
Xerorthents.					
279, 280 Yellowlark	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
281 Zacharias	Slight	Slight	Moderate: small stones.	Slight	Slight.
282, 283 Zacharias	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WILDLIFE HABITAT

(N means nonirrigated; I means irrigated. See text for definitions of "well suited," "suited," "poorly suited," and "unsuited." Absence of an entry indicates that the soil was not rated)

Map symbol and soil name	Vegetative elements											
	Grain and seed crops		Domestic grasses and legumes		Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
	N	I	N	I								
101 Acampo	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
102 Alamo	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Well suited.	Well suited.
103:												
Alo	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Vaquero	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
104:												
Alo	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Vaquero	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
105:												
Amador	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Lithic Xerorthents.												
106, 107 Archerdale	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
108. Arents												
109 Bisgani	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Suited	Suited	Suited	Suited	Suited.
110 Boggiano	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
111 Bruella	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Well suited.
112 Bruella	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Suited	Suited	Unsuited	Suited	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements											
	Grain and seed crops		Domestic grasses and legumes		Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
	N	I	N	I								
113 Calla	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.
114:												
Calla	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Carbona	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
115:												
Calla	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Carbona	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
116:												
Calla	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Pleito	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
117 Capay	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Suited	Well suited.
118 Capay	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.	Well suited.
119 Capay	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.
120 Capay	Suited	Well suited.	Suited	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Well suited.
121 Capay	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Poorly suited.	Well suited.	Poorly suited.	Suited	Well suited.	Well suited.
122:												
Capay	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.	Well suited.
Urban land.												
123 Carbona	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
124:												
Carbona	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Orognen	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
125:												
Carbona	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Orognen	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
126:												
Carbona	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Carbona, bedrock substratum	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
127 Chulpak	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
128, 129 Cogna	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
130, 131, 132, 133 Columbia	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited	Suited	Suited	Suited.
134 Cometa	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
135, 136:												
Corning	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
Redding	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
137 Cortina	Suited	Suited	Suited	Suited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.
138, 139 Cosumnes	Unsuited	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements											
	Grain and seed crops		Domestic grasses and legumes		Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
	N	I	N	I								
140 Coyotecreek	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.
141, 142 Delhi	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
143:												
Delhi	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
Urban land.												
144, 145 Dello	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited	Suited	Suited	Suited.
146, 147 Dello	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
148 Dello	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited	Suited	Suited	Suited.
149 Devries	Suited	Suited	Suited	Suited	Well suited.	Suited	Suited	Well suited.	Suited	Suited	Well suited.	Well suited.
150, 151. Dumps												
152, 153, 154 Egbert	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Suited	Suited	Suited.
155:												
Egbert	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Suited	Suited	Suited.
Urban land.												
156 El Solyo	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Well suited.	Unsuited	Well suited.	Suited	Suited.
157 Exeter	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Suited	Suited	Unsuited	Suited	Well suited.	Well suited.
158 Finrod	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
159. Fluvaquents												

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
160 Galt	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
161 Galt	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
162:												
Galt	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
Urban land.												
163:												
Gonzaga	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Franciscan	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Suited	Unsuited	Unsuited.
164:												
Gonzaga	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Honker	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Franciscan	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Suited	Unsuited	Unsuited.
165:												
Gonzaga	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Honker	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Franciscan	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Suited	Unsuited	Unsuited.
166, 167 Grangeville	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited	Suited	Suited	Suited.
168 Guard	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Poorly suited.	Suited	Poorly suited.	Well suited.	Well suited.
169 Guard	Suited	Well suited.	Suited	Well suited.	Well suited.	Poorly suited.	Suited	Suited	Poorly suited.	Suited	Suited	Suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements											
	Grain and seed crops		Domestic grasses and legumes		Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
	N	I	N	I								
170, 171 Hicksville	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.
172 Hicksville	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.
173 Hollenbeck	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
174 Hollenbeck	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Poorly suited.	Well suited.	Poorly suited.	Poorly suited.	Well suited.	Well suited.
175 Honcut	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
176:												
Honker	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Vallecitos	Unsuited	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Gonzaga	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
177:												
Honker	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Vallecitos	Unsuited	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Honker, eroded	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
178:												
Honker	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Vallecitos	Unsuited	Unsuited	Unsuited	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Honker, eroded	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
179 Itano	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
180---------- Jacktone	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
181:												
Jacktone----------	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
Urban land.												
182---------- Jahant	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Well suited.	Suited	Poorly suited.	Well suited.	Well suited.
183---------- Jahant	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
184---------- Kaseberg	Poorly suited.	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
185, 186---------- Kaseberg	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
187:												
Keyes----------	Poorly suited.	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Bellota----------	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
188:												
Keyes----------	Poorly suited.	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Redding----------	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
189---------- Kingdon	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
190---------- Kingile	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
191:												
Kingile----------	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
Ryde----------	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
192: Lithic Xerorthents.												
Ioomes	Poorly suited.	Poorly suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
193 Madera	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Well suited.	Suited	Poorly suited.	Well suited.	Well suited.
194 Madera	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Well suited.	Poorly suited.	Poorly suited.	Suited	Suited.
195: Madera	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Well suited.	Suited	Poorly suited.	Well suited.	Well suited.
Alamo	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Well suited.	Well suited.
196 Manteca	Suited	Suited	Suited	Suited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Suited	Suited.
197 Merritt	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Suited	Suited	Suited.
198 Merritt	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited	Suited	Suited	Suited.
199 Montpellier	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
200: Montpellier	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
Cometa	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
201 Nord	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
202, 203 Pardee	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
204, 205 Peltier	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Poorly suited.	Suited	Poorly suited.	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
206, 207, 208 Pentz	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
209:												
Pentz	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Bellota	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
210:												
Pentz	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Redding	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
211 Pescadero	Poorly suited.	Suited	Poorly suited.	Suited	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Well suited.
212 Peters	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
213 Piper	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
214. Pits												
215 Pleito	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.
216, 217, 218 Ramoth	Suited	Suited	Suited	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Suited	Poorly suited.	Poorly suited.
219, 220, 221 Redding	Poorly suited.	Poorly suited.	Poorly suited.	Suited	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Poorly suited.	Poorly suited.
222 Reiff	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.
223 Reiff	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Well suited.	Unsuited	Well suited.	Suited	Suited.
224, 225 Rindge	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
226 Rioblancho	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.
227:												
Rioblancho	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.
Urban land.												
228, 229 Rocklin	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Poorly suited.	Suited	Well suited.	Unsuited	Poorly suited.	Poorly suited.
230, 231, 232 Ryde	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Poorly suited.	Suited	Poorly suited.	Well suited.	Well suited.
233:												
Ryde	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Poorly suited.	Suited	Poorly suited.	Well suited.	Well suited.
Peltier	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Poorly suited.	Suited	Poorly suited.	Well suited.	Well suited.
234, 235 Sailboat	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Suited	Well suited.	Suited	Suited.
236 San Joaquin	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Well suited.	Suited	Poorly suited.	Well suited.	Well suited.
237 San Joaquin	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Well suited.	Poorly suited.	Poorly suited.	Suited	Suited.
238 San Joaquin	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Well suited.	Well suited.
239 San Joaquin	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Suited	Suited.
240, 241 San Joaquin	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Well suited.	Well suited.
242:												
San Joaquin	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Well suited.	Well suited.
Urban land.												

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
243, 244 Scribner	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Suited	Suited	Suited.
245:												
Scribner	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Suited	Suited	Suited	Suited	Suited	Suited.
Urban land.												
246 Shima	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
247 Shinkee	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
248, 249, 250 Stockton	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
251:												
Stockton	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Poorly suited.	Poorly suited.	Unsuited	Poorly suited.	Well suited.	Well suited.
Urban land.												
252 Stomar	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Well suited.	Unsuited	Well suited.	Suited	Suited.
253 Stomar	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Poorly suited.	Suited	Suited	Suited.
254 Timor	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
255 Tinnin	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
256 Tokay	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
257:												
Tokay	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
Urban land.												
258 Trahern	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Suited	Poorly suited.	Suited	Suited	Suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
259 Tujunga	Suited	Suited	Suited	Suited	Suited	Unsuited	Suited	Well suited.	Unsuited	Suited	Unsuited	Unsuited.
260. Urban land												
261 Valdez	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
262:												
Vaquero	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
Carbona	Poorly suited.	Unsuited	Suited	Poorly suited.	Suited	Unsuited	Poorly suited.	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
263 Venice	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
264 Venice	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.
265 Veritas	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Suited	Poorly suited.	Suited	Suited	Suited.
266 Veritas	Suited	Well suited.	Suited	Well suited.	Well suited.	Unsuited	Suited	Well suited.	Unsuited	Suited	Suited	Suited.
267 Veritas	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Suited	Poorly suited.	Suited	Suited	Suited.
268 Vernalis	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Well suited.	Unsuited	Well suited.	Suited	Suited.
269 Vernalis	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Poorly suited.	Suited	Suited	Suited.
270, 271 Vignolo	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Unsuited	Well suited.	Well suited.	Unsuited	Well suited.	Poorly suited.	Poorly suited.
272 Vina	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Suited	Well suited.	Well suited.	Poorly suited.	Suited	Suited	Suited.
273 Webile	Suited	Well suited.	Suited	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Unsuited	Well suited.	Well suited.

TABLE 12.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Vegetative elements: Grain and seed crops: N	Grain and seed crops: I	Domestic grasses and legumes: N	Domestic grasses and legumes: I	Wild herbaceous plants	Riparian herbaceous plants	Shrubs and vines	Desertic shrubs	Riparian shrubs, vines, and trees	Hardwood trees	Non-saline wetland plants	Saline wetland plants
274---------- Willows	Poorly suited.	Suited	Poorly suited.	Suited	Suited	Suited	Suited	Suited	Suited	Poorly suited.	Suited	Well suited.
275:												
Wisflat----------	Unsuited	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Arburua----------	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
San Timoteo--------	Unsuited	Unsuited	Poorly suited.	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
276:												
Wisflat----------	Unsuited	Unsuited	Unsuited	Unsuited	Poorly suited.	Unsuited	Poorly suited.	Suited	Unsuited	Unsuited	Unsuited	Unsuited.
Arburua----------	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
San Timoteo--------	Unsuited	Unsuited	Unsuited	Unsuited	Suited	Unsuited	Suited	Suited	Unsuited	Poorly suited.	Unsuited	Unsuited.
277. Xerofluvents												
278: Xerofluvents.												
Xerorthents.												
279, 280---------- Yellowlark	Suited	Suited	Suited	Suited	Well suited.	Unsuited	Poorly suited.	Suited	Well suited.	Unsuited	Poorly suited.	Poorly suited.
281, 282---------- Zacharias	Well suited.	Well suited.	Well suited.	Well suited.	Well suited.	Poorly suited.	Well suited.	Well suited.	Unsuited	Well suited.	Suited	Suited.
283---------- Zacharias	Well suited.	Suited	Well suited.	Suited	Well suited.	Unsuited	Well suited.	Suited	Unsuited	Poorly suited.	Poorly suited.	Poorly suited.

TABLE 13.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
101 Acampo	Moderate: cemented pan.	Slight	Moderate: cemented pan.	Slight	Slight	Slight.
102 Alamo	Severe: cemented pan, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, cemented pan.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
103*, 104*:						
Alo	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, too clayey.
Vaquero	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
105*:						
Amador	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Lithic Xerorthents.						
106, 107 Archerdale	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
108. Arents						
109 Bisgani	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty, too sandy.
110 Boggiano	Moderate: cemented pan.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
111, 112 Bruella	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
113 Calla	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
114*, 115*:						
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
114*, 115*:						
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
116*:						
Calla	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Pleito	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
117 Capay	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
118, 119 Capay	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
120 Capay	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
121 Capay	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
122*:						
Capay	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Urban land.						
123 Carbona	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
124*, 125*:						
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Orognen	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
126*:						
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
126*:						
Carbona, bedrock substratum	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
127 Chuloak	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
128 Cogna	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
129 Cogna	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.	Slight.
130 Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
131 Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
132 Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
133 Columbia	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
134 Cometa	Moderate: too clayey, dense layer.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: shrink-swell.	Moderate: droughty.
135*:						
Corning	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones, droughty.
Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Moderate: small stones, large stones.
136*:						
Corning	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, shrink-swell.	Moderate: small stones, large stones, slope.
Redding	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Moderate: small stones, large stones, slope.
137 Cortina	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: small stones, large stones.
138 Cosumnes	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
139 Cosumnes	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Moderate: flooding.
140 Coyotecreek	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
141, 142 Delhi	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
143*:						
Delhi	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Urban land.						
144 Dello	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding, too sandy.
145, 146, 147, 148 Dello	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
149 Devries	Severe: cemented pan.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, flooding.	Moderate: cemented pan.
150*, 151*. Dumps						
152, 153 Egbert	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
154 Egbert	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
155*:						
Egbert	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Urban land.						
156 El Solyo	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
157 Exeter	Severe: cemented pan, cutbanks cave.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.
158 Finrod	Moderate: cemented pan, too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
159. Fluvaquents						
160 Galt	Severe: cemented pan, cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
161 Galt	Severe: cemented pan, cutbanks cave.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
162*:						
Galt	Severe: cemented pan, cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Urban land.						
163*:						
Gonzaga	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
164*, 165*:						
Gonzaga	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Honker	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Franciscan	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
166, 167 Grangeville	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
168 Guard	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: shrink-swell, wetness, flooding.	Moderate: wetness.
169 Guard	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: shrink-swell, flooding.	Slight.
170 Hicksville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
171---------- Hicksville	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
172---------- Hicksville	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, flooding.
173, 174---------- Hollenbeck	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
175---------- Honcut	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
176*:						
Honker----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Vallecitos-------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
Gonzaga----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
177*, 178*:						
Honker----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Vallecitos-------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
Honker, eroded---	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
179---------- Itano	Moderate: wetness.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Severe: too acid.
180---------- Jacktone	Severe: cemented pan, cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
181*:						
Jacktone---------	Severe: cemented pan, cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
181*: Urban land.						
182 Jahant	Moderate: cemented pan, too clayey.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
183 Jahant	Moderate: cemented pan, too clayey.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
184 Kaseberg	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Severe: droughty, cemented pan.
185 Kaseberg	Severe: depth to rock, cemented pan.	Moderate: slope, depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: slope.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock.
186 Kaseberg	Severe: depth to rock, cemented pan, slope.	Severe: slope.	Severe: depth to rock, cemented pan, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
187*:						
Keyes	Severe: depth to rock, cemented pan.	Severe: shrink-swell, cemented pan.	Severe: depth to rock, cemented pan, shrink-swell.	Severe: shrink-swell, slope, cemented pan.	Severe: cemented pan, shrink-swell, low strength.	Severe: depth to rock.
Bellota	Moderate: depth to rock, cemented pan, too clayey.	Moderate: shrink-swell, slope.	Moderate: depth to rock, cemented pan, slope.	Severe: slope.	Moderate: shrink-swell, slope.	Moderate: droughty, slope, depth to rock.
188*:						
Keyes	Severe: depth to rock, cemented pan.	Severe: shrink-swell, cemented pan.	Severe: depth to rock, cemented pan, shrink-swell.	Severe: shrink-swell, cemented pan.	Severe: cemented pan, shrink-swell, low strength.	Severe: depth to rock.
Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Moderate: small stones, large stones.
189 Kingdon	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
190 Kingile	Moderate: too clayey, wetness.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Severe: excess humus.
191*: Kingile	Moderate: too clayey, wetness.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Severe: excess humus.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
191*:						
Ryde	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
192*:						
Lithic Xerorthents.						
Toomes	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.
193 Madera	Severe: cemented pan.	Moderate: shrink-swell.	Severe: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: droughty, cemented pan.
194 Madera	Severe: cemented pan.	Moderate: shrink-swell.	Severe: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.
195*:						
Madera	Severe: cemented pan.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, shrink-swell.	Moderate: droughty, cemented pan.
Alamo	Severe: cemented pan, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, cemented pan.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
196 Manteca	Severe: cemented pan, cutbanks cave.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, flooding.	Moderate: cemented pan.
197 Merritt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
198 Merritt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
199 Montpellier	Moderate: dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope.	Moderate: slope.
200*:						
Montpellier	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.
Cometa	Moderate: too clayey, dense layer.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: shrink-swell.	Moderate: droughty.
201 Nord	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
202 Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
203 Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: large stones, depth to rock.
204 Peltier	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
205 Peltier	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
206 Pentz	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
207 Pentz	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
208 Pentz	Severe: depth to rock.	Moderate: depth to rock, large stones.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, large stones.	Severe: large stones, depth to rock.
209*:						
Pentz	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Bellota	Moderate: depth to rock, cemented pan, too clayey.	Moderate: shrink-swell, slope.	Moderate: depth to rock, cemented pan, slope.	Severe: slope.	Moderate: shrink-swell, slope.	Moderate: droughty, slope, depth to rock.
210*:						
Pentz	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Redding	Severe: cemented pan.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Moderate: small stones, large stones, slope.
211 Pescadero	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
212 Peters	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: depth to rock.
213 Piper	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
214*. Pits						

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
215 Pleito	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
216 Ramoth	Severe: cutbanks cave.	Slight	Moderate: shrink-swell.	Moderate: slope.	Slight	Slight.
217 Ramoth	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope.	Moderate: slope.
218 Ramoth	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
219 Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.
220 Redding	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Moderate: small stones, large stones.
221 Redding	Severe: cemented pan, slope.	Severe: slope.	Severe: cemented pan, slope.	Severe: slope.	Severe: slope.	Severe: slope.
222 Reiff	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
223 Reiff	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
224 Rindge	Severe: excess humus.	Severe: flooding, low strength, subsides.	Severe: flooding, low strength, subsides.	Severe: flooding, low strength, subsides.	Severe: low strength, subsides.	Slight.
225 Rindge	Severe: excess humus.	Severe: flooding, low strength, subsides.	Severe: flooding, low strength, subsides.	Severe: flooding, low strength, subsides.	Severe: low strength, subsides.	Severe: excess humus.
226 Rioblancho	Severe: cemented pan.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, shrink-swell, low strength.	Moderate: cemented pan.
227*:						
Rioblancho	Severe: cemented pan.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, shrink-swell, low strength.	Moderate: cemented pan.
Urban land.						
228, 229 Rocklin	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Severe: cemented pan.	Moderate: shrink-swell, cemented pan.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
230 Ryde	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
231 Ryde	Severe: excess humus.	Severe: flooding, low strength.	Severe: flooding, low strength.	Severe: flooding, low strength.	Severe: low strength.	Slight.
232 Ryde	Severe: cutbanks cave, excess humus.	Severe: flooding, low strength.	Severe: flooding.	Severe: flooding, low strength.	Severe: low strength.	Slight.
233*:						
Ryde	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
Peltier	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding.	Severe: subsides, flooding, low strength.	Severe: subsides, low strength.	Slight.
234 Sailboat	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, shrink-swell.	Slight.
235 Sailboat	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
236, 237 San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty, cemented pan.
238, 239, 240 San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
241*:						
San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
San Joaquin, thick surface	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
242*:						
San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.
Urban land.						
243 Scribner	Moderate: wetness.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Slight.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
244 Scribner	Severe: cutbanks cave.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Slight.
245*:						
Scribner	Moderate: wetness.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, low strength.	Slight.
Urban land.						
246 Shima	Severe: cutbanks cave, excess humus.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides.	Severe: excess humus.
247 Shinkee	Severe: excess humus.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides, flooding.	Severe: subsides.	Severe: excess humus.
248, 249 Stockton	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
250 Stockton	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
251*:						
Stockton	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Urban land.						
252 Stomar	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
253 Stomar	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
254 Timor	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
255 Tinnin	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
256 Tokay	Slight	Slight	Slight	Slight	Slight	Slight.
257*:						
Tokay	Slight	Slight	Slight	Slight	Slight	Slight.
Urban land.						
258 Trahern	Severe: cemented pan.	Severe: flooding, shrink-swell.	Severe: flooding, cemented pan.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: cemented pan.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
259 Tujunga	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
260*. Urban land						
261 Valdez	Severe: excess humus.	Severe: subsides, flooding.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding.	Severe: subsides, low strength.	Slight.
262*:						
Vaquero	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
Carbona	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
263 Venice	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides.	Slight.
264 Venice	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding, low strength.	Severe: subsides.	Severe: excess humus.
265 Veritas	Moderate: cemented pan, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
266, 267 Veritas	Moderate: cemented pan.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
268 Vernalis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
269 Vernalis	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
270, 271 Vignolo	Severe: cemented pan.	Severe: flooding.	Severe: flooding, cemented pan.	Severe: flooding.	Moderate: cemented pan, low strength, flooding.	Moderate: cemented pan.
272 Vina	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
273 Webile	Severe: excess humus.	Severe: subsides, flooding, low strength.	Severe: subsides, flooding.	Severe: subsides, flooding, low strength.	Severe: subsides.	Severe: excess humus.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
274 Willows	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
275*, 276*:						
Wisflat	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Arburua	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
San Timoteo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
277. Xerofluvents						
278*:						
Xerofluvents.						
Xerorthents.						
279, 280 Yellowlark	Moderate: cemented pan, too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, cemented pan, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: small stones.
281 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
282 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: small stones.
283 Zacharias	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
101 Acampo	Moderate: cemented pan.	Severe: seepage.	Severe: cemented pan, seepage.	Severe: seepage.	Fair: cemented pan, thin layer.
102 Alamo	Severe: cemented pan, wetness.	Severe: cemented pan.	Severe: cemented pan, wetness.	Severe: cemented pan, wetness.	Poor: cemented pan, too clayey, hard to pack.
103*, 104*:					
Alo	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Vaquero	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
105*:					
Amador	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Lithic Xerorthents.					
106, 107 Archerdale	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
108. Arents					
109 Bisgani	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
110 Boggiano	Moderate: flooding, cemented pan, percs slowly.	Moderate: seepage, cemented pan.	Severe: cemented pan.	Moderate: flooding, cemented pan.	Fair: cemented pan, too clayey, thin layer.
111 Bruella	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
112 Bruella	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
113 Calla	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
114*, 115*:					
Calla	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
116*:					
Calla	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Pleito	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
117 Capay	Severe: percs slowly.	Slight	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
118 Capay	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
119 Capay	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
120 Capay	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, excess sodium.
121 Capay	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
122*:					
Capay	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Urban land.					
123 Carbona	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
124*, 125*:					
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Orognen	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
126*:					
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
126*:					
Carbona, bedrock substratum	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer.
127 Chuloak	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Good.
128 Cogna	Moderate: flooding, percs slowly.	Severe: seepage.	Moderate: flooding, too clayey.	Severe: seepage.	Fair: too clayey.
129 Cogna	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
130 Columbia	Moderate: flooding, percs slowly.	Severe: seepage.	Moderate: flooding.	Severe: seepage.	Good.
131, 132 Columbia	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
133 Columbia	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack.
134 Cometa	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
135*:					
Corning	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
136*:					
Corning	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
Redding	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, large stones.
137 Cortina	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
138 Cosumnes	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
139 Cosumnes	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
140 Coyotecreek	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
141, 142 Delhi	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
143*:					
Delhi	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
144 Dello	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
145 Dello	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
146 Dello	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Poor: seepage, too sandy.
147 Dello	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
148 Dello	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
149 Devries	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Severe: cemented pan, seepage.	Poor: cemented pan.
150*, 151*. Dumps					
152 Egbert	Severe: percs slowly.	Moderate: excess humus.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
153 Egbert	Severe: percs slowly.	Slight	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
154 Egbert	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness.	Poor: too sandy.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
155*:					
Egbert	Severe: percs slowly.	Slight	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
Urban land.					
156 El Solyo	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
157 Exeter	Severe: cemented pan, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
158 Finrod	Severe: percs slowly.	Moderate: cemented pan.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
159. Fluvaquents					
160, 161 Galt	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
162*:					
Galt	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
Urban land.					
163*:					
Gonzaga	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
Franciscan	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
164*, 165*:					
Gonzaga	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
Honker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Franciscan	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
166, 167 Grangeville	Moderate: flooding, wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
168 Guard	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Moderate: flooding, wetness.	Fair: too clayey, wetness.
169 Guard	Severe: percs slowly.	Slight	Severe: wetness.	Moderate: flooding.	Fair: too clayey.
170 Hicksville	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
171 Hicksville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, depth to rock.	Severe: flooding.	Fair: depth to rock, too clayey, wetness.
172 Hicksville	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey, small stones.
173, 174 Hollenbeck	Severe: percs slowly.	Moderate: cemented pan.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
175 Honcut	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
176*:					
Honker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Vallecitos	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Gonzaga	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
177*, 178*:					
Honker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Vallecitos	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
177*, 178*:					
Honker, eroded	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
179 Itano	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too acid.	Severe: wetness.	Poor: too acid.
180 Jacktone	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, wetness, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
181*:					
Jacktone	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, wetness, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey, hard to pack.
Urban land.					
182 Jahant	Severe: percs slowly.	Moderate: seepage, cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Poor: thin layer.
183 Jahant	Severe: percs slowly.	Moderate: seepage, cemented pan, slope.	Severe: cemented pan.	Moderate: cemented pan.	Poor: thin layer.
184 Kaseberg	Severe: cemented pan, percs slowly.	Severe: seepage, cemented pan, slope.	Moderate: cemented pan, slope.	Severe: cemented pan.	Poor: cemented pan.
185 Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock.
186 Kaseberg	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, slope.	Severe: depth to rock, cemented pan, slope.	Poor: depth to rock, slope.
187*:					
Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan, too clayey.	Severe: depth to rock, cemented pan.	Poor: depth to rock, too clayey, hard to pack.
Bellota	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock, small stones.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
188*:					
Keyes	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan, too clayey.	Severe: depth to rock, cemented pan.	Poor: depth to rock, too clayey, hard to pack.
Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
189 Kingdon	Moderate: wetness, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
190 Kingile	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
191*:					
Kingile	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
Ryde	Severe: wetness.	Severe: wetness.	Severe: wetness, excess humus.	Severe: wetness.	Poor: hard to pack.
192*:					
Lithic Xerorthents.					
Toomes	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
193, 194 Madera	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
195*:					
Madera	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
Alamo	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan.	Severe: cemented pan, wetness, too clayey.	Severe: cemented pan, wetness.	Poor: cemented pan, too clayey, hard to pack.
196 Manteca	Severe: cemented pan.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan, seepage.	Poor: cemented pan.
197 Merritt	Severe: percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too sandy.
198 Merritt	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too sandy.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
199 Montpellier	Severe: percs slowly.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
200*:					
Montpellier	Severe: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Cometa	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
201 Nord	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
202 Pardee	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock, small stones.
203 Pardee	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: depth to rock, small stones.
204 Peltier	Severe: subsides, wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey, excess humus.	Severe: wetness.	Poor: too clayey, hard to pack.
205 Peltier	Severe: subsides, wetness.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: hard to pack.
206 Pentz	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock.
207 Pentz	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
208 Pentz	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, small stones.
209*:					
Pentz	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock.
Bellota	Severe: depth to rock, cemented pan, percs slowly.	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock.	Severe: depth to rock, cemented pan.	Poor: depth to rock, small stones.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
210*:					
Pentz	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, small stones.
Redding	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
211 Pescadero	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey, excess sodium.	Severe: wetness.	Poor: too clayey, hard to pack, excess sodium.
212 Peters	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
213 Piper	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
214*. Pits					
215 Pleito	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
216 Ramoth	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
217 Ramoth	Severe: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
218 Ramoth	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
219 Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
220 Redding	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan, small stones.
221 Redding	Severe: cemented pan, slope.	Severe: cemented pan, slope.	Severe: cemented pan, slope.	Severe: cemented pan, slope.	Poor: cemented pan, small stones, slope.
222 Reiff	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding, seepage.	Fair: too sandy.
223 Reiff	Moderate: flooding, percs slowly.	Severe: seepage.	Moderate: flooding, too sandy.	Severe: seepage.	Fair: too sandy.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
224, 225---------- Rindge	Severe: wetness, poor filter, subsides.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus.
226---------- Rioblancho	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
227*:					
Rioblancho---------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
Urban land.					
228, 229---------- Rocklin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
230---------- Ryde	Severe: wetness.	Severe: wetness.	Severe: wetness, excess humus.	Severe: wetness.	Poor: hard to pack.
231---------- Ryde	Severe: wetness.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus.
232---------- Ryde	Severe: wetness.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, excess humus.	Severe: wetness.	Poor: hard to pack.
233*:					
Ryde----------	Severe: wetness.	Severe: wetness.	Severe: wetness, excess humus.	Severe: wetness.	Poor: hard to pack.
Peltier----------	Severe: subsides, wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey, excess humus.	Severe: wetness.	Poor: too clayey, hard to pack.
234---------- Sailboat	Severe: percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
235---------- Sailboat	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
236, 237, 238, 239, 240---------- San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
241*:					
San Joaquin--------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
241*:					
San Joaquin, thick surface	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
242*:					
San Joaquin	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: cemented pan, too clayey.
Urban land.					
243 Scribner	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
244 Scribner	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
245*:					
Scribner	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Urban land.					
246 Shima	Severe: subsides, wetness, poor filter.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
247 Shinkee	Severe: wetness, percs slowly.	Severe: seepage, excess humus, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness.
248 Stockton	Severe: percs slowly.	Severe: seepage.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
249, 250 Stockton	Severe: percs slowly.	Moderate: cemented pan.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
251*:					
Stockton	Severe: percs slowly.	Moderate: cemented pan.	Severe: cemented pan, too clayey.	Moderate: flooding, cemented pan.	Poor: too clayey, hard to pack.
Urban land.					
252 Stomar	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
253 Stomar	Severe: percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
254 Timor	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
255 Tinnin	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy, thin layer.
256 Tokay	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
257*:					
Tokay	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Urban land.					
258 Trahern	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, wetness.	Severe: cemented pan.	Poor: cemented pan.
259 Tujunga	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
260*. Urban land					
261 Valdez	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
262*:					
Vaquero	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
Carbona	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
263, 264 Venice	Severe: subsides, wetness, poor filter.	Severe: seepage, excess humus, wetness.	Severe: seepage, wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus.
265 Veritas	Moderate: flooding, cemented pan, wetness.	Severe: seepage.	Severe: cemented pan, seepage, wetness.	Severe: seepage.	Fair: cemented pan, thin layer.
266, 267 Veritas	Moderate: flooding, cemented pan.	Severe: seepage.	Severe: cemented pan, seepage.	Severe: seepage.	Fair: cemented pan, thin layer.
268 Vernalis	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
269 Vernalis	Severe: percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
270, 271 Vignolo	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: cemented pan.
272 Vina	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
273 Webile	Severe: subsides, wetness, percs slowly.	Severe: seepage, excess humus, wetness.	Severe: wetness, excess humus.	Severe: seepage, wetness.	Poor: excess humus.
274 Willows	Severe: percs slowly.	Slight	Severe: wetness, too clayey, excess sodium.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack, excess salt.
275*, 276*:					
Wisflat	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Arburua	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
San Timoteo	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
277. Xerofluvents					
278*:					
Xerofluvents.					
Xerorthents.					
279, 280 Yellowlark	Severe: wetness, percs slowly.	Severe: wetness.	Severe: cemented pan.	Moderate: cemented pan.	Fair: cemented pan, too clayey, small stones.
281 Zacharias	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
282 Zacharias	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
283 Zacharias	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
101 Acampo	Fair: cemented pan, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
102 Alamo	Poor: cemented pan, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
103*:				
Alo	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Vaquero	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
104*:				
Alo	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Vaquero	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
105*:				
Amador	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Lithic Xerorthents.				
106, 107 Archerdale	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
108. Arents				
109 Bisgani	Good	Probable	Improbable: too sandy.	Fair: too sandy, thin layer.
110 Boggiano	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
111 Bruella	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
112 Bruella	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
113 Calla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
114*:				
Calla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
115*:				
Calla	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Carbona	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
116*:				
Calla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Pleito	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
117 Capay	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
118, 119 Capay	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess flnes.	Poor: too clayey.
120 Capay	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
121 Capay	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
122*:				
Capay	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
123 Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
124*:				
Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
124*:				
Orognen	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
125*:				
Carbona	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Orognen	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
126*:				
Carbona	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Carbona, bedrock substratum	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
127 Chuloak	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
128, 129 Cogna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
130, 131, 132 Columbia	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
133 Columbia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
134 Cometa	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
135*, 136*:				
Corning	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
137 Cortina	Good	Probable	Probable	Poor: small stones, area reclaim.
138, 139 Cosumnes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
140 Coyotecreek	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
141 Delhi	Good	Probable	Improbable: too sandy.	Poor: too sandy.
142 Delhi	Good	Probable	Improbable: too sandy.	Fair: too sandy.
143*:				
Delhi	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Urban land.				
144, 145, 146 Dello	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
147 Dello	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
148 Dello	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
149 Devries	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, thin layer.
150*, 151*. Dumps				
152, 153 Egbert	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
154 Egbert	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
155*:				
Egbert	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
156 El Solyo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
157 Exeter	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, too clayey, small stones.
158 Finrod	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
159. Fluvaquents				
160, 161 Galt	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
162*:				
Galt	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
163*:				
Gonzaga	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Franciscan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
164*, 165*:				
Gonzaga	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Honker	Poor: depth to rock, shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Franciscan	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
166 Grangeville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
167 Grangeville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
168 Guard	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
169 Guard	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
170 Hicksville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
171 Hicksville	Fair: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
172 Hicksville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
173, 174 Hollenbeck	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
175 Honcut	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
176*:				
Honker	Poor: depth to rock, shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Vallecitos	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Gonzaga	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
177*, 178*:				
Honker	Poor: depth to rock, shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Vallecitos	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
Honker, eroded	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
179 Itano	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
180 Jacktone	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
181*:				
Jacktone	Poor: cemented pan, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
182, 183 Jahant	Fair: cemented pan, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
184 Kaseberg	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan, area reclaim.
185 Kaseberg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan.
186 Kaseberg	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan, slope.
187*:				
Keyes	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan, small stones.
Bellota	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
188*:				
Keyes	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, cemented pan, small stones.
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
189 Kingdon	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
190 Kingile	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, too clayey.
191*:				
Kingile	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, too clayey.
Ryde	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus.
192*:				
Lithic Xerorthents.				
Toomes	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
193, 194 Madera	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
195*:				
Madera	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
195*:				
Alamo	Poor: cemented pan, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
196 Manteca	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, thin layer.
197, 198 Merritt	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
199 Montpellier	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
200*:				
Montpellier	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Cometa	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
201 Nord	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
202, 203 Pardee	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
204 Peltier	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
205 Peltier	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
206 Pentz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
207 Pentz	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
208 Pentz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
209*:				
Pentz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Bellota	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
210*:				
Pentz	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
211 Pescadero	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
212 Peters	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
213 Piper	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
214*. Pits				
215 Pleito	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
216 Ramoth	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
217 Ramoth	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
218 Ramoth	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
219, 220 Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
221 Redding	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
222, 223 Reiff	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
224, 225 Rindge	Poor: low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus.
226 Rioblancho	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, too clayey.
227*:				
Rioblancho	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, too clayey.
Urban land.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
228, 229 Rocklin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, area reclaim, too clayey.
230 Ryde	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus.
231 Ryde	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
232 Ryde	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
233*:				
Ryde	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus.
Peltier	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
234, 235 Sailboat	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
236, 237, 238, 239, 240 San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
241*:				
San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
San Joaquin, thick surface	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
242*:				
San Joaquin	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan.
Urban land.				
243 Scribner	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
244 Scribner	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
245*:				
Scribner	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
246 Shima	Good	Probable	Improbable: too sandy.	Poor: excess humus.
247 Shinkee	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
248, 249, 250 Stockton	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
251*:				
Stockton	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
252 Stomar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.
253 Stomar	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
254 Timor	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
255 Tinnin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
256 Tokay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
257*:				
Tokay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
258 Trahern	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
259 Tujunga	Good	Probable	Probable	Poor: too sandy, small stones.
260*. Urban land				
261 Valdez	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
262*:				
Vaquero	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Carbona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
263, 264 Venice	Poor: low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
265 Veritas	Fair: cemented pan, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
266, 267 Veritas	Fair: cemented pan, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
268, 269 Vernalis	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
270 Vignolo	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, thin layer.
271 Vignolo	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Fair: cemented pan, too clayey, thin layer.
272 Vina	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
273 Webile	Fair: thin layer.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus.
274 Willows	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
275*, 276*:				
Wisflat	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Arburua	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
San Timoteo	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
277. Xerofluvents				
278*:				
Xerofluvents.				
Xerorthents.				
279, 280 Yellowlark	Fair: cemented pan, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
281 Zacharias	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
282, 283 Zacharias	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
101 Acampo	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Erodes easily, soil blowing.	Erodes easily.
102 Alamo	Moderate: cemented pan.	Severe: wetness.	Percs slowly, cemented pan.	Wetness, slow intake, percs slowly.	Cemented pan, wetness, percs slowly.	Wetness, cemented pan, percs slowly.
103*, 104*:						
Alo	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Vaquero	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
105*:						
Amador	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lithic Xerorthents.						
106 Archerdale	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
107 Archerdale	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
108. Arents						
109 Bisgani	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
110 Boggiano	Moderate: seepage, cemented pan.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
111 Bruella	Slight	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
112 Bruella	Slight	Slight	Deep to water	Percs slowly	Favorable	Favorable.
113 Calla	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
114*, 115*:						
Calla	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
114*, 115*:						
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
116*:						
Calla	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Pleito	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
117 Capay	Slight	Slight	Deep to water	Percs slowly	Percs slowly	Percs slowly.
118 Capay	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
119 Capay	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly	Percs slowly.
120 Capay	Slight	Severe: excess sodium.	Deep to water	Slow intake, percs slowly, excess sodium.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
121 Capay	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
122*:						
Capay	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Urban land.						
123 Carbona	Moderate: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Favorable	Percs slowly.
124*, 125*:						
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
Orognen	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
126*:						
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, percs slowly.	Slope	Slope, percs slowly.
Carbona, bedrock substratum	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Percs slowly, slope.	Slope	Slope, percs slowly.
127 Chuloak	Severe: seepage.	Severe: thin layer.	Deep to water	Soil blowing	Soil blowing	Favorable.
128 Cogna	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
129 Cogna	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
130 Columbia	Severe: seepage.	Severe: piping.	Deep to water	Droughty	Favorable	Droughty.
131, 132 Columbia	Severe: seepage.	Severe: piping.	Deep to water	Droughty, flooding.	Favorable	Droughty.
133 Columbia	Severe: seepage.	Moderate: hard to pack, wetness.	Deep to water	Droughty, percs slowly.	Percs slowly	Droughty.
134 Cometa	Moderate: slope.	Severe: piping.	Deep to water	Droughty, percs slowly, slope.	Percs slowly	Rooting depth.
135*:						
Corning	Moderate: seepage, slope.	Slight	Deep to water	Slope, droughty, percs slowly.	Percs slowly	Droughty, percs slowly.
Redding	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan	Droughty, cemented pan.
136*:						
Corning	Severe: slope.	Slight	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
Redding	Severe: slope.	Severe: thin layer.	Deep to water	Slope, large stones, droughty.	Slope, large stones, cemented pan.	Large stones, slope, droughty.
137 Cortina	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
138 Cosumnes	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
139 Cosumnes	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily, flooding.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
140 Coyotecreek	Slight	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
141, 142 Delhi	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
143*:						
Delhi	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.						
144, 145, 146 Dello	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
147 Dello	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
148 Dello	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty	Too sandy	Droughty.
149 Devries	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
150*, 151*. Dumps						
152 Egbert	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly	Soil blowing, percs slowly.	Percs slowly.
153 Egbert	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
154 Egbert	Severe: seepage.	Severe: seepage, piping.	Deep to water	Percs slowly	Too sandy	Percs slowly.
155*:						
Egbert	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
Urban land.						
156 El Solyo	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
157 Exeter	Severe: seepage.	Severe: thin layer.	Deep to water	Cemented pan	Cemented pan	Cemented pan.
158 Finrod	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
159. Fluvaquents						
160 Galt	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
161 Galt	Moderate: cemented pan, slope.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
162*:						
Galt	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
Urban land.						

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
163*:						
Gonzaga	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
164*, 165*:						
Gonzaga	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Franciscan	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
166, 167 Grangeville	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Too sandy	Favorable.
168 Guard	Slight	Moderate: piping, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.	Percs slowly.
169 Guard	Slight	Moderate: piping.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
170 Hicksville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Flooding	Favorable	Favorable.
171 Hicksville	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, flooding.	Favorable	Favorable.
172 Hicksville	Slight	Moderate: thin layer.	Deep to water	Flooding	Favorable	Favorable.
173, 174 Hollenbeck	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
175 Honcut	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
176*:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Vallecitos	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Gonzaga	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
177*, 178*:						
Honker	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Vallecitos	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Honker, eroded	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
179 Itano	Slight	Severe: piping.	Deep to water	Erodes easily, too acid.	Erodes easily	Erodes easily.
180 Jacktone	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
181*:						
Jacktone	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
Urban land.						
182 Jahant	Moderate: seepage, cemented pan.	Severe: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
183 Jahant	Moderate: seepage, cemented pan, slope.	Severe: piping.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
184 Kaseberg	Severe: cemented pan, slope.	Severe: piping.	Deep to water	Slope, droughty, fast intake.	Slope, cemented pan, percs slowly.	Slope, droughty, cemented pan.
185, 186 Kaseberg	Severe: depth to rock, cemented pan, slope.	Severe: depth to rock, piping.	Deep to water	Slope, depth to rock, cemented pan.	Slope, depth to rock, cemented pan.	Slope, erodes easily, depth to rock.
187*:						
Keyes	Severe: depth to rock, cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, droughty, depth to rock.
Bellota	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, droughty, depth to rock.
188*:						
Keyes	Severe: depth to rock, cemented pan.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Depth to rock, cemented pan.	Droughty, depth to rock.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
188*:						
Redding	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan	Droughty, cemented pan.
189 Kingdon	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Erodes easily, soil blowing.	Erodes easily.
190 Kingile	Slight	Moderate: piping, wetness.	Deep to water	Soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
191*:						
Kingile	Slight	Moderate: piping, wetness.	Deep to water	Soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
Ryde	Moderate: seepage.	Severe: excess humus.	Deep to water	Favorable	Favorable	Favorable.
192*: Lithic Xerorthents.						
Toomes	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
193 Madera	Moderate: cemented pan.	Severe: piping, thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan, erodes easily.	Erodes easily, droughty.
194 Madera	Moderate: cemented pan, slope.	Severe: piping, thin layer.	Deep to water	Slope, percs slowly.	Cemented pan, erodes easily.	Erodes easily.
195*:						
Madera	Moderate: cemented pan.	Severe: piping, thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan, erodes easily.	Erodes easily, droughty.
Alamo	Moderate: cemented pan.	Severe: thin layer, wetness.	Percs slowly, cemented pan.	Wetness, percs slowly, cemented pan.	Cemented pan, wetness, percs slowly.	Wetness, cemented pan, percs slowly.
196 Manteca	Moderate: seepage, cemented pan.	Severe: piping.	Deep to water	Soil blowing, cemented pan.	Cemented pan, soil blowing.	Cemented pan.
197 Merritt	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
198 Merritt	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
199 Montpellier	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Slope	Slope.
200*:						
Montpellier	Moderate: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Favorable	Favorable.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
200*:						
Cometa	Moderate: slope.	Severe: piping.	Deep to water	Droughty, percs slowly, slope.	Percs slowly	Rooting depth.
201 Nord	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
202 Pardee	Severe: depth to rock.	Severe: thin layer.	Deep to water	Droughty	Large stones, depth to rock.	Large stones, droughty.
203 Pardee	Severe: depth to rock, slope.	Severe: thin layer, large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
204 Peltier	Moderate: seepage.	Severe: excess humus.	Deep to water	Percs slowly, soil blowing.	Soil blowing	Percs slowly.
205 Peltier	Severe: seepage.	Severe: excess humus.	Deep to water	Percs slowly, soil blowing.	Soil blowing	Percs slowly.
206, 207 Pentz	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
208 Pentz	Severe: depth to rock.	Severe: thin layer.	Deep to water	Slope, large stones, droughty.	Large stones, depth to rock.	Large stones, droughty.
209*:						
Pentz	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Bellota	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, cemented pan.	Slope, droughty, depth to rock.
210*:						
Pentz	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, droughty.	Slope, depth to rock.	Slope, droughty.
Redding	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, cemented pan.	Slope, droughty, cemented pan.
211 Pescadero	Slight	Severe: excess sodium.	Deep to water	Droughty, percs slowly.	Percs slowly	Excess salt, excess sodium.
212 Peters	Severe: depth to rock.	Severe: thin layer.	Deep to water	Slope, slow intake, percs slowly.	Slope, slow intake, percs slowly.	Depth to rock.
213 Piper	Severe: seepage.	Severe: piping.	Deep to water	Droughty	Soil blowing	Droughty.
214*. Pits						

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
215 Pleito	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
216 Ramoth	Severe: seepage.	Moderate: thin layer.	Deep to water	Slope	Favorable	Favorable.
217, 218 Ramoth	Severe: seepage, slope.	Moderate: thin layer.	Deep to water	Slope	Slope	Slope.
219 Redding	Moderate: cemented pan.	Severe: piping.	Deep to water	Percs slowly, cemented pan.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
220 Redding	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan	Droughty, cemented pan.
221 Redding	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, cemented pan.	Slope, droughty, cemented pan.
222 Reiff	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Too sandy	Favorable.
223 Reiff	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily, too sandy.	Erodes easily.
224, 225 Rindge	Severe: seepage.	Severe: excess humus.	Deep to water	Soil blowing	Soil blowing	Favorable.
226 Rioblancho	Moderate: seepage, cemented pan.	Severe: piping.	Deep to water	Cemented pan	Cemented pan, erodes easily.	Erodes easily, cemented pan.
227*:						
Rioblancho	Moderate: seepage, cemented pan.	Severe: piping.	Deep to water	Cemented pan	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Urban land.						
228 Rocklin	Moderate: seepage, cemented pan, slope.	Severe: thin layer, piping.	Deep to water	Slope, cemented pan, erodes easily.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
229 Rocklin	Moderate: seepage, cemented pan.	Severe: thin layer, piping.	Deep to water	Cemented pan, erodes easily.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
230 Ryde	Moderate: seepage.	Severe: excess humus.	Deep to water	Favorable	Favorable	Favorable.
231 Ryde	Severe: seepage.	Severe: excess humus.	Deep to water	Favorable	Favorable	Favorable.
232 Ryde	Moderate: seepage.	Severe: excess humus.	Deep to water	Favorable	Favorable	Favorable.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
233*:						
Ryde	Moderate: seepage.	Severe: excess humus.	Deep to water	Favorable	Favorable	Favorable.
Peltier	Moderate: seepage.	Severe: excess humus.	Deep to water	Percs slowly, soil blowing.	Soil blowing	Percs slowly.
234 Sailboat	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
235 Sailboat	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
236 San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Droughty, percs slowly.	Cemented pan	Cemented pan.
237 San Joaquin	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Cemented pan	Cemented pan.
238 San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily, cemented pan.
239 San Joaquin	Moderate: cemented pan, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
240 San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily, cemented pan.
241*:						
San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily, cemented pan.
San Joaquin, thick surface	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily, cemented pan.
242*:						
San Joaquin	Moderate: cemented pan.	Severe: thin layer.	Deep to water	Percs slowly	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Urban land.						
243 Scribner	Slight	Moderate: piping, wetness.	Deep to water	Favorable	Favorable	Favorable.
244 Scribner	Severe: seepage.	Moderate: thin layer, piping, wetness.	Deep to water	Favorable	Favorable	Favorable.
245*:						
Scribner	Slight	Moderate: piping, wetness.	Deep to water	Favorable	Favorable	Favorable.
Urban land.						

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
246---------- Shima	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
247---------- Shinkee	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
248---------- Stockton	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
249---------- Stockton	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
250---------- Stockton	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
251*:						
Stockton---------	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
Urban land.						
252, 253---------- Stomar	Slight---------	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
254---------- Timor	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
255---------- Tinnin	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
256---------- Tokay	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
257*:						
Tokay----------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
Urban land.						
258---------- Trahern	Moderate: cemented pan.	Slight---------	Deep to water	Percs slowly, cemented pan, erodes easily.	Cemented pan, erodes easily.	Erodes easily, cemented pan, percs slowly.
259---------- Tujunga	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
260*. Urban land						
261---------- Valdez	Severe: seepage.	Severe: thin layer.	Deep to water	Erodes easily	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
262*:						
Vaquero	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Carbona	Severe: slope.	Moderate: piping.	Deep to water	Slope, slow intake, percs slowly.	Slope	Slope, percs slowly.
263, 264 Venice	Severe: seepage.	Severe: excess humus.	Deep to water	Soil blowing	Soil blowing	Favorable.
265 Veritas	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
266 Veritas	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Favorable	Favorable.
267 Veritas	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
268, 269 Vernalis	Slight	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
270, 271 Vignolo	Moderate: cemented pan.	Severe: piping.	Deep to water	Cemented pan, erodes easily.	Cemented pan, erodes easily.	Erodes easily, cemented pan.
272 Vina	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
273 Webile	Severe: seepage.	Severe: excess humus.	Deep to water	Soil blowing, percs slowly.	Soil blowing	Favorable.
274 Willows	Slight	Severe: hard to pack, excess sodium, excess salt.	Deep to water	Droughty, slow intake, percs slowly.	Percs slowly	Excess salt, excess sodium, droughty.
275*, 276*:						
Wisflat	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
Arburua	Severe: slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, erodes easily.
279 Yellowlark	Moderate: seepage, cemented pan.	Moderate: thin layer, piping.	Deep to water	Percs slowly	Favorable	Favorable.
280 Yellowlark	Moderate: seepage, cemented pan, slope.	Moderate: thin layer, piping.	Deep to water	Slope, percs slowly.	Favorable	Favorable.
281 Zacharias	Slight	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
282 Zacharias	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
283----------Zacharias	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
101---------- Acampo	0-19	Sandy loam--------	SM	A-4	0	100	90-100	65-80	35-50	20-30	NP-5
	19-47	Sandy loam, fine sandy loam, coarse sandy loam.	SM	A-4	0	100	90-100	50-75	35-50	20-30	NP-5
	47-49	Indurated--------	---	---	---	---	---	---	---	---	---
	49-60	Cemented---------	---	---	---	---	---	---	---	---	---
102---------- Alamo	0-12	Clay----------	CH	A-7	0	100	100	80-95	70-85	50-65	25-35
	12-33	Clay----------	CH	A-7	0	100	100	80-95	70-85	50-65	25-35
	33-60	Indurated--------	---	---	---	---	---	---	---	---	---
103*, 104*:											
Alo----------	0-16	Clay----------	CH	A-7	0	100	95-100	95-100	85-95	50-65	25-40
	16-34	Silty clay, clay, clay loam.	CL, CH	A-7	0	90-95	90-100	90-95	80-90	45-65	20-40
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Vaquero---------	0-21	Clay----------	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	21-25	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
105*:											
Amador----------	0-4	Loam----------	ML	A-4	0	85-100	75-100	70-85	50-60	25-35	NP-10
	4-15	Loam, sandy loam	ML, SM	A-4	0	85-100	75-100	50-85	40-60	20-35	NP-10
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
Lithic Xerorthents.											
106---------- Archerdale	0-18	Very fine sandy loam.	ML	A-4	0	100	95-100	80-95	50-65	---	NP
	18-38	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	80-90	35-40	15-25
	38-60	Clay loam, clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
107---------- Archerdale	0-8	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	80-90	35-50	15-25
	8-35	Clay loam, clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	35-60	Clay loam, clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
108. Arents											
109---------- Bisgani	0-11	Loamy coarse sand	SM	A-1, A-2	0	100	95-100	45-70	15-25	---	NP
	11-60	Coarse sand, loamy sand, loamy coarse sand.	SM, SP-SM	A-1, A-2, A-3	0	100	95-100	40-70	5-25	---	NP
110---------- Boggiano	0-23	Clay loam--------	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	23-48	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	25-40	5-15
	48-60	Cemented---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
111---------- Bruella	0-18	Sandy loam-------	SC-SM, SM	A-4	0	95-100	95-100	60-70	35-50	20-30	NP-10
	18-31	Sandy clay loam, sandy loam.	SC	A-6	0	95-100	95-100	65-80	35-50	30-40	10-15
	31-67	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	65-80	35-60	30-40	10-20
112---------- Bruella	0-8	Sandy loam-------	SC-SM, SM	A-4	0	95-100	95-100	60-70	35-50	20-30	NP-10
	8-42	Sandy loam, sandy clay loam.	SC	A-6	0	95-100	95-100	65-80	35-50	30-40	10-15
	42-60	Sandy clay loam, sandy clay.	SC	A-6, A-7	0	95-100	95-100	70-85	35-50	35-50	15-25
113---------- Calla	0-11	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	11-29	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
	29-60	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
114*, 115*:											
Calla----------	0-18	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	18-30	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
	30-60	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
Carbona---------	0-6	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	6-25	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	25-36	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	36-62	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
116*:											
Calla----------	0-11	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	11-29	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
	29-60	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
Pleito----------	0-16	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	16-60	Clay loam--------	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
117---------- Capay	0-6	Clay loam--------	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
	6-20	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Silty clay loam, clay loam.	CL	A-7	0	100	100	95-100	75-95	40-50	15-25
118, 119--------- Capay	0-20	Clay----------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
120---------- Capay	0-20	Clay----------	CH, CL	A-7	0	100	100	95-100	85-100	40-60	20-35
	20-44	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-100	40-60	20-35
	44-60	Silty clay loam, clay loam.	CL	A-7	0	100	100	95-100	75-95	40-50	15-25
121---------- Capay	0-20	Clay----------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-44	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	44-60	Silty clay loam, clay loam.	CL	A-7	0	100	100	95-100	75-95	40-50	15-25
122*:											
Capay----------	0-20	Clay----------	CH, CL	A-7	0	100	100	95-100	85-95	40-60	20-35
	20-60	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
Urban land.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
123---------- Carbona	0-6	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	6-25	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	25-36	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	36-62	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
124*, 125*:											
Carbona---------	0-6	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	6-25	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	25-36	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	36-62	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
Orognen---------	0-11	Gravelly clay loam.	GC, SC, CL	A-6	0	60-80	50-75	50-70	35-60	30-40	15-20
	11-30	Gravelly clay loam, gravelly clay.	CL, CH	A-7	0	55-80	50-75	45-70	40-65	40-55	20-35
	30-60	Clay loam, clay	CL, CH	A-7	0	85-95	75-90	70-85	65-80	40-60	20-40
126*:											
Carbona---------	0-6	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	6-25	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	25-36	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	36-62	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
Carbona, bedrock substratum-----	0-19	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	60-80	35-45	15-25
	19-41	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	41-57	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-25
	57	Weathered bedrock	---	---	---	---	---	---	---	---	---
127---------- Chuloak	0-19	Coarse sandy loam	SM	A-2, A-4	0	85-100	75-100	55-75	25-45	20-30	NP-5
	19-44	Sandy clay loam, sandy loam.	SC-SM, SC	A-4, A-6	0	85-100	75-100	65-85	35-50	25-35	5-15
	44-55	Fine sandy loam	SM	A-4	0	95-100	85-100	65-85	35-50	20-30	NP-5
	55-64	Loamy coarse sand	SM	A-2, A-1	0	90-100	80-100	40-60	15-25	---	NP
128---------- Cogna	0-18	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	20-30	NP-5
	18-38	Loam----------	CL-ML, ML	A-4	0	100	100	90-100	85-90	25-35	5-10
	38-60	Loam, clay loam, silt loam.	CL-ML, ML, CL	A-4, A-6	0	100	100	90-100	85-95	25-40	5-15
129---------- Cogna	0-25	Loam----------	CL-ML, ML	A-4	0	100	100	90-100	85-90	25-35	5-10
	25-64	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	25-40	5-15
130---------- Columbia	0-12	Fine sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	12-60	Stratified sand to silt loam.	SM	A-4	0	100	95-100	60-90	35-50	20-25	NP-5
131---------- Columbia	0-12	Fine sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	12-60	Fine sandy loam, sandy loam.	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
132---------- Columbia	0-12	Fine sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	12-60	Stratified sand to silt loam.	SM	A-4	0	100	95-100	60-90	35-50	20-25	NP-5
133---------- Columbia	0-20	Fine sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	20-48	Fine sandy loam, sandy loam.	SM, SC-SM	A-2, A-4	0	100	95-100	65-90	30-50	20-30	NP-10
	48-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
134---------- Cometa	0-22	Sandy loam-------	SM, SC-SM	A-2, A-4	0	95-100	85-100	50-85	25-50	20-30	NP-10
	22-36	Sandy clay, clay, clay loam.	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	36-60	Stratified sandy loam to sandy clay loam.	SM, SC-SM, SC	A-2, A-4, A-6	0	95-100	85-100	50-65	25-50	20-35	NP-15
135*:											
Corning---------	0-21	Gravelly loam----	SM, SC-SM	A-4	0-5	75-90	60-75	60-70	40-50	25-35	5-10
	21-36	Clay----------	CL, CH	A-7	0	95-100	95-100	95-100	90-100	50-65	35-45
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	65-80	25-40	5-15
Redding---------	0-4	Gravelly loam----	SC, SC-SM, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	4-15	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-80	50-75	45-70	35-55	25-40	5-15
	15-25	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	90-100	70-95	40-60	15-30
	25-60	Indurated--------	---	---	---	---	---	---	---	---	---
136*:											
Corning---------	0-12	Cobbly loam------	SC, SC-SM	A-4	15-30	70-95	70-90	55-75	35-50	25-35	5-10
	12-25	Clay----------	CL, CH	A-7	0	95-100	95-100	95-100	90-100	50-65	35-45
	25-67	Loam, clay loam	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	65-80	25-40	5-15
Redding---------	0-4	Cobbly loam------	SC, SC-SM	A-4, A-6	15-30	75-95	70-90	55-75	35-50	20-35	5-15
	4-15	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-80	50-75	45-70	35-55	25-40	5-15
	15-25	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	90-100	70-95	40-60	15-30
	25-60	Indurated--------	---	---	---	---	---	---	---	---	---
137---------- Cortina	0-18	Gravelly sandy loam.	SM, GM	A-2, A-4	0-10	55-80	50-75	35-60	25-40	20-30	NP-5
	18-60	Stratified very gravelly loamy sand to very gravelly loam.	GP-GM, GM	A-1, A-2	0-10	30-60	25-55	15-40	5-35	20-30	NP-5
138, 139--------- Cosumnes	0-7	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-90	30-45	10-20
	7-21	Silty clay loam, clay.	CL, CH	A-6, A-7	0	100	95-100	90-100	70-95	35-60	15-30
	21-47	Clay loam, clay	CH, CL	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	47-63	Clay loam, clay	CH, CL	A-7	0	100	95-100	90-100	70-95	40-55	20-30
140---------- Coyotecreek	0-23	Silt loam--------	CL-ML, ML	A-4	0	100	100	90-100	85-90	25-35	5-10
	23-36	Loam, silt loam	CL-ML, ML	A-4	0	100	100	95-100	85-90	25-35	5-10
	36-69	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-100	50-85	25-35	5-15
141---------- Delhi	0-10	Fine sand--------	SP-SM, SM	A-1, A-3, A-2	0	100	100	40-70	5-25	---	NP
	10-60	Sand, loamy sand, fine sand.	SP-SM, SM	A-1, A-2, A-3	0	100	100	40-80	5-35	---	NP
142---------- Delhi	0-16	Loamy sand-------	SM	A-2	0	100	100	50-80	15-35	---	NP
	16-26	Loamy sand, loamy fine sand.	SM	A-2	0	100	100	50-80	15-35	---	NP
	26-60	Sand, loamy sand, fine sand.	SP-SM, SM	A-1, A-2, A-3	0	100	100	40-80	5-35	---	NP

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
143*:											
Delhi	0-16	Loamy sand	SM	A-2	0	100	100	50-80	15-35	---	NP
	16-26	Loamy sand, loamy fine sand.	SM	A-2	0	100	100	50-80	15-35	---	NP
	26-60	Sand, loamy sand, fine sand.	SP-SM, SM	A-1, A-2, A-3	0	100	100	40-80	5-35	---	NP
Urban land.											
144 Dello	0-20	Sand	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-20	---	NP
	20-60	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-20	---	NP
145 Dello	0-7	Loamy sand	SM	A-2	0	100	100	60-80	15-35	---	NP
	7-60	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-20	---	NP
146 Dello	0-10	Loamy sand	SM	A-2	0	100	100	60-80	15-35	---	NP
	10-60	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-20	---	NP
147 Dello	0-16	Sandy loam	SM	A-4	0	100	95-100	60-80	35-50	20-30	NP-5
	16-43	Sand, loamy sand	SP-SM, SM	A-2, A-3	0	100	95-100	50-70	5-30	---	NP
	43-60	Silty clay, clay loam.	CH, CL	A-7	0	100	95-100	90-100	85-95	40-60	20-35
148 Dello	0-12	Clay loam	CL	A-6	0	100	95-100	85-100	70-80	30-40	10-20
	12-60	Sand, fine sand	SM, SP-SM	A-2, A-3	0	100	95-100	50-70	5-20	---	NP
149 Devries	0-13	Sandy loam	SM	A-4	0	100	95-100	60-70	35-50	20-30	NP-5
	13-28	Sandy loam, fine sandy loam.	SM	A-4	0	100	95-100	60-85	35-50	20-30	NP-5
	28-80	Indurated	---	---	---	---	---	---	---	---	---
150*, 151*. Dumps											
152 Egbert	0-8	Mucky clay loam	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-25
	8-19	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
	19-60	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	---
153 Egbert	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-20
	8-19	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
	19-60	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	---
154 Egbert	0-14	Silty clay loam	CL, ML	A-7, A-6	0	100	100	90-100	70-95	35-50	15-20
	14-40	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-35
	40-60	Stratified loamy fine sand to sand.	SM	A-2	0	100	100	50-80	15-35	---	NP
155*:											
Egbert	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-20
	6-31	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-35
	31-60	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	---
Urban land.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
156---------- El Solyo	0-10	Clay loam--------	ML, CL	A-6, A-7	0	100	100	95-100	75-90	35-45	10-20
	10-60	Silty clay loam, silty clay.	ML, MH, CL, CH	A-7	0	100	100	95-100	90-95	40-55	15-25
157---------- Exeter	0-26	Sandy loam-------	SM, SC-SM	A-4	0	95-100	85-100	50-70	35-50	15-25	NP-10
	26-33	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	85-100	70-90	35-65	25-40	10-20
	33-60	Indurated--------	---	---	---	---	---	---	---	---	---
158---------- Finrod	0-8	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	80-90	35-50	15-25
	8-33	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	33-48	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	48-60	Cemented---------	---	---	---	---	---	---	---	---	---
159. Fluvaquents											
160---------- Galt	0-25	Clay----------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	25-34	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	34-60	Cemented---------	---	---	---	---	---	---	---	---	---
161---------- Galt	0-20	Clay----------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	20-34	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	34-60	Cemented---------	---	---	---	---	---	---	---	---	---
162*:											
Galt----------	0-25	Clay----------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	25-34	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	34-60	Cemented---------	---	---	---	---	---	---	---	---	---
Urban land.											
163*:											
Gonzaga---------	0-5	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	5-10	Loam, clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0-5	80-100	75-100	70-85	40-70	25-35	5-15
	10-29	Clay, clay loam	CL, CH	A-7	0-5	80-100	75-100	70-90	50-85	40-60	20-35
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Franciscan------	0-13	Loam----------	CL-ML, ML	A-4	0	90-100	85-100	70-90	50-65	25-35	5-10
	13-36	Clay loam--------	CL, SC	A-6	0-5	80-90	75-90	70-85	35-60	30-40	10-20
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
164*, 165*:											
Gonzaga---------	0-5	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	5-10	Loam, clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0-5	80-100	75-100	70-85	40-70	25-35	5-15
	10-29	Clay, clay loam	CL, CH	A-7	0-5	80-100	75-100	70-90	50-85	40-60	20-35
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Honker----------	0-5	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	5-33	Gravelly clay loam, gravelly clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
164*, 165*:											
Franciscan------	0-13	Loam----------	CL-ML, ML	A-4	0	90-100	85-100	70-90	50-65	25-35	5-10
	13-36	Clay loam--------	CL, SC	A-6	0-5	80-90	75-90	70-85	35-60	30-40	10-20
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
166---------- Grangeville	0-20	Fine sandy loam	SM	A-4	0	100	95-100	60-85	35-50	20-30	NP-5
	20-60	Stratified loamy sand to silt loam.	SM	A-2, A-4	0	100	95-100	60-95	25-50	15-25	NP-5
167---------- Grangeville	0-16	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-75	30-40	10-20
	16-32	Sandy loam, fine sandy loam, loam.	SM, ML	A-4	0	100	95-100	60-95	35-60	20-35	NP-10
	32-60	Stratified loamy sand to silt loam.	SM	A-2, A-4	0	100	95-100	60-95	25-50	15-25	NP-5
168, 169--------- Guard	0-15	Clay loam--------	CL	A-6	0	100	95-100	80-90	65-70	35-40	15-20
	15-72	Clay loam, sandy clay loam.	SC, CL	A-6	0	100	85-95	75-90	35-60	30-40	10-20
170---------- Hicksville	0-15	Loam----------	CL-ML, ML	A-4	0	90-100	75-100	60-90	50-60	25-35	5-10
	15-36	Clay loam, sandy clay loam.	CL, SC	A-6	0	85-95	75-95	65-95	45-75	30-40	10-20
	36-60	Sandy clay loam, sandy loam.	SC-SM, SM	A-4	0	85-95	75-95	50-85	35-50	25-35	5-10
171---------- Hicksville	0-8	Loam----------	ML, CL-ML	A-4	0	90-100	75-100	60-90	50-60	25-35	5-10
	8-26	Clay loam, sandy clay loam.	CL, SC	A-6	0	85-95	75-95	65-95	45-75	30-40	10-20
	26-44	Stratified very gravelly loamy sand to clay loam.	GM-GC, GM	A-1, A-2	0-5	40-65	25-50	15-40	5-30	20-30	NP-10
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
172---------- Hicksville	0-13	Gravelly loam----	SC-SM, SM, GM-GC, GM	A-4	0	60-85	50-75	45-65	35-50	25-35	5-10
	13-36	Gravelly clay loam, gravelly sandy clay loam.	SC, GC	A-2, A-6	0	60-85	50-75	45-70	25-50	30-40	10-20
	36-60	Stratified very gravelly loamy sand to clay loam.	GM-GC, GM	A-1, A-2	0-5	40-65	25-50	15-40	5-30	20-30	NP-10
173---------- Hollenbeck	0-10	Silty clay-------	CH, CL	A-7	0	100	100	90-100	85-95	40-60	20-35
	10-37	Clay, silty clay	CH, CL	A-7	0	100	100	90-100	85-95	40-60	20-35
	37-42	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	85-100	75-90	35-50	15-25
	42-60	Cemented---------	---	---	---	---	---	---	---	---	---
174---------- Hollenbeck	0-32	Clay----------	CH, CL	A-7	0	100	100	90-100	85-95	40-60	20-35
	32-55	Clay, silty clay	CH, CL	A-7	0	100	100	90-100	85-95	40-60	20-35
	55-60	Cemented---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
175---------- Honcut	0-21	Sandy loam-------	SM	A-4	0	85-100	75-100	45-70	35-50	20-30	NP-5
	21-60	Coarse sandy loam, sandy loam.	SM	A-4	0	85-100	75-100	45-70	35-50	20-30	NP-5
176*:											
Honker----------	0-5	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	5-33	Gravelly clay loam, gravelly clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Vallecitos------	0-4	Gravelly loam----	SC, SC-SM	A-4, A-6	0-5	70-80	60-75	55-70	35-50	25-35	5-15
	4-20	Gravelly clay loam, gravelly clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	40-60	40-60	20-35
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gonzaga---------	0-3	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	3-7	Loam, clay loam	CL-ML, CL, SC-SM, SC	A-6, A-4	0-5	80-100	75-100	70-85	40-70	25-35	5-15
	7-34	Clay, clay loam	CL, CH	A-7	0-5	80-100	75-100	70-90	50-85	40-60	20-35
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
177*, 178*:											
Honker----------	0-5	Loam----------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-95	50-65	25-35	5-15
	5-33	Gravelly clay loam, gravelly clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Vallecitos------	0-4	Gravelly loam----	SC, SC-SM	A-4, A-6	0-5	70-80	60-75	55-70	35-50	25-35	5-15
	4-20	Gravelly clay loam, gravelly clay.	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	40-60	40-60	20-35
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Honker, eroded--	0-7	Gravelly loam----	SC-SM, SC, GM-GC, GC	A-4, A-6	0-10	60-80	55-75	50-70	35-50	25-35	5-15
	7-18	Gravelly clay loam.	SC, GC	A-2, A-6	0-5	55-80	50-75	45-70	25-60	30-40	10-20
	18-31	Gravelly clay----	CL, CH, SC, GC	A-7	0-5	60-80	55-75	50-70	35-60	40-60	20-35
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
179---------- Itano	0-15	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-45	10-20
	15-34	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	80-95	30-45	5-20
	34-60	Stratified very fine sandy loam to silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	85-100	75-90	30-45	5-20

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
180---------- Jacktone	0-22	Clay----------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	22-34	Clay loam, clay, silty clay.	CL, CH	A-7	0	100	100	85-100	80-95	40-60	20-35
	34-37	Indurated--------	---	---	---	---	---	---	---	---	---
	37-46	Loam, clay loam	CL-ML, CL	A-4, A-6	0	80-100	75-100	60-85	50-75	25-40	5-15
	46-60	Cemented---------	---	---	---	---	---	---	---	---	---
181*:											
Jacktone--------	0-22	Clay----------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	22-34	Clay loam, clay, silty clay.	CL, CH	A-7	0	100	100	85-100	80-95	40-60	20-35
	34-37	Indurated--------	---	---	---	---	---	---	---	---	---
	37-46	Loam, clay loam	CL-ML, CL	A-4, A-6	0	80-100	75-100	60-85	50-75	25-40	5-15
	46-60	Cemented---------	---	---	---	---	---	---	---	---	---
Urban land.											
182, 183--------- Jahant	0-5	Loam----------	ML	A-4	0	85-100	80-100	60-95	50-65	25-35	NP-10
	5-31	Loam, clay loam	CL-ML, CL	A-4, A-6	0	85-100	80-100	65-95	50-70	25-40	5-15
	31-49	Clay, clay loam	CH, CL	A-7	0	90-100	85-100	80-100	75-95	45-65	25-40
	49-53	Cemented---------	---	---	---	---	---	---	---	---	---
	53-60	Indurated--------	---	---	---	---	---	---	---	---	---
184---------- Kaseberg	0-10	Loamy sand-------	SM	A-1, A-2	0	80-100	75-100	40-70	15-30	---	NP
	10-16	Gravelly loamy sand, loamy sand.	SM	A-1, A-2	0-5	70-100	60-90	35-60	10-25	---	NP
	16-17	Indurated--------	---	---	---	---	---	---	---	---	---
	17-60	Stratified sandy loam to sandy clay loam.	SM, SC-SM, SC	A-2, A-4, A-6	0	95-100	85-100	50-65	25-50	20-35	NP-15
185---------- Kaseberg	0-17	Fine sandy loam	SM, ML	A-4	0	100	95-100	85-100	40-55	20-30	NP-5
	17-20	Indurated--------	---	---	---	---	---	---	---	---	---
	20	Weathered bedrock	---	---	---	---	---	---	---	---	---
186---------- Kaseberg	0-16	Loam----------	ML	A-4	0	100	95-100	95-100	60-85	25-35	NP-5
	16-17	Indurated--------	---	---	---	---	---	---	---	---	---
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
187*:											
Keyes----------	0-12	Gravelly loam----	GM-GC, GM, SC-SM, SM	A-4	0-10	55-80	50-75	40-70	35-50	25-35	5-10
	12-19	Gravelly clay, gravelly clay loam.	GC, CL, CH	A-7	0-10	55-80	50-75	50-70	40-65	40-65	20-35
	19-34	Indurated--------	---	---	---	---	---	---	---	---	---
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Bellota---------	0-9	Sandy loam-------	SC-SM, SM	A-4	0	85-100	75-100	50-70	35-50	20-30	NP-10
	9-23	Gravelly sandy clay loam, gravelly clay loam, cobbly sandy clay loam.	SC	A-6, A-2	5-25	70-80	65-75	60-70	25-45	30-40	10-20
	23-35	Clay----------	CL, CH	A-7	0	95-100	95-100	90-95	85-90	40-60	20-35
	35-37	Indurated, cemented.	---	---	---	---	---	---	---	---	---
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
188*:											
Keyes	0-6	Gravelly loam	GM-GC, GM, SC-SM, SM	A-4	0-10	55-80	50-75	40-70	35-50	25-35	5-10
	6-13	Gravelly clay, gravelly clay loam.	GC, CL, CH	A-7	0-10	55-80	50-75	50-70	40-65	40-65	20-35
	13-34	Indurated	---	---	---	---	---	---	---	---	---
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Redding	0-16	Gravelly loam	SC, SC-SM, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	16-22	Clay, clay loam	CH, CL	A-7	0	80-95	75-90	70-90	60-75	40-60	15-30
	22-60	Indurated	---	---	---	---	---	---	---	---	---
189 Kingdon	0-5	Fine sandy loam	SM	A-4	0	100	95-100	65-85	35-50	20-30	NP-5
	5-14	Fine sandy loam	SM	A-4	0	100	95-100	65-85	35-50	20-30	NP-5
	14-28	Sandy loam, fine sandy loam.	SM	A-4	0	100	95-100	65-85	35-50	20-30	NP-5
	28-42	Fine sandy loam, loam.	SC-SM, CL-ML	A-4	0	100	95-100	70-85	40-60	25-30	5-10
	42-61	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	100	95-100	50-75	25-50	20-25	NP-5
190 Kingile	0-17	Muck	PT	A-8	---	---	---	---	---	---	---
	17-61	Silty clay loam, clay, silty clay.	ML, CL	A-6, A-7	0	100	100	85-100	75-95	35-45	10-20
191*:											
Kingile	0-17	Muck	PT	A-8	---	---	---	---	---	---	---
	17-61	Silty clay loam, clay, silty clay.	ML, CL	A-6, A-7	0	100	100	85-100	75-95	35-45	10-20
Ryde	0-24	Clay loam	CL, ML	A-7, A-6	0	100	100	95-100	65-85	30-50	10-20
	24-63	Stratified muck to silty clay loam.	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-20
192*: Lithic Xerorthents.											
Toomes	0-15	Loam	ML	A-4	0-5	80-95	75-90	65-85	50-60	25-35	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
193 Madera	0-19	Sandy loam	SM	A-4	0	95-100	95-100	65-85	35-50	20-30	NP-5
	19-23	Sandy clay loam	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	23-29	Clay, clay loam	CL, CH, SC	A-7	0	100	95-100	80-95	40-80	40-60	20-35
	29-60	Indurated	---	---	---	---	---	---	---	---	---
194 Madera	0-10	Loam	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-65	25-35	5-10
	10-30	Clay, clay loam	CL, CH, SC	A-7	0	100	95-100	80-95	40-80	40-60	20-35
	30-60	Indurated	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
195*:											
Madera	0-10	Sandy loam	SM	A-4	0	95-100	95-100	65-85	35-50	20-30	NP-5
	10-20	Clay, clay loam	CL, CH, SC	A-7	0	100	95-100	80-95	40-80	40-60	20-35
	20-60	Indurated	---	---	---	---	---	---	---	---	---
Alamo	0-12	Sandy loam	SM	A-4	0	100	90-100	65-85	35-50	20-30	NP-5
	12-25	Clay	CH	A-7	0	100	100	80-95	70-85	50-65	25-35
	25-34	Clay	CH	A-7	0	100	100	80-95	70-85	50-65	25-35
	34-60	Indurated	---	---	---	---	---	---	---	---	---
196 Manteca	0-11	Fine sandy loam	SM	A-4	0	100	95-100	70-80	35-50	20-30	NP-5
	11-24	Fine sandy loam, loam, sandy loam.	SM, SC-SM	A-4	0	100	95-100	70-80	35-50	20-30	NP-10
	24-35	Indurated	---	---	---	---	---	---	---	---	---
	35-54	Cemented	---	---	---	---	---	---	---	---	---
	54-74	Stratified loamy sand to loam.	SM	A-2, A-4	0	100	95-100	60-80	30-50	20-30	NP-5
197 Merritt	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	17-49	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	10-20
	49-60	Stratified loamy fine sand to silt loam.	SM, ML	A-4	0	100	100	95-100	40-60	---	NP
198 Merritt	0-15	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	15-42	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	10-20
	42-60	Stratified loamy fine sand to silt loam.	SM, ML	A-4	0	100	100	95-100	40-60	---	NP
199 Montpellier	0-18	Sandy loam	SM	A-4	0	95-100	90-100	60-70	35-50	20-30	NP-5
	18-46	Sandy clay loam	SC	A-6	0	95-100	90-100	70-90	35-50	30-40	10-20
	46-54	Coarse sandy loam	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
	54-60	Sandy loam, coarse sandy loam.	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
200*:											
Montpellier	0-20	Coarse sandy loam	SM	A-4	0	95-100	90-100	60-70	35-50	20-30	NP-5
	20-43	Sandy clay loam	SC	A-6	0	95-100	90-100	70-90	35-50	30-40	10-20
	43-55	Coarse sandy loam	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
	55-60	Sandy loam, coarse sandy loam.	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
Cometa	0-22	Sandy loam	SM, SC-SM	A-2, A-4	0	95-100	85-100	50-85	25-50	20-30	NP-10
	22-36	Sandy clay, clay, clay loam.	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	36-60	Stratified sandy loam to sandy clay loam.	SM, SC-SM, SC	A-2, A-4, A-6	0	95-100	85-100	50-65	25-50	20-35	NP-15
201 Nord	0-25	Loam	ML, CL-ML	A-4	0	100	95-100	85-95	50-70	20-30	NP-10
	25-60	Stratified sandy loam to loam.	SM, ML, SC-SM, CL-ML	A-4	0	100	95-100	60-95	35-70	20-30	NP-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symboi	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
202---------- Pardee	0-9	Gravelly loam----	GM, SM, GM-GC, SC-SM	A-4	0-5	55-80	50-75	45-65	35-50	20-30	NP-10
	9-18	Very cobbly loam, very gravelly clay loam, very gravelly loam.	GC, GM-GC	A-6, A-4	15-45	55-65	50-60	45-55	35-50	25-35	5-15
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
203---------- Pardee	0-9	Cobbly loam------	SM, SC-SM	A-4	20-40	80-85	75-85	65-75	45-50	20-30	NP-10
	9-18	Very cobbly loam, very gravelly clay loam, very gravelly loam.	GC, GM-GC	A-6, A-4	15-45	55-65	50-60	45-55	35-50	25-35	5-15
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
204---------- Peltier	0-22	Mucky clay loam	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-25
	22-24	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	70-95	40-60	20-35
	24-45	Mucky clay loam, mucky silty clay loam, mucky clay.	OL, OH	A-8	0	100	100	90-100	70-95	40-60	10-25
	45-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	20-30
205---------- Peltier	0-22	Mucky clay loam	OH, OL	A-8	0	100	100	90-100	70-85	40-60	10-25
	22-24	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	75-95	40-60	20-35
	24-44	Mucky clay loam	OH, OL	A-8	0	100	100	90-100	70-95	40-60	10-25
	44-60	Mucky peat, muck	PT	A-8	---	---	---	---	---	---	---
206, 207--------- Pentz	0-4	Sandy loam-------	SM, SC-SM	A-4	0-5	85-100	75-95	50-75	35-50	20-30	NP-10
	4-15	Sandy loam, loam, fine sandy loam.	SC-SM, SM, CL-ML, ML	A-4	0-5	85-100	75-100	55-85	40-60	25-35	5-10
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
208---------- Pentz	0-8	Cobbly sandy loam	SM	A-4	25-40	80-95	75-90	45-65	35-50	20-30	NP-5
	8-13	Gravelly sandy loam, gravelly loam, cobbly sandy loam.	SM, GM	A-2, A-4	5-15	55-80	50-75	40-70	25-50	20-35	NP-10
	13	Weathered bedrock	---	---	---	---	---	---	---	---	---
209*:											
Pentz----------	0-7	Loam----------	ML, CL-ML	A-4	0-5	85-100	75-95	60-85	50-60	20-30	NP-10
	7-14	Sandy loam, loam, fine sandy loam.	SC-SM, SM, CL-ML, ML	A-4	0-5	85-100	75-100	55-85	40-60	25-35	5-10
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Bellota---------	0-17	Loam----------	CL-ML, ML	A-4	0	85-100	75-100	65-85	50-60	25-35	5-10
	17-21	Gravelly sandy clay loam, gravelly clay loam, cobbly sandy clay loam.	SC	A-6, A-2	5-25	70-80	65-75	60-70	25-45	30-40	10-20
	21-36	Clay----------	CL, CH	A-7	0	95-100	95-100	90-95	85-90	40-60	20-35
	36-37	Indurated, cemented.	---	---	---	---	---	---	---	---	---
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
210*:											
Pentz	0-10	Gravelly sandy loam.	SM, GM	A-2	0-5	55-80	50-75	40-65	25-35	20-30	NP-5
	10-14	Gravelly sandy loam, gravelly loam, cobbly sandy loam.	SM, GM	A-2, A-4	5-15	55-80	50-75	40-70	25-50	20-35	NP-10
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Redding	0-20	Gravelly sandy loam.	SM	A-2	0-15	55-90	50-75	40-55	25-35	20-30	NP-5
	20-35	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0-5	55-80	50-75	45-70	40-60	40-60	15-30
	35-60	Indurated	---	---	---	---	---	---	---	---	---
211 Pescadero	0-10	Clay loam	CL	A-7, A-6	0	95-100	95-100	95-100	70-90	30-45	10-20
	10-42	Clay, silty clay	CH	A-7	0	100	100	95-100	85-95	50-65	25-40
	42-60	Clay loam, silty clay loam.	CL	A-7, A-6	0	95-100	95-100	90-100	70-90	30-45	10-20
212 Peters	0-5	Clay	CL, CH	A-7	0-5	95-100	80-100	75-100	70-95	40-60	25-35
	5-15	Clay	CL, CH	A-7	0-10	95-100	90-100	85-100	75-95	40-60	25-35
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
213 Piper	0-15	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	20-30	NP-5
	15-39	Sandy loam, fine sandy loam.	SM	A-4, A-2	0	100	100	60-85	30-50	20-30	NP-5
	39-60	Stratified sandy loam to sand.	SM	A-2	0	100	100	50-75	15-35	---	NP
214*. Pits											
215 Pleito	0-16	Clay loam	CL	A-6	0	90-100	85-100	80-95	60-75	30-40	10-15
	16-60	Clay loam	CL	A-6	0	90-100	85-95	80-95	60-75	30-40	10-20
216, 217, 218 Ramoth	0-14	Sandy loam	SM	A-4	0	100	100	60-70	35-50	20-30	NP-5
	14-32	Sandy loam, coarse sandy loam.	SC-SM	A-4	0	100	100	60-70	35-50	20-30	5-10
	32-54	Sandy clay loam	SC	A-6	0	100	100	80-90	35-50	30-40	10-15
	54-60	Sandy loam, coarse sandy loam, loamy coarse sand.	SM	A-2, A-4	0	100	100	50-70	25-40	20-30	NP-5
219 Redding	0-6	Loam	CL-ML, CL	A-4, A-6	0-5	80-95	75-90	60-80	50-65	20-35	5-15
	6-27	Loam, clay loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	65-95	60-90	55-80	50-65	25-40	5-15
	27-30	Clay loam, clay, gravelly clay.	CL, CH	A-7	0-5	65-95	60-90	55-85	50-75	40-60	15-30
	30-60	Indurated	---	---	---	---	---	---	---	---	---
220, 221 Redding	0-7	Gravelly loam	SC, SC-SM, GC, GM-GC	A-4, A-6	0-15	55-90	50-75	45-70	35-50	20-35	5-15
	7-16	Gravelly loam, gravelly clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-5	55-80	50-75	45-70	35-55	25-40	5-15
	16-22	Clay, clay loam	CH, CL	A-7	0	80-95	75-90	70-90	60-75	40-60	15-30
	22-60	Indurated	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
222---------- Reiff	0-9	Fine sandy loam	SM	A-4	0	95-100	75-100	50-70	35-50	20-30	NP-5
	9-56	Stratified loamy sand to loam.	SM, ML, SC-SM, CL-ML	A-4	0	95-100	75-100	50-80	35-60	20-30	NP-10
	56-63	Stratified loam to silt loam.	CL-ML, CL	A-4, A-6	0	95-100	75-100	65-95	50-80	25-35	5-15
223---------- Reiff	0-7	Loam----------	CL-ML, ML	A-4	0	95-100	75-100	65-85	50-65	20-30	NP-10
	7-55	Stratified loamy sand to loam.	SM, ML, SC-SM, CL-ML	A-4	0	95-100	75-100	50-80	35-60	20-30	NP-10
	55-60	Stratified loam to silt loam.	CL-ML, CL	A-4, A-6	0	95-100	75-100	65-95	50-80	25-35	5-15
224---------- Rindge	0-12	Mucky silt loam	ML, OL	A-8, A-5	0	100	100	55-100	50-95	40-50	5-10
	12-60	Mucky peat, peat, muck.	PT	A-8	---	---	---	---	---	---	---
225---------- Rindge	0-13	Muck----------	PT	A-8	---	---	---	---	---	---	---
	13-60	Mucky peat, peat, muck.	PT	A-8	---	---	---	---	---	---	---
226---------- Rioblancho	0-16	Clay loam--------	CL	A-6	0	100	100	85-95	70-85	30-40	10-20
	16-28	Loam, clay loam	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-85	25-40	5-20
	28-39	Sandy loam, loam, silt loam.	SC-SM, SM, CL-ML, ML	A-4	0	100	100	70-90	35-60	25-35	5-10
	39-80	Cemented---------	---	---	---	---	---	---	---	---	---
227*: Rioblancho------	0-16	Clay loam--------	CL	A-6	0	100	100	85-95	70-85	30-40	10-20
	16-28	Loam, clay loam	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-85	25-40	5-20
	28-39	Sandy loam, loam, silt loam.	SC-SM, SM, CL-ML, ML	A-4	0	100	100	70-90	35-60	25-35	5-10
	39-80	Cemented---------	---	---	---	---	---	---	---	---	---
Urban land.											
228---------- Rocklin	0-25	Sandy loam-------	SM	A-4	0	95-100	90-100	50-75	35-50	20-30	NP-5
	25-36	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	65-90	40-65	30-40	10-20
	36-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40-60	Coarse sandy loam, sandy loam.	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
229---------- Rocklin	0-25	Fine sandy loam	SM	A-4	0	95-100	90-100	50-75	35-50	20-30	NP-5
	25-36	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	90-100	65-90	40-65	30-40	10-20
	36-40	Indurated--------	---	---	---	---	---	---	---	---	---
	40-60	Coarse sandy loam, sandy loam.	SM	A-4	0	95-100	90-100	50-60	35-50	20-30	NP-5
230---------- Ryde	0-24	Clay loam--------	CL, ML	A-7, A-6	0	100	100	95-100	65-85	30-50	10-20
	24-63	Stratified muck to silty clay loam.	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-20

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
231---------- Ryde	0-24	Silty clay loam	CL, ML	A-6, A-7	0	100	100	90-100	75-85	30-50	10-20
	24-40	Stratified silt loam to mucky silty clay loam.	OL, OH	A-8	0	100	100	90-100	75-85	40-60	10-20
	40-60	Mucky peat, peat, muck.	PT	A-8	0	---	---	---	---	---	---
232---------- Ryde	0-24	Clay loam--------	ML, CL	A-6, A-7	0	100	100	90-100	75-85	30-50	10-20
	24-40	Stratified muck to silty clay loam.	OL, OH	A-8	0	100	100	90-100	70-85	40-60	NP-20
	40-60	Stratified loamy fine sand to sand.	SM	A-2	0	100	100	50-80	15-35	---	NP
233*:											
Ryde----------	0-24	Clay loam--------	CL, ML	A-7, A-6	0	100	100	95-100	65-85	30-50	10-20
	24-63	Stratified muck to silty clay loam.	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-20
Peltier---------	0-22	Mucky clay loam	OL, OH	A-8	0	100	100	90-100	70-85	40-60	10-25
	22-24	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	70-95	40-60	20-35
	24-45	Mucky clay loam, mucky silty clay loam, mucky clay.	OL, OH	A-8	0	100	100	90-100	70-95	40-60	10-25
	45-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	70-95	40-60	20-30
234, 235--------- Sailboat	0-8	Silt loam--------	CL-ML, ML	A-4	0	100	100	85-100	70-85	25-35	5-10
	8-23	Stratified sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-100	50-85	25-40	5-20
	23-61	Stratified sandy clay loam to silty clay loam.	CL	A-6	0	100	100	80-100	50-85	30-40	10-20
236---------- San Joaquin	0-13	Sandy loam--------	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	13-20	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	20-60	Indurated--------	---	---	---	---	---	---	---	---	---
237---------- San Joaquin	0-10	Sandy loam--------	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	10-20	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	20-60	Indurated--------	---	---	---	---	---	---	---	---	---
238, 239--------- San Joaquin	0-16	Loam----------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	16-26	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	26-60	Indurated--------	---	---	---	---	---	---	---	---	---
240---------- San Joaquin	0-12	Loam----------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	12-26	Sandy clay loam	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	26-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
241*:											
San Joaquin-----	0-16	Loam----------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	16-26	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	26-60	Indurated--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
241*:											
San Joaquin, thick surface--	0-12	Loam----------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	12-26	Sandy clay loam	SC	A-6	0	95-100	95-100	70-90	35-50	30-40	10-20
	26-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-60	Indurated--------	---	---	---	---	---	---	---	---	---
242*:											
San Joaquin-----	0-16	Loam----------	CL-ML, ML	A-4	0	95-100	95-100	75-90	50-60	15-30	NP-10
	16-26	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	26-60	Indurated--------	---	---	---	---	---	---	---	---	---
Urban land.											
243---------- Scribner	0-24	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	24-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	80-100	50-90	30-45	10-20
244---------- Scribner	0-25	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	25-44	Stratified silt loam to clay loam.	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	44-60	Stratified loamy fine sand to sand.	SM	A-2	0	100	100	50-70	15-30	---	NP
245*:											
Scribner--------	0-24	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-85	30-45	10-20
	24-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	80-100	50-90	30-45	10-20
Urban land.											
246---------- Shima	0-21	Muck----------	PT	A-8	---	---	---	---	---	---	---
	21-23	Mucky silty clay, mucky clay loam.	OL, OH	A-5, A-7	0	100	100	90-100	70-95	40-60	5-15
	23-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	50-75	5-30	---	NP
247---------- Shinkee	0-22	Muck----------	PT	A-8	---	---	---	---	---	---	---
	22-26	Mucky clay loam, mucky silty clay loam.	OL, OH	A-8	0	100	100	90-100	70-80	40-60	10-25
	26-60	Stratified fine sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	60-85	25-40	5-20
248---------- Stockton	0-16	Fine sandy loam	SM	A-2, A-4	0	100	95-100	75-90	25-50	20-30	NP-5
	16-53	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	53-58	Clay loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	75-95	65-85	30-45	5-20
	58-60	Cemented---------	---	---	---	---	---	---	---	---	---
249---------- Stockton	0-12	Silty clay loam	ML	A-6, A-7	0	100	100	90-100	80-95	35-50	10-20
	12-34	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	34-47	Clay loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	100	75-95	65-85	30-45	5-20
	47-60	Cemented---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
250---------- Stockton	0-29	Clay----------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	29-37	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	37-42	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	75-95	65-85	30-45	10-20
	42-60	Cemented---------	---	---	---	---	---	---	---	---	---
251*:											
Stockton--------	0-29	Clay----------	CL, CH	A-7	0	100	100	90-100	80-95	40-60	20-35
	29-37	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	37-42	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	75-95	65-85	30-45	10-20
	42-60	Cemented---------	---	---	---	---	---	---	---	---	---
Urban land.											
252---------- Stomar	0-17	Clay loam--------	CL	A-6	0-5	95-100	90-100	85-95	65-85	30-40	10-20
	17-47	Clay loam, clay	CL, CH	A-7	0-5	95-100	90-100	85-100	70-95	40-60	20-35
	47-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-95	60-85	30-45	10-20
253---------- Stomar	0-17	Clay loam--------	CL	A-6	0	100	95-100	90-100	65-85	30-40	10-20
	17-47	Clay, clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	47-60	Clay loam, silty clay loam.	SC, CL	A-6	0	90-100	85-100	80-90	35-70	20-40	10-25
254---------- Timor	0-14	Loamy sand-------	SM	A-1, A-2	0	95-100	95-100	40-70	15-30	---	NP
	14-56	Loamy sand, loamy coarse sand, sand.	SM	A-1, A-2	0	90-100	75-100	30-70	10-30	---	NP
	56-60	Cemented---------	---	---	---	---	---	---	---	---	---
255---------- Tinnin	0-28	Loamy coarse sand	SM	A-1, A-2	0	90-100	85-100	40-75	15-30	---	NP
	28-53	Loamy coarse sand, loamy sand.	SM	A-1, A-2	0	90-100	85-100	40-75	15-30	---	NP
	53-75	Loamy coarse sand, loamy sand, sand.	SM	A-1, A-2	0	90-100	80-100	40-75	10-30	---	NP
256---------- Tokay	0-19	Fine sandy loam	SM	A-4	0	100	95-100	75-85	35-50	20-30	NP-5
	19-45	Fine sandy loam, sandy loam.	SM	A-4	0	100	95-100	65-85	35-50	20-30	NP-5
	45-60	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	100	95-100	50-75	25-50	20-30	NP-5
257*:											
Tokay----------	0-19	Fine sandy loam	SM	A-4	0	100	95-100	75-85	35-50	20-30	NP-5
	19-45	Fine sandy loam, sandy loam.	SM	A-4	0	100	95-100	65-85	35-50	20-30	NP-5
	45-60	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	100	95-100	50-75	25-50	20-30	NP-5
Urban land.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
258---------- Trahern	0-14	Clay loam--------	CL	A-6	0	100	100	90-100	70-80	30-40	10-20
	14-28	Clay----------	CH, CL	A-7	0	100	100	90-100	75-95	40-60	20-35
	28-38	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-20
	38-60	Cemented---------	---	---	0	100	100	---	---	---	---
259---------- Tujunga	0-22	Loamy sand-------	SW-SM, SM, SP-SM	A-1, A-2, A-3	0-5	90-100	75-95	40-70	5-25	---	NP
	22-67	Loamy sand, fine sand, sand.	SW-SM, SM, SP-SM	A-1, A-2, A-3	0-5	90-100	75-95	40-70	5-25	---	NP
260*. Urban land											
261---------- Valdez	0-14	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	25-35	NP-10
	14-40	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	90-100	80-90	25-50	10-20
	40-50	Mucky silty clay loam, mucky silt loam.	OL, ML	A-8, A-5	0	100	100	100	75-95	40-50	5-10
	50-60	Muck, mucky peat	PT	A-8	0	---	---	---	---	---	---
262*:											
Vaquero---------	0-21	Clay----------	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	21-25	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
Carbona---------	0-18	Clay----------	CL, CH	A-7	0	80-100	75-100	70-95	65-90	40-55	15-30
	18-30	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-85	40-55	15-30
	30-60	Clay loam--------	CL	A-6, A-7	0	80-100	75-100	70-95	55-80	30-45	10-20
263---------- Venice	0-15	Mucky silt loam	OL	A-8	0	100	100	55-100	50-95	40-50	5-10
	15-60	Peat, mucky peat	PT	A-8	---	---	---	---	---	---	---
264---------- Venice	0-12	Muck----------	PT	A-8	---	---	---	---	---	---	---
	12-60	Peat, mucky peat	PT	A-8	---	---	---	---	---	---	---
265---------- Veritas	0-19	Sandy loam-------	SM	A-4	0	100	95-100	60-70	35-50	20-30	NP-5
	19-44	Sandy loam, fine sandy loam.	SM	A-4	0	100	95-100	60-85	35-50	20-30	NP-5
	44-60	Cemented---------	---	---	---	---	---	---	---	---	---
266---------- Veritas	0-15	Fine sandy loam	SM, SC-SM	A-4	0	100	90-100	70-85	35-50	20-30	NP-10
	15-54	Sandy loam, fine sandy loam.	SM, SC-SM	A-4	0	100	90-100	70-85	35-50	20-30	NP-10
	54-70	Cemented---------	---	---	---	---	---	---	---	---	---
267---------- Veritas	0-19	Silty clay loam	CL	A-6	0	100	100	95-100	80-90	30-40	10-20
	19-46	Sandy loam, fine sandy loam.	SM, SC-SM	A-4	0	100	90-100	70-85	35-50	20-30	NP-10
	46-60	Cemented---------	---	---	---	---	---	---	---	---	---
268---------- Vernalis	0-9	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	9-47	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-80	25-40	5-20
	47-60	Stratified sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	75-100	50-80	20-40	5-20

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
269---------- Vernalis	0-9	Clay loam--------	CL	A-6	0	100	95-100	85-100	65-85	30-40	10-20
	9-47	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-85	25-40	5-20
	47-60	Stratified sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	75-100	50-80	20-40	5-20
270---------- Vignolo	0-17	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	85-95	25-35	5-10
	17-33	Loam, silt loam	ML, CL-ML	A-4	0	100	100	90-100	85-95	25-35	5-10
	33-60	Cemented---------	---	---	---	---	---	---	---	---	---
271---------- Vignolo	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	30-45	10-15
	14-30	Clay loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	90-100	85-95	30-45	10-15
	30-60	Cemented---------	---	---	---	---	---	---	---	---	---
272---------- Vina	0-9	Fine sandy loam	SM	A-4	0	80-100	75-100	50-75	35-50	20-30	NP-5
	9-37	Sandy loam, loam, fine sandy loam.	CL-ML, ML, SC-SM, SM	A-4	0	80-100	75-100	55-85	35-55	25-35	5-10
	37-60	Stratified sandy loam to loam.	ML, SM	A-4	0	80-100	75-100	55-85	35-55	20-35	NP-10
273---------- Webile	0-39	Muck----------	PT	A-8	0	---	---	---	---	---	---
	39-60	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	40-60	20-35
274---------- Willows	0-20	Clay----------	CH	A-7	0	100	100	90-100	85-95	50-70	30-45
	20-60	Clay, silty clay	CH	A-7	0	100	100	90-100	85-95	50-70	30-45
275*, 276*:											
Wisflat---------	0-3	Sandy loam-------	SM	A-4	0-5	90-100	75-95	50-70	35-50	20-30	NP-5
	3-10	Sandy loam, loam, gravelly sandy loam.	SM, ML	A-2, A-4	5-10	75-100	60-95	50-80	30-60	20-35	NP-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Arburua---------	0-6	Clay loam--------	CL	A-6, A-7	0	95-100	85-100	80-100	70-80	30-45	10-20
	6-31	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	75-100	70-100	50-75	25-45	5-20
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
San Timoteo-----	0-5	Sandy loam-------	SM	A-4	0	80-100	75-95	50-80	35-50	20-30	NP-5
	5-29	Loam, sandy loam	SM, ML	A-4	0	80-100	75-95	50-85	40-60	20-35	NP-10
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
277. Xerofluvents											
278*:											
Xerofluvents.											
Xerorthents.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
279, 280--------- Yellowlark	0-8	Gravelly loam----	SC-SM, SM	A-4	0	75-85	60-75	50-65	35-50	25-35	5-10
	8-39	Gravelly loam, gravelly clay loam.	SC, CL	A-6	0	75-85	60-75	50-70	40-60	30-40	10-15
	39-47	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-15	35-55	30-50	25-45	20-35	30-40	10-15
	47-54	Gravelly clay, clay.	CL, CH, GC	A-7	0-5	55-95	50-90	45-85	40-75	40-55	20-30
	54-59	Gravelly clay loam, clay loam.	GC, CL	A-6	0	55-95	50-90	45-85	35-70	30-40	10-20
	59-62	Cemented, indurated.	---	---	---	---	---	---	---	---	---
281---------- Zacharias	0-19	Clay loam--------	CL	A-6	0	85-100	75-100	65-90	60-80	30-40	10-15
	19-53	Clay loam, loam	CL	A-6	0	85-100	75-100	60-90	50-80	30-40	10-20
	53-60	Gravelly clay loam, gravelly loam.	GC, CL	A-6	0	55-80	50-75	45-70	35-55	30-40	10-20
282---------- Zacharias	0-14	Gravelly clay loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-15
	14-30	Gravelly clay loam, gravelly loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-20
	30-60	Gravelly loam, gravelly sandy loam.	GM, SM	A-2, A-4	0-10	60-85	50-75	40-70	25-50	20-35	NP-10
283---------- Zacharias	0-15	Gravelly clay loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-15
	15-33	Gravelly clay loam, gravelly loam.	GC, SC, CL	A-6	0	55-80	50-75	45-70	35-60	30-40	10-20
	33-60	Gravelly loam, gravelly sandy loam.	GM, SM	A-2, A-4	0-10	60-85	50-75	40-70	25-50	20-35	NP-10

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
101---------- Acampo	0-19	7-18	1.50-1.60	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low--------	0.32	3	3	1-3
	19-47	7-15	1.50-1.65	2.0-6.0	0.10-0.14	6.6-8.4	<2	Low--------	0.37			
	47-49	---	---	---	---	---	---	Low--------	----			
	49-60	---	---	---	---	---	---	Low--------	----			
102---------- Alamo	0-12	40-60	1.25-1.40	0.06-0.2	0.13-0.16	6.1-7.8	<2	High-------	0.24	2	8	1-4
	12-33	40-60	1.25-1.40	<0.06	0.12-0.15	6.6-8.4	<2	High-------	0.24			
	33-60	---	---	---	---	---	---	----------	----			
103*, 104*:												
Alo----------	0-16	40-55	1.25-1.45	0.06-0.2	0.14-0.16	6.6-7.8	<2	High-------	0.24	2	8	1-3
	16-34	35-55	1.20-1.35	0.06-0.2	0.14-0.17	6.6-8.4	<2	High-------	0.24			
	34	---	---	---	---	---	---	----------	----			
Vaquero---------	0-21	40-60	1.35-1.50	0.06-0.2	0.13-0.16	6.6-8.4	<2	High-------	0.20	2	8	<2
	21-25	40-60	1.35-1.50	0.06-0.2	0.09-0.17	7.4-9.0	4-16	High-------	0.28			
	25	---	---	---	---	---	---	----------	----			
105*:												
Amador----------	0-4	12-25	1.45-1.55	0.6-2.0	0.14-0.16	5.1-6.5	<2	Low--------	0.37	1	8	<2
	4-15	12-25	1.50-1.60	0.6-2.0	0.12-0.16	5.1-6.5	<2	Low--------	0.37			
	15	---	---	---	---	---	---	----------	----			
Lithic Xerorthents.												
106---------- Archerdale	0-18	5-15	1.45-1.55	0.6-2.0	0.14-0.17	6.1-7.3	<2	Low--------	0.37	5	3	1-2
	18-38	30-40	1.40-1.50	0.2-0.6	0.18-0.20	6.6-7.3	<2	High-------	0.28			
	38-60	35-50	1.25-1.45	0.06-0.2	0.14-0.16	6.6-7.3	<2	High-------	0.32			
107---------- Archerdale	0-8	30-40	1.40-1.50	0.2-0.6	0.18-0.20	6.6-7.3	<2	High-------	0.28	5	8	1-4
	8-35	35-50	1.25-1.45	0.06-0.2	0.14-0.16	6.6-7.3	<2	High-------	0.32			
	35-60	35-50	1.25-1.45	0.06-0.2	0.14-0.16	6.6-7.3	<2	High-------	0.32			
108. Arents												
109---------- Bisgani	0-11	2-10	1.60-1.70	6.0-20	0.06-0.08	7.4-8.4	<2	Low--------	0.17	5	2	1-3
	11-60	2-10	1.60-1.70	6.0-20	0.06-0.08	7.4-8.4	<4	Low--------	0.17			
110---------- Boggiano	0-23	27-35	1.40-1.50	0.2-0.6	0.17-0.20	6.6-7.8	<2	Moderate	0.37	3	8	1-3
	23-48	20-30	1.45-1.55	0.6-2.0	0.14-0.19	7.4-7.8	<2	Moderate	0.37			
	48-60	---	---	---	---	---	---	----------	----			
111---------- Bruella	0-18	12-20	1.50-1.65	2.0-6.0	0.11-0.13	6.1-7.3	<2	Low--------	0.32	5	8	.5-1
	18-31	18-30	1.45-1.60	0.2-0.6	0.13-0.17	6.1-7.3	<2	Moderate	0.28			
	31-67	25-35	1.45-1.60	0.2-0.6	0.15-0.18	6.1-7.3	<2	Moderate	0.24			
112---------- Bruella	0-8	12-20	1.50-1.65	2.0-6.0	0.11-0.13	6.1-7.3	<2	Low--------	0.32	5	8	.5-1
	8-42	18-30	1.45-1.60	0.2-0.6	0.13-0.17	6.1-7.3	<2	Moderate	0.28			
	42-60	30-40	1.50-1.65	0.06-0.2	0.07-0.09	6.1-7.3	<2	Moderate	0.24			
113---------- Calla	0-11	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32	5	8	.5-1
	11-29	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
	29-60	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
114*, 115*:												
Calla----------	0-18	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32	5	8	.5-1
	18-30	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
	30-60	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
Carbona---------	0-6	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	<4	Moderate	0.28	5	8	2-5
	6-25	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	<4	High------	0.32			
	25-36	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	<4	High------	0.32			
	36-62	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			
116*:												
Calla----------	0-11	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32	5	8	.5-1
	11-29	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
	29-60	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
Pleito----------	0-16	27-35	1.35-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32	5	8	1-4
	16-60	27-35	1.40-1.55	0.2-0.6	0.16-0.18	7.9-8.4	<2	Moderate	0.32			
117---------- Capay	0-6	35-40	1.35-1.50	0.06-0.2	0.17-0.19	6.6-8.4	<2	High------	0.28	5	8	1-2
	6-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24			
	20-60	35-40	1.40-1.55	0.06-0.2	0.17-0.19	6.6-8.4	<2	High------	0.28			
118, 119--------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24	5	8	1-2
	20-60	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24			
120---------- Capay	0-20	40-60	1.35-1.50	0.06-0.2	0.10-0.15	6.6-8.4	4-8	High------	0.32	5	8	1-2
	20-44	40-60	1.35-1.50	0.06-0.2	0.10-0.15	7.9-9.0	4-8	High------	0.37			
	44-60	35-40	1.40-1.55	0.06-0.2	0.13-0.17	7.9-9.0	4-8	High------	0.37			
121---------- Capay	0-20	40-60	1.30-1.50	0.06-0.2	0.13-0.16	6.6-8.4	<4	High------	0.24	5	8	1-2
	20-44	40-60	1.35-1.50	0.06-0.2	0.13-0.16	6.6-8.4	<4	High------	0.24			
	44-60	35-40	1.40-1.55	0.06-0.2	0.16-0.19	6.6-8.4	<4	High------	0.28			
122*:												
Capay----------	0-20	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24	5	8	1-2
	20-60	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24			
Urban land.												
123---------- Carbona	0-6	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	<4	Moderate	0.28	5	8	2-5
	6-25	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	<4	High------	0.32			
	25-36	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	<4	High------	0.32			
	36-62	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			
124*, 125*:												
Carbona---------	0-6	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	<4	Moderate	0.28	5	8	2-5
	6-25	35-45	1.30-1.50	0.06-0.2	0.13-0.18	6.6-8.4	<4	High------	0.32			
	25-36	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	<4	High------	0.32			
	36-62	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			
Orognen---------	0-11	27-35	1.40-1.55	0.2-0.6	0.12-0.15	6.6-7.8	<2	Moderate	0.24	2	8	.5-1
	11-30	38-55	1.35-1.50	<0.06	0.06-0.08	6.6-8.4	<2	High------	0.20			
	30-60	35-60	1.35-1.50	<0.06	0.06-0.08	7.4-8.4	<2	High------	0.24			
126*:												
Carbona---------	0-6	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	<4	Moderate	0.28	5	8	2-5
	6-25	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	<4	High------	0.32			
	25-36	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.9-8.4	<4	High------	0.32			
	36-62	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
126*:												
Carbona, bedrock substratum-----	0-19	35-40	1.35-1.50	0.06-0.2	0.15-0.18	7.4-8.4	<4	High------	0.28	3	8	2-5
	19-41	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	<4	High------	0.32			
	41-57	30-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			
	57	---	---	---	---	---	---	----------	----			
127---------- Chuloak	0-19	10-20	1.50-1.60	2.0-6.0	0.09-0.11	5.6-6.5	<2	Low-------	0.20	5	3	1-2
	19-44	18-25	1.50-1.60	0.2-0.6	0.13-0.15	6.1-7.3	<2	Moderate	0.24			
	44-55	5-15	1.50-1.60	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low-------	0.28			
	55-64	5-10	1.60-1.70	6.0-20	0.06-0.08	6.6-7.3	<2	Low-------	0.10			
128---------- Cogna	0-18	8-18	1.50-1.60	2.0-6.0	0.13-0.15	6.1-7.8	<2	Low-------	0.37	5	8	.5-1
	18-38	20-27	1.45-1.55	0.6-2.0	0.15-0.17	6.1-7.3	<2	Low-------	0.37			
	38-60	20-30	1.45-1.55	0.6-2.0	0.14-0.19	7.4-8.4	<2	Moderate	0.43			
129---------- Cogna	0-25	20-27	1.45-1.55	0.6-2.0	0.15-0.17	6.1-7.3	<2	Low-------	0.37	5	8	1-3
	25-64	20-30	1.45-1.55	0.6-2.0	0.14-0.19	7.4-8.4	<2	Moderate	0.43			
130---------- Columbia	0-12	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32	5	7	.5-2
	12-60	10-18	1.50-1.65	2.0-6.0	0.08-0.11	6.1-7.8	<2	Low-------	0.32			
131---------- Columbia	0-12	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32	5	7	.5-2
	12-60	10-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32			
132---------- Columbia	0-12	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32	5	7	.5-2
	12-60	10-18	1.50-1.65	2.0-6.0	0.08-0.11	6.1-7.8	<2	Low-------	0.32			
133---------- Columbia	0-20	8-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32	5	7	.5-2
	20-48	10-18	1.50-1.60	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low-------	0.32			
	48-60	35-60	1.45-1.55	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.28			
134---------- Cometa	0-22	10-20	1.50-1.70	0.6-2.0	0.10-0.13	5.6-6.5	<2	Low-------	0.32	2	8	.5-1
	22-36	35-50	1.45-1.65	<0.06	0.04-0.06	6.1-7.3	<2	High------	0.24			
	36-60	10-30	1.80-2.00	<0.06	0.08-0.10	6.6-7.3	<2	Low-------	0.28			
135*:												
Corning---------	0-21	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low-------	0.20	2	8	.5-1
	21-36	60-70	1.45-1.65	<0.06	0.04-0.06	4.5-6.5	<2	High------	0.28			
	36-60	18-30	1.50-1.60	0.06-0.2	0.09-0.12	5.1-7.3	<2	Moderate	0.24			
Redding---------	0-4	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low-------	0.24	2	8	<2
	4-15	18-30	1.45-1.55	0.2-0.6	0.11-0.14	5.1-6.5	<2	Moderate	0.24			
	15-25	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High------	0.28			
	25-60	---	---	---	---	---	---	----------	----			
136*:												
Corning---------	0-12	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low-------	0.20	2	8	.5-1
	12-25	60-70	1.45-1.65	<0.06	0.04-0.06	4.5-6.5	<2	High------	0.28			
	25-67	18-30	1.50-1.60	0.06-2.0	0.06-0.12	5.1-7.3	<2	Moderate	0.24			
Redding---------	0-4	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low-------	0.20	2	8	<2
	4-15	18-30	1.45-1.55	0.2-0.6	0.11-0.14	5.1-6.5	<2	Moderate	0.24			
	15-25	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High------	0.28			
	25-60	---	---	---	---	---	---	----------	----			
137---------- Cortina	0-18	10-20	1.45-1.60	2.0-6.0	0.07-0.14	6.6-8.4	<2	Low-------	0.20	5	8	<1
	18-60	5-25	1.50-1.70	2.0-6.0	0.06-0.08	6.6-8.4	<2	Low-------	0.10			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
138, 139--------- Cosumnes	0-7	27-35	1.40-1.50	0.2-0.6	0.17-0.19	6.1-7.8	<2	Moderate	0.37	5	8	<2
	7-21	27-55	1.35-1.50	0.06-0.2	0.15-0.19	6.1-7.8	<2	High------	0.32			
	21-47	35-55	1.35-1.50	0.06-0.2	0.14-0.17	6.6-8.4	<2	High------	0.24			
	47-63	30-45	1.35-1.50	0.06-0.2	0.14-0.17	7.4-8.4	<2	High------	0.28			
140---------- Coyotecreek	0-23	18-27	1.45-1.55	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low-------	0.43	5	8	2-3
	23-36	18-27	1.45-1.55	0.2-0.6	0.17-0.20	6.1-7.8	<2	Low-------	0.37			
	36-69	15-30	1.40-1.60	0.2-0.6	0.15-0.19	6.6-7.8	<2	Low-------	0.32			
141---------- Delhi	0-10	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	<2	Low-------	0.20	5	1	<1
	10-60	0-5	1.60-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low-------	0.20			
142---------- Delhi	0-16	0-5	1.60-1.70	6.0-20	0.06-0.10	6.1-7.8	<2	Low-------	0.24	5	2	<1
	16-26	0-5	1.60-1.70	6.0-20	0.06-0.10	6.1-7.8	<2	Low-------	0.24			
	26-60	0-5	1.60-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low-------	0.20			
143*:												
Delhi----------	0-16	0-5	1.60-1.70	6.0-20	0.06-0.10	6.1-7.8	<2	Low-------	0.24	5	2	<1
	16-26	0-5	1.60-1.70	6.0-20	0.06-0.10	6.1-7.8	<2	Low-------	0.24			
	26-60	0-5	1.60-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low-------	0.20			
Urban land.												
144---------- Dello	0-20	0-7	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.10	5	1	<1
	20-60	0-7	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.10			
145---------- Dello	0-7	0-10	1.60-1.70	6.0-20	0.07-0.10	6.6-8.4	<2	Low-------	0.15	5	2	<1
	7-60	0-7	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.10			
146---------- Dello	0-10	0-10	1.60-1.70	6.0-20	0.07-0.10	6.6-8.4	<2	Low-------	0.15	5	2	<1
	10-60	0-7	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.10			
147---------- Dello	0-16	5-15	1.50-1.60	2.0-6.0	0.10-0.13	6.6-8.4	<2	Low-------	0.24	5	3	<1
	16-43	0-10	1.60-1.70	6.0-20	0.06-0.10	6.6-8.4	<2	Low-------	0.15			
	43-60	35-60	1.40-1.55	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.28			
148---------- Dello	0-12	30-40	1.40-1.50	0.2-0.6	0.17-0.18	6.6-8.4	<2	Moderate	0.28	5	8	<1
	12-60	0-7	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.10			
149---------- Devries	0-13	7-18	1.50-1.60	2.0-6.0	0.10-0.13	6.6-8.4	<2	Low-------	0.24	2	3	1-3
	13-28	7-18	1.50-1.60	2.0-6.0	0.11-0.14	6.6-8.4	<2	Low-------	0.28			
	28-80	---	---	---	---	---	---	----------	----			
150*, 151*. Dumps												
152---------- Egbert	0-8	30-40	1.10-1.20	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.28	5	3	10-20
	8-19	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-7.8	<2	High------	0.24			
	19-60	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-8.4	<2	High------	0.24			
153---------- Egbert	0-8	35-40	1.30-1.40	0.2-0.6	0.17-0.19	6.1-7.3	<2	Moderate	0.28	5	4	2-10
	8-19	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-7.8	<2	High------	0.24			
	19-60	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-8.4	<2	High------	0.24			
154---------- Egbert	0-14	35-40	1.30-1.40	0.2-0.6	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	4	2-10
	14-40	35-50	1.30-1.40	0.06-0.2	0.18-0.20	6.1-7.8	<2	High------	0.28			
	40-60	0-10	1.60-1.75	6.0-20	0.06-0.08	7.4-7.8	<2	Low-------	0.20			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
155*:												
Egbert----------	0-6	35-40	1.30-1.40	0.2-0.6	0.17-0.19	6.1-7.3	<2	Moderate	0.28	5	4	2-10
	6-31	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-7.8	<2	High------	0.24			
	31-60	35-50	1.30-1.40	0.06-0.2	0.15-0.18	6.1-8.4	<2	High------	0.24			
Urban land.												
156---------- El Solyo	0-10	30-40	1.40-1.50	0.2-0.6	0.17-0.20	6.6-7.8	<2	Moderate	0.43	5	8	<2
	10-60	35-50	1.35-1.50	0.06-0.2	0.14-0.19	7.4-8.4	<4	High------	0.37			
157---------- Exeter	0-26	10-20	1.50-1.60	0.6-2.0	0.10-0.13	6.1-7.3	<2	Low-------	0.32	2	7	0-1
	26-33	18-30	1.40-1.50	0.6-2.0	0.14-0.17	6.6-7.8	<2	Moderate	0.32			
	33-60	---	---	---	---	---	---	----------	----			
158---------- Finrod	0-8	30-40	1.40-1.50	0.2-0.6	0.18-0.20	6.6-7.8	<2	High------	0.28	3	8	1-3
	8-33	35-50	1.25-1.45	0.06-0.2	0.14-0.16	6.6-7.8	<2	High------	0.32			
	33-48	35-50	1.25-1.45	0.06-0.2	0.14-0.16	7.4-8.4	<2	High------	0.32			
	48-60	---	---	---	---	---	---	----------	----			
159. Fluvaquents												
160---------- Galt	0-25	40-60	1.35-1.50	0.06-0.2	0.12-0.15	6.6-7.3	<2	High------	0.24	2	8	1-2
	25-34	40-60	1.30-1.50	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	34-60	---	---	---	---	---	---	----------	----			
161---------- Galt	0-20	40-60	1.35-1.50	0.06-0.2	0.12-0.15	6.6-7.3	<2	High------	0.24	2	8	1-2
	20-34	40-60	1.30-1.50	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	34-60	---	---	---	---	---	---	----------	----			
162*:												
Galt----------	0-25	40-60	1.35-1.50	0.06-0.2	0.12-0.15	6.1-7.3	<2	High------	0.24	2	8	1-2
	25-34	40-60	1.30-1.50	0.06-0.2	0.12-0.14	6.6-8.4	<2	High------	0.24			
	34-60	---	---	---	---	---	---	----------	----			
Urban land.												
163*:												
Gonzaga---------	0-5	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low-------	0.32	2	8	1-5
	5-10	15-30	1.40-1.55	0.2-0.6	0.14-0.18	6.6-7.3	<2	Moderate	0.32			
	10-29	35-55	1.35-1.50	<0.06	0.06-0.08	6.6-7.8	<2	High------	0.28			
	29	---	---	---	---	---	---	----------	----			
Franciscan------	0-13	10-20	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low-------	0.28	2	8	2-4
	13-36	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	<2	Moderate	0.32			
	36	---	---	---	---	---	---	----------	----			
164*, 165*:												
Gonzaga---------	0-5	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low-------	0.32	2	8	1-5
	5-10	15-30	1.40-1.55	0.2-0.6	0.14-0.18	6.6-7.3	<2	Moderate	0.32			
	10-29	35-55	1.35-1.50	<0.06	0.06-0.08	6.6-7.8	<2	High------	0.28			
	29	---	---	---	---	---	---	----------	----			
Honker----------	0-5	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Moderate	0.32	2	8	1-3
	5-33	35-55	1.35-1.55	<0.06	0.06-0.08	6.6-7.8	<2	High------	0.15			
	33	---	---	---	---	---	---	----------	----			
Franciscan------	0-13	10-20	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low-------	0.28	2	8	2-4
	13-36	20-35	1.40-1.55	0.2-0.6	0.12-0.16	6.1-7.3	<2	Moderate	0.32			
	36	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
166---------- Grangeville	0-20	8-18	1.50-1.60	2.0-6.0	0.12-0.14	6.6-7.8	<2	Low--------	0.32	5	7	1-6
	20-60	8-18	1.55-1.70	2.0-6.0	0.08-0.10	6.6-8.4	<2	Low--------	0.32			
167---------- Grangeville	0-16	27-35	1.40-1.50	0.2-0.6	0.17-0.18	6.6-7.8	<2	Moderate	0.32	5	8	1-6
	16-32	8-18	1.50-1.60	2.0-6.0	0.12-0.15	6.6-8.4	<2	Low--------	0.32			
	32-60	8-18	1.55-1.70	2.0-6.0	0.08-0.10	6.6-8.4	<2	Low--------	0.32			
168, 169---------- Guard	0-15	27-35	1.40-1.50	0.2-0.6	0.17-0.19	7.9-8.4	<2	Moderate	0.28	5	8	2-5
	15-72	20-35	1.40-1.55	0.06-0.2	0.11-0.14	7.9-8.4	<2	Moderate	0.24			
170---------- Hicksville	0-15	18-27	1.45-1.55	0.6-2.0	0.16-0.18	5.6-6.5	<2	Low--------	0.32	5	8	1-3
	15-36	27-35	1.40-1.55	0.2-0.6	0.17-0.20	6.1-7.8	<2	Moderate	0.28			
	36-60	15-25	1.50-1.60	0.6-2.0	0.11-0.15	6.6-7.8	<2	Low--------	0.20			
171---------- Hicksville	0-8	18-27	1.45-1.55	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low--------	0.32	3	8	1-3
	8-26	27-35	1.40-1.55	0.2-0.6	0.16-0.19	6.1-7.8	<2	Moderate	0.28			
	26-44	18-30	1.50-1.65	0.2-0.6	0.09-0.13	6.6-7.8	<2	Low--------	0.10			
	44	---	---	---	---	---	---	----------	----			
172---------- Hicksville	0-13	18-27	1.45-1.55	0.6-2.0	0.12-0.14	5.6-6.5	<2	Low--------	0.17	5	8	1-3
	13-36	27-35	1.40-1.55	0.2-0.6	0.13-0.15	6.1-7.8	<2	Moderate	0.15			
	36-60	18-30	1.45-1.70	0.2-0.6	0.07-0.12	6.6-7.8	<2	Low--------	0.10			
173---------- Hollenbeck	0-10	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.24	3	8	1-2
	10-37	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.28			
	37-42	30-40	1.40-1.55	0.2-0.6	0.17-0.20	6.6-8.4	<2	Moderate	0.37			
	42-60	---	---	---	---	---	---	----------	----			
174---------- Hollenbeck	0-32	40-60	1.30-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.24	3	8	1-2
	32-55	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.28			
	55-60	---	---	---	---	---	---	----------	----			
175---------- Honcut	0-21	7-12	1.55-1.65	2.0-6.0	0.10-0.12	6.1-7.3	<2	Low--------	0.28	5	3	.5-1
	21-60	7-15	1.55-1.65	2.0-6.0	0.10-0.12	6.1-7.8	<2	Low--------	0.28			
176*:												
Honker----------	0-5	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Moderate	0.32	2	8	1-3
	5-33	35-55	1.35-1.55	<0.06	0.06-0.08	6.6-7.8	<2	High-------	0.15			
	33	---	---	---	---	---	---	----------	----			
Vallecitos------	0-4	15-27	1.45-1.55	0.6-2.0	0.11-0.13	6.6-7.3	<2	Low--------	0.24	1	8	1-2
	4-20	35-50	1.35-1.50	0.06-0.2	0.09-0.11	6.6-7.3	<2	High-------	0.20			
	20	---	---	---	---	---	---	----------	----			
Gonzaga----------	0-3	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low--------	0.32	2	8	1-5
	3-7	15-30	1.40-1.55	0.2-0.6	0.14-0.18	6.6-7.3	<2	Moderate	0.32			
	7-34	35-55	1.35-1.50	<0.06	0.06-0.08	6.6-7.8	<2	High-------	0.28			
	34	---	---	---	---	---	---	----------	----			
177*, 178*:												
Honker----------	0-5	15-27	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Moderate	0.32	2	8	1-3
	5-33	35-55	1.35-1.55	<0.06	0.06-0.08	6.6-7.8	<2	High-------	0.15			
	33	---	---	---	---	---	---	----------	----			
Vallecitos------	0-4	15-27	1.45-1.55	0.6-2.0	0.11-0.13	6.6-7.3	<2	Low--------	0.24	1	8	1-2
	4-20	35-50	1.35-1.50	0.06-0.2	0.09-0.11	6.6-7.3	<2	High-------	0.20			
	20	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
177*, 178*:												
Honker, eroded--	0-7	15-27	1.45-1.55	0.2-0.6	0.11-0.14	6.6-7.3	<2	Moderate	0.20	2	8	1-3
	7-18	20-35	1.40-1.55	0.2-0.6	0.11-0.14	6.6-7.3	<2	Moderate	0.20			
	18-31	40-55	1.35-1.55	<0.06	0.06-0.08	6.6-7.8	<2	High------	0.15			
	31	---	---	---	---	---	---	----------	----			
179----------	0-15	27-35	1.40-1.50	0.2-0.6	0.18-0.19	<5.1	<2	Moderate	0.37	5	6	.5-1
Itano	15-34	18-35	1.40-1.55	0.2-0.6	0.15-0.19	4.5-5.5	<2	Moderate	0.43			
	34-60	18-35	1.45-1.55	0.2-0.6	0.15-0.19	<5.1	<2	Moderate	0.43			
180----------	0-22	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24	2	8	2-5
Jacktone	22-34	35-60	1.35-1.50	0.06-0.2	0.14-0.16	7.9-9.0	<2	High------	0.24			
	34-37	---	---	---	---	---	---	----------	----			
	37-46	20-30	1.45-1.60	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.32			
	46-60	---	---	---	---	---	---	----------	----			
181*:												
Jacktone--------	0-22	40-60	1.35-1.50	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24	2	8	2-5
	22-34	35-60	1.35-1.50	0.06-0.2	0.14-0.16	7.9-9.0	<2	High------	0.24			
	34-37	---	---	---	---	---	---	----------	----			
	37-46	20-30	1.45-1.60	0.2-0.6	0.13-0.17	7.9-9.0	<2	Moderate	0.32			
	46-60	---	---	---	---	---	---	----------	----			
Urban land.												
182, 183---------	0-5	15-25	1.45-1.55	0.6-2.0	0.13-0.15	6.1-7.3	<2	Low-------	0.37	2	8	1-3
Jahant	5-31	20-30	1.40-1.55	0.6-2.0	0.13-0.17	6.1-7.3	<2	Moderate	0.37			
	31-49	35-60	1.40-1.55	<0.06	0.08-0.10	6.1-7.3	<2	High------	0.28			
	49-53	---	---	---	---	---	---	Low-------	----			
	53-60	---	---	---	---	---	---	----------	----			
184----------	0-10	2-10	1.60-1.70	6.0-20	0.06-0.08	5.6-7.3	<2	Low-------	0.17	1	8	<2
Kaseberg	10-16	2-10	1.60-1.70	6.0-20	0.05-0.08	5.6-7.3	<2	Low-------	0.15			
	16-17	---	---	---	---	---	---	----------	----			
	17-60	10-25	1.80-2.00	<0.06	0.04-0.07	5.6-7.3	<2	Low-------	0.28			
185----------	0-17	8-18	1.55-1.70	0.6-2.0	0.11-0.14	5.6-7.3	<2	Low-------	0.37	1	8	.5-1
Kaseberg	17-20	---	---	---	---	---	---	----------	----			
	20	---	---	---	---	---	---	----------	----			
186----------	0-16	10-20	1.55-1.70	0.6-2.0	0.14-0.17	5.6-7.3	<2	Low-------	0.43	1	8	.5-1
Kaseberg	16-17	---	---	---	---	---	---	----------	----			
	17	---	---	---	---	---	---	----------	----			
187*:												
Keyes----------	0-12	15-27	1.45-1.55	0.6-2.0	0.10-0.13	5.6-7.3	<2	Low-------	0.20	1	8	<2
	12-19	35-60	1.40-1.60	<0.06	0.04-0.06	6.1-7.3	<2	High------	0.17			
	19-34	---	---	---	---	---	---	----------	----			
	34	---	---	---	---	---	---	----------	----			
Bellota---------	0-9	12-20	1.50-1.60	2.0-6.0	0.11-0.13	5.6-6.5	<2	Low-------	0.28	2	8	<2
	9-23	20-30	1.45-1.55	0.2-0.6	0.10-0.14	5.6-6.5	<2	Moderate	0.20			
	23-35	40-60	1.35-1.50	<0.06	0.04-0.06	6.1-7.3	<2	High------	0.20			
	35-37	---	---	---	---	---	---	----------	----			
	37	---	---	---	---	---	---	----------	----			
188*:												
Keyes----------	0-6	15-27	1.45-1.55	0.6-2.0	0.10-0.13	5.6-7.3	<2	Low-------	0.20	1	8	<2
	6-13	35-60	1.40-1.60	<0.06	0.04-0.06	6.1-7.3	<2	High------	0.17			
	13-34	---	---	---	---	---	---	----------	----			
	34	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
188*:												
Redding---------	0-16	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low--------	0.24	2	8	<2
	16-22	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High-------	0.28			
	22-60	---	---	---	---	---	---	----------	----			
189---------- Kingdon	0-5	10-14	1.50-1.60	2.0-6.0	0.13-0.15	5.6-7.3	<2	Low--------	0.32	5	3	1-3
	5-14	10-14	1.50-1.60	2.0-6.0	0.13-0.15	6.1-7.3	<2	Low--------	0.32			
	14-28	10-14	1.50-1.60	2.0-6.0	0.12-0.15	6.1-7.3	<2	Low--------	0.37			
	28-42	15-20	1.45-1.60	0.6-2.0	0.13-0.16	6.1-7.8	<2	Low--------	0.37			
	42-61	8-15	1.50-1.60	2.0-6.0	0.10-0.14	6.6-8.4	<2	Low--------	0.37			
190---------- Kingile	0-17	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low--------	0.02	5	2	35-45
	17-61	35-60	1.20-1.40	0.06-0.2	0.14-0.18	5.6-7.8	<2	Moderate	0.24			
191*:												
Kingile---------	0-17	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low--------	0.02	5	2	35-45
	17-61	35-60	1.20-1.40	0.06-0.2	0.14-0.18	5.6-7.8	<2	Moderate	0.24			
Ryde----------	0-24	27-35	1.35-1.45	0.2-0.6	0.17-0.20	5.1-7.3	<2	Moderate	0.28	5	7	2-10
	24-63	20-30	0.80-1.35	0.6-2.0	0.20-0.25	6.1-7.8	<2	Moderate	0.24			
192*: Lithic Xerorthents.												
Toomes----------	0-15	10-27	1.40-1.50	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low--------	0.32	1	8	1-2
	15	---	---	---	---	---	---	----------	----			
193---------- Madera	0-19	5-15	1.50-1.60	2.0-6.0	0.09-0.13	5.6-7.3	<2	Low--------	0.32	2	8	<1
	19-23	20-30	1.50-1.60	0.2-0.6	0.15-0.17	6.1-7.3	<2	Moderate	0.28			
	23-29	35-55	1.45-1.65	<0.06	0.04-0.08	6.6-8.4	<2	High-------	0.24			
	29-60	---	---	---	---	---	<2	----------	----			
194---------- Madera	0-10	10-25	1.45-1.55	0.6-2.0	0.14-0.16	5.6-7.3	<2	Low--------	0.37	2	8	<1
	10-30	35-55	1.45-1.65	<0.06	0.04-0.08	6.6-8.4	<2	High-------	0.24			
	30-60	---	---	---	---	---	<2	----------	----			
195*:												
Madera----------	0-10	5-15	1.50-1.60	2.0-6.0	0.09-0.13	5.6-7.3	<2	Low--------	0.32	2	8	<1
	10-20	35-55	1.45-1.65	<0.06	0.04-0.08	6.6-8.4	<2	High-------	0.24			
	20-60	---	---	---	---	---	<2	----------	----			
Alamo----------	0-12	10-20	1.50-1.70	0.6-2.0	0.10-0.13	6.1-7.3	<2	Low--------	0.32	2	8	.5-1
	12-25	40-60	1.25-1.40	<0.06	0.12-0.15	6.1-7.8	<2	High-------	0.24			
	25-34	40-60	1.25-1.40	<0.06	0.12-0.15	6.6-8.4	<2	High-------	0.24			
	34-60	---	---	---	---	---	---	----------	----			
196---------- Manteca	0-11	10-18	1.50-1.60	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low--------	0.28	2	3	1-2
	11-24	10-18	1.50-1.60	0.6-2.0	0.10-0.16	7.4-8.4	<2	Low--------	0.32			
	24-35	---	---	---	---	---	<2	----------	----			
	35-54	---	---	---	---	---	<2	----------	----			
	54-74	5-15	1.55-1.70	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low--------	0.32			
197---------- Merritt	0-17	27-35	1.35-1.50	0.2-0.6	0.17-0.19	6.6-8.4	<2	Moderate	0.43	5	8	1-4
	17-49	20-30	1.35-1.55	0.2-0.6	0.15-0.19	7.9-8.4	<2	Moderate	0.43			
	49-60	5-15	1.50-1.70	0.6-2.0	0.11-0.14	7.9-8.4	<2	Low--------	0.32			
198---------- Merritt	0-15	27-35	1.35-1.50	0.2-0.6	0.17-0.19	6.6-8.4	<2	Moderate	0.43	5	8	1-4
	15-42	20-30	1.35-1.55	0.2-0.6	0.15-0.19	7.9-8.4	<2	Moderate	0.43			
	42-60	5-15	1.50-1.70	0.6-2.0	0.11-0.14	7.9-8.4	<2	Low--------	0.32			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
199---------- Montpellier	0-18	10-18	1.55-1.65	2.0-6.0	0.10-0.12	5.6-7.3	<2	Low--------	0.32	4	8	0-1
	18-46	20-30	1.50-1.60	0.2-0.6	0.14-0.16	5.6-7.3	<2	Moderate	0.28			
	46-54	10-20	1.60-1.70	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low--------	0.32			
	54-60	10-20	1.80-2.00	<0.06	0.04-0.08	6.1-7.3	<2	Low--------	0.20			
200*:												
Montpellier-----	0-20	10-18	1.55-1.65	2.0-6.0	0.10-0.12	5.6-7.3	<2	Low--------	0.32	4	8	0-1
	20-43	20-30	1.50-1.60	0.2-0.6	0.14-0.16	5.6-7.3	<2	Moderate	0.28			
	43-55	10-20	1.60-1.70	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low--------	0.32			
	55-60	10-20	1.80-2.00	<0.06	0.04-0.08	6.1-7.3	<2	Low--------	0.20			
Cometa----------	0-22	10-20	1.50-1.70	0.6-2.0	0.10-0.13	5.6-6.5	<2	Low--------	0.32	2	8	.5-1
	22-36	35-50	1.45-1.65	<0.06	0.04-0.06	6.1-7.3	<2	High-------	0.24			
	36-60	10-30	1.80-2.00	<0.06	0.08-0.10	6.6-7.3	<2	Low--------	0.28			
201---------- Nord	0-25	10-18	1.45-1.55	0.6-2.0	0.13-0.15	6.6-7.8	<2	Low--------	0.37	5	7	1-2
	25-60	10-18	1.50-1.60	0.6-2.0	0.11-0.15	7.4-8.4	<2	Low--------	0.43			
202---------- Pardee	0-9	8-18	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low--------	0.20	1	8	1-2
	9-18	18-30	1.45-1.55	0.2-0.6	0.08-0.11	5.1-6.5	<2	Low--------	0.10			
	18	---	---	---	---	---	---	----------	----			
203---------- Pardee	0-9	8-18	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low--------	0.20	1	8	1-2
	9-18	18-30	1.45-1.55	0.2-0.6	0.08-0.11	5.1-6.5	<2	Low--------	0.10			
	18	---	---	---	---	---	---	----------	----			
204---------- Peltier	0-22	27-35	1.10-1.20	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.28	5	3	10-25
	22-24	35-45	1.20-1.35	0.06-0.2	0.13-0.15	5.6-7.8	<2	High-------	0.28			
	24-45	35-45	1.10-1.20	0.6-2.0	0.18-0.20	5.6-7.8	<2	Moderate	0.28			
	45-60	35-50	1.30-1.40	0.06-0.2	0.13-0.15	5.6-7.8	<2	High-------	0.28			
205---------- Peltier	0-22	30-40	1.10-1.20	0.6-2.0	0.18-0.20	5.6-6.5	<2	Moderate	0.28	5	3	15-20
	22-24	35-45	1.20-1.35	0.06-0.2	0.13-0.15	5.6-7.8	<2	High-------	0.28			
	24-44	35-40	1.10-1.20	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.28			
	44-60	---	0.80-1.00	6.0-20	0.20-0.30	4.5-6.5	<2	Low--------	----			
206, 207--------- Pentz	0-4	8-18	1.65-1.75	2.0-6.0	0.11-0.13	5.1-6.5	<2	Low--------	0.28	1	8	1-3
	4-15	10-20	1.55-1.75	2.0-6.0	0.11-0.15	5.6-7.3	<2	Low--------	0.37			
	15	---	---	---	---	---	---	----------	----			
208---------- Pentz	0-8	8-18	1.50-1.60	2.0-6.0	0.09-0.12	5.1-6.5	<2	Low--------	0.20	1	8	1-3
	8-13	10-20	1.50-1.60	2.0-6.0	0.09-0.13	5.6-7.3	<2	Low--------	0.20			
	13	---	---	---	---	---	---	----------	----			
209*:												
Pentz----------	0-7	8-18	1.55-1.65	2.0-6.0	0.13-0.15	5.1-6.5	<2	Low--------	0.32	1	8	1-3
	7-14	10-20	1.55-1.75	2.0-6.0	0.11-0.15	5.6-7.3	<2	Low--------	0.37			
	14	---	---	---	---	---	---	----------	----			
Bellota---------	0-17	15-25	1.45-1.55	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low--------	0.32	2	8	<2
	17-21	20-30	1.45-1.55	0.2-0.6	0.10-0.14	5.6-6.5	<2	Moderate	0.20			
	21-36	40-60	1.35-1.50	<0.06	0.04-0.06	6.1-7.3	<2	High-------	0.20			
	36-37	---	---	---	---	---	---	----------	----			
	37	---	---	---	---	---	---	----------	----			
210*:												
Pentz----------	0-10	8-18	1.50-1.60	2.0-6.0	0.09-0.11	5.1-6.5	<2	Low--------	0.20	1	8	1-3
	10-14	10-20	1.50-1.60	2.0-6.0	0.09-0.13	5.6-7.3	<2	Low--------	0.20			
	14	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
210*:												
Redding---------	0-20	10-20	1.50-1.60	0.6-2.0	0.07-0.10	5.1-6.5	<2	Low--------	0.20	2	8	<2
	20-35	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High-------	0.20			
	35-60	---	---	---	---	---	---	----------	----			
211---------- Pescadero	0-10	27-35	1.40-1.50	0.2-0.6	0.14-0.16	7.4-8.4	4-8	Moderate	0.32	5	8	1-4
	10-42	40-60	1.40-1.55	<0.06	0.08-0.10	7.9-9.0	4-16	High-------	0.28			
	42-60	29-40	1.45-1.60	0.06-0.2	0.12-0.13	7.9-9.0	4-16	Moderate	0.32			
212---------- Peters	0-5	40-60	1.35-1.50	0.06-0.2	0.14-0.16	5.6-7.3	<2	High-------	0.24	1	8	1-3
	5-15	40-60	1.35-1.50	0.06-0.2	0.12-0.16	5.6-7.3	<2	High-------	0.20			
	15	---	---	---	---	---	---	----------	----			
213---------- Piper	0-15	9-15	1.50-1.60	0.6-2.0	0.10-0.13	7.4-8.4	<4	Low--------	0.28	5	3	.5-2
	15-39	9-15	1.50-1.60	0.6-2.0	0.05-0.08	7.4-8.4	<4	Low--------	0.32			
	39-60	5-15	1.55-1.70	2.0-6.0	0.05-0.09	7.4-8.4	<2	Low--------	0.17			
214*. Pits												
215---------- Pleito	0-16	27-35	1.35-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32	5	8	1-4
	16-60	27-35	1.40-1.55	0.2-0.6	0.16-0.18	7.9-8.4	<2	Moderate	0.32			
216, 217, 218---- Ramoth	0-14	8-15	1.50-1.60	2.0-6.0	0.10-0.13	5.6-6.5	<2	Low--------	0.28	5	8	<1
	14-32	12-20	1.50-1.60	2.0-6.0	0.10-0.13	5.6-6.5	<2	Low--------	0.28			
	32-54	20-27	1.45-1.55	0.2-0.6	0.13-0.15	6.1-7.3	<2	Moderate	0.28			
	54-60	5-15	1.50-1.60	2.0-6.0	0.08-0.12	6.1-7.3	<2	Low--------	0.24			
219---------- Redding	0-6	10-25	1.45-1.55	0.6-2.0	0.14-0.16	5.1-6.5	<2	Low--------	0.37	2	8	<2
	6-27	18-30	1.45-1.55	0.2-0.6	0.13-0.17	5.1-6.5	<2	Moderate	0.28			
	27-30	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High-------	0.28			
	30-60	---	---	---	---	---	---	----------	----			
220, 221--------- Redding	0-7	10-25	1.45-1.55	0.6-2.0	0.10-0.14	5.1-6.5	<2	Low--------	0.24	2	8	<2
	7-16	18-30	1.45-1.55	0.2-0.6	0.11-0.14	5.1-6.5	<2	Moderate	0.24			
	16-22	35-60	1.35-1.60	<0.06	0.04-0.06	5.1-6.5	<2	High-------	0.28			
	22-60	---	---	---	---	---	---	----------	----			
222---------- Reiff	0-9	5-15	1.50-1.60	2.0-6.0	0.09-0.11	6.1-7.8	<2	Low--------	0.32	5	5	1-2
	9-56	8-18	1.50-1.65	2.0-6.0	0.11-0.16	6.6-7.8	<2	Low--------	0.32			
	56-63	15-25	1.50-1.60	0.6-2.0	0.16-0.19	6.6-7.8	<2	Low--------	0.37			
223---------- Reiff	0-7	8-18	1.45-1.55	2.0-6.0	0.13-0.16	6.1-7.8	<2	Low--------	0.37	5	5	1-2
	7-55	8-18	1.50-1.65	2.0-6.0	0.11-0.16	6.6-7.8	<2	Low--------	0.32			
	55-60	15-25	1.50-1.60	0.6-2.0	0.16-0.19	6.6-7.8	<2	Low--------	0.37			
224---------- Rindge	0-12	12-25	1.10-1.30	6.0-20	0.16-0.18	5.6-7.3	<2	Low--------	0.28	5	3	10-25
	12-60	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low--------	0.02			
225---------- Rindge	0-13	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low--------	0.02	5	2	25-55
	13-60	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low--------	0.02			
226---------- Rioblancho	0-16	27-30	1.40-1.50	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.28	2	8	2-5
	16-28	20-35	1.45-1.55	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
	28-39	10-20	1.50-1.60	0.6-2.0	0.10-0.16	7.9-8.4	<2	Low--------	0.37			
	39-80	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
227*:												
Rioblancho------	0-16	27-30	1.40-1.50	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.28	2	8	2-5
	16-28	20-35	1.45-1.55	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.32			
	28-39	10-20	1.50-1.60	0.6-2.0	0.10-0.16	7.9-8.4	<2	Low-------	0.37			
	39-80	---	---	---	---	---	---	----------	----			
Urban land.												
228, 229--------- Rocklin	0-25	10-20	1.55-1.65	0.6-2.0	0.11-0.13	5.6-6.5	<2	Low-------	0.37	2	7	<1
	25-36	18-30	1.40-1.55	0.6-2.0	0.15-0.18	6.1-7.3	<2	Moderate	0.37			
	36-40	---	---	---	---	---	---	----------	----			
	40-60	10-20	1.80-2.00	<0.06	0.04-0.08	6.1-7.3	<2	Low-------	0.20			
230---------- Ryde	0-24	27-35	1.35-1.45	0.2-0.6	0.17-0.20	5.1-7.3	<2	Moderate	0.28	5	7	2-10
	24-63	20-30	0.80-1.35	0.6-2.0	0.20-0.25	6.1-7.8	<2	Moderate	0.24			
231---------- Ryde	0-24	27-35	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	<2	Moderate	0.28	5	8	2-10
	24-40	20-35	1.10-1.50	0.6-2.0	0.15-0.20	5.1-7.3	<2	Moderate	----			
	40-60	---	0.80-1.00	6.0-20	0.20-0.30	4.5-6.5	<2	Low-------	----			
232---------- Ryde	0-24	27-35	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	<2	Moderate	0.28	5	7	2-10
	24-40	20-30	0.80-1.35	0.6-2.0	0.20-0.25	6.1-7.8	<2	Moderate	0.24			
	40-60	0-5	1.60-1.75	6.0-20	0.06-0.08	7.4-7.8	<2	Low-------	0.20			
233*:												
Ryde----------	0-24	27-35	1.35-1.45	0.2-0.6	0.17-0.20	5.1-7.3	<2	Moderate	0.28	5	7	2-10
	24-63	20-30	0.80-1.35	0.6-2.0	0.20-0.25	6.1-7.8	<2	Moderate	0.24			
Peltier---------	0-22	27-35	1.10-1.20	0.6-2.0	0.18-0.20	5.6-7.3	<2	Moderate	0.28	5	3	10-25
	22-24	35-45	1.20-1.35	0.06-0.2	0.13-0.15	5.6-7.8	<2	High------	0.28			
	24-45	35-45	1.10-1.20	0.6-2.0	0.18-0.20	5.6-7.8	<2	Moderate	0.28			
	45-60	35-50	1.30-1.40	0.06-0.2	0.13-0.15	5.6-7.8	<2	High------	0.28			
234, 235--------- Sailboat	0-8	15-27	1.45-1.55	0.6-2.0	0.15-0.19	6.1-7.3	<2	Low-------	0.43	5	5	<2
	8-23	18-35	1.45-1.60	0.2-0.6	0.15-0.19	6.6-7.8	<2	Moderate	0.37			
	23-61	25-35	1.45-1.55	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate	0.24			
236---------- San Joaquin	0-13	10-20	1.45-1.55	0.6-2.0	0.10-0.13	5.6-6.5	<2	Low-------	0.32	2	8	.5-1
	13-20	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High------	0.24			
	20-60	---	---	---	---	---	---	----------	----			
237---------- San Joaquin	0-10	10-20	1.45-1.55	0.6-2.0	0.10-0.13	5.6-6.5	<2	Low-------	0.32	2	8	.5-1
	10-20	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High------	0.24			
	20-60	---	---	---	---	---	---	----------	----			
238, 239--------- San Joaquin	0-16	15-25	1.50-1.60	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low-------	0.37	2	8	.5-1
	16-26	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High------	0.24			
	26-60	---	---	---	---	---	---	----------	----			
240---------- San Joaquin	0-12	15-25	1.50-1.60	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low-------	0.37	2	8	.5-1
	12-26	20-25	1.50-1.60	0.2-0.6	0.16-0.17	6.1-7.3	<2	Low-------	0.28			
	26-35	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High------	0.24			
	35-60	---	---	---	---	---	---	----------	----			
241*:												
San Joaquin-----	0-16	15-25	1.50-1.60	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low-------	0.37	2	8	.5-1
	16-26	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High------	0.24			
	26-60	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
241*:												
San Joaquin, thick surface--	0-12	15-25	1.50-1.60	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low--------	0.37	2	8	.5-1
	12-26	20-25	1.50-1.60	0.2-0.6	0.16-0.17	6.1-7.3	<2	Low--------	0.28			
	26-35	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High-------	0.24			
	35-60	---	---	---	---	---	---	----------	----			
242*:												
San Joaquin-----	0-16	15-25	1.50-1.60	0.6-2.0	0.14-0.16	5.6-6.5	<2	Low--------	0.37	2	8	.5-1
	16-26	35-50	1.50-1.65	<0.06	0.04-0.06	6.1-7.8	<2	High-------	0.24			
	26-60	---	---	---	---	---	---	----------	----			
Urban land.												
243---------- Scribner	0-24	27-35	1.35-1.50	0.2-0.6	0.19-0.21	6.1-7.8	<2	Moderate	0.24	5	4	2-10
	24-60	20-35	1.40-1.55	0.2-0.6	0.15-0.19	6.6-8.4	<2	Moderate	0.32			
244---------- Scribner	0-25	27-35	1.35-1.50	0.2-0.6	0.19-0.21	6.1-7.8	<2	Moderate	0.24	5	4	2-10
	25-44	25-35	1.40-1.55	0.2-0.6	0.17-0.21	6.6-8.4	<2	Moderate	0.24			
	44-60	0-5	1.60-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.20			
245*:												
Scribner--------	0-24	27-35	1.35-1.50	0.2-0.6	0.19-0.21	6.1-7.8	<2	Moderate	0.24	5	4	2-10
	24-60	20-35	1.40-1.55	0.2-0.6	0.15-0.19	6.6-8.4	<2	Moderate	0.32			
Urban land.												
246---------- Shima	0-21	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<4	Low--------	0.02	5	2	40-55
	21-23	27-35	1.10-1.20	0.6-2.0	0.18-0.20	4.5-7.3	<4	Moderate	0.28			
	23-60	0-10	1.60-1.70	>20	0.06-0.10	4.5-8.4	<4	Low--------	0.20			
247---------- Shinkee	0-22	---	0.80-1.00	6.0-20	0.26-0.30	5.1-6.5	<2	Low--------	0.02	5	2	35-65
	22-26	27-35	1.00-1.20	0.2-0.6	0.18-0.20	5.1-8.4	<2	Moderate	0.28			
	26-60	15-35	1.40-1.60	0.2-0.6	0.14-0.19	5.1-8.4	<2	Moderate	0.37			
248---------- Stockton	0-16	15-20	1.50-1.60	2.0-6.0	0.12-0.15	7.4-8.4	<2	Low--------	0.32	3	6	1-2
	16-53	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24			
	53-58	25-40	1.40-1.55	0.06-0.2	0.14-0.17	7.9-8.4	<2	Moderate	0.32			
	58-60	---	---	---	---	---	---	----------	----			
249---------- Stockton	0-12	27-35	1.35-1.50	0.2-0.6	0.17-0.19	7.4-8.4	<2	Moderate	0.37	3	7	1-2
	12-34	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24			
	34-47	25-40	1.40-1.55	0.06-0.2	0.14-0.17	7.9-8.4	<2	Moderate	0.32			
	47-60	---	---	---	---	---	---	----------	----			
250---------- Stockton	0-29	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24	3	8	2-5
	29-37	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24			
	37-42	27-40	1.35-1.55	0.06-0.2	0.14-0.17	7.4-8.4	<2	Moderate	0.32			
	42-60	---	---	---	---	---	---	----------	----			
251*:												
Stockton--------	0-29	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24	3	8	2-5
	29-37	40-55	1.30-1.50	0.06-0.2	0.14-0.16	7.4-8.4	<2	High-------	0.24			
	37-42	27-40	1.35-1.55	0.06-0.2	0.14-0.17	7.4-8.4	<2	Moderate	0.32			
	42-60	---	---	---	---	---	---	----------	----			
Urban land.												
252---------- Stomar	0-17	27-35	1.40-1.55	0.2-0.6	0.16-0.18	6.6-7.3	<2	Moderate	0.37	5	8	<2
	17-47	35-60	1.35-1.50	0.06-0.2	0.15-0.18	6.6-8.4	<2	High-------	0.32			
	47-60	27-40	1.40-1.55	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.37			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
253---------- Stomar	0-17	27-35	1.40-1.55	0.2-0.6	0.17-0.19	6.6-7.3	<2	Moderate	0.37	5	8	1-2
	17-47	35-60	1.35-1.50	0.06-0.2	0.12-0.15	6.6-8.4	<2	High------	0.32			
	47-60	27-40	1.40-1.55	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.37			
254---------- Timor	0-14	2-10	1.60-1.70	6.0-20	0.06-0.08	6.6-7.8	<2	Low-------	0.17	3	2	1-2
	14-56	2-10	1.60-1.70	6.0-20	0.05-0.07	7.4-8.4	<2	Low-------	0.17			
	56-60	---	---	---	---	---	---	----------	----			
255---------- Tinnin	0-28	0-10	1.60-1.70	6.0-20	0.06-0.08	6.1-7.8	<2	Low-------	0.17	5	2	1-2
	28-53	0-10	1.60-1.70	6.0-20	0.05-0.07	6.1-7.8	<2	Low-------	0.17			
	53-75	0-10	1.60-1.75	6.0-20	0.05-0.07	6.6-8.4	<2	Low-------	0.17			
256---------- Tokay	0-19	10-15	1.50-1.60	2.0-6.0	0.13-0.15	6.1-7.8	<2	Low-------	0.32	5	3	1-3
	19-45	10-18	1.50-1.60	2.0-6.0	0.12-0.14	6.1-7.8	<2	Low-------	0.37			
	45-60	8-15	1.50-1.65	2.0-6.0	0.10-0.14	6.1-8.4	<2	Low-------	0.37			
257*:												
Tokay----------	0-19	10-15	1.50-1.60	2.0-6.0	0.13-0.15	6.1-7.8	<2	Low-------	0.32	5	3	1-3
	19-45	10-18	1.50-1.60	2.0-6.0	0.12-0.14	6.1-7.8	<2	Low-------	0.37			
	45-60	8-15	1.50-1.65	2.0-6.0	0.10-0.14	6.1-8.4	<2	Low-------	0.37			
Urban land.												
258---------- Trahern	0-14	27-35	1.40-1.50	0.2-0.6	0.16-0.18	7.4-8.4	<4	Moderate	0.37	2	8	1-2
	14-28	45-60	1.35-1.50	<0.06	0.11-0.13	8.5-9.0	4-8	High------	0.24			
	28-38	30-40	1.40-1.55	0.2-0.6	0.16-0.18	7.9-9.0	<4	Moderate	0.37			
	38-60	---	---	---	---	---	---	----------	----			
259---------- Tujunga	0-22	0-5	1.60-1.70	6.0-20	0.05-0.10	6.1-7.3	<2	Low-------	0.20	5	2	<1
	22-67	0-5	1.60-1.70	6.0-20	0.05-0.08	6.1-7.8	<2	Low-------	0.20			
260*. Urban land												
261---------- Valdez	0-14	18-27	1.45-1.55	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low-------	0.43	5	5	.5-1
	14-40	18-35	1.40-1.55	0.2-0.6	0.15-0.19	6.1-7.3	<2	Moderate	0.43			
	40-50	20-35	1.10-1.20	2.0-6.0	0.18-0.22	6.1-7.3	<2	Low-------	0.28			
	50-60	---	0.80-1.00	6.0-20	0.26-0.30	5.6-7.3	<4	Low-------	0.02			
262*:												
Vaquero----------	0-21	40-60	1.35-1.50	0.06-0.2	0.13-0.16	6.6-8.4	<2	High------	0.20	2	8	<2
	21-25	40-60	1.35-1.50	0.06-0.2	0.09-0.17	7.4-9.0	4-16	High------	0.28			
	25	---	---	---	---	---	---	----------	----			
Carbona----------	0-18	40-45	1.30-1.45	0.06-0.2	0.13-0.16	7.4-8.4	<4	High------	0.24	5	8	2-5
	18-30	35-45	1.30-1.50	0.06-0.2	0.13-0.18	7.4-8.4	<4	High------	0.32			
	30-60	27-40	1.40-1.50	0.2-0.6	0.15-0.18	7.9-8.4	<4	Moderate	0.32			
263---------- Venice	0-15	10-25	1.10-1.20	6.0-20	0.16-0.18	4.5-7.3	<2	Low-------	0.28	5	3	10-25
	15-60	---	0.08-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low-------	0.02			
264---------- Venice	0-12	---	0.80-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low-------	0.02	5	2	35-55
	12-60	---	0.08-1.00	6.0-20	0.26-0.30	4.5-6.5	<2	Low-------	0.02			
265---------- Veritas	0-19	7-18	1.55-1.65	2.0-6.0	0.10-0.13	6.6-8.4	<2	Low-------	0.24	3	3	1-3
	19-44	7-18	1.50-1.60	2.0-6.0	0.11-0.14	7.4-8.4	<2	Low-------	0.28			
	44-60	---	---	---	---	---	---	----------	----			
266---------- Veritas	0-15	5-16	1.55-1.65	2.0-6.0	0.12-0.15	7.4-8.4	<4	Low-------	0.28	3	3	1-2
	15-54	5-16	1.50-1.60	2.0-6.0	0.12-0.15	7.4-8.4	<4	Low-------	0.32			
	54-70	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
267---------- Veritas	0-19	27-35	1.45-1.55	0.2-0.6	0.17-0.19	6.6-8.4	<4	Moderate	0.37	3	7	1-2
	19-46	5-16	1.50-1.60	2.0-6.0	0.12-0.15	7.4-8.4	<4	Low--------	0.32			
	46-60	---	---	---	---	---	---	----------	----			
268, 269--------- Vernalis	0-9	27-35	1.40-1.50	0.2-0.6	0.17-0.18	6.6-8.4	<2	Moderate	0.32	5	8	1-2
	9-47	18-30	1.40-1.55	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.37			
	47-60	10-30	1.50-1.60	0.6-2.0	0.11-0.18	7.9-8.4	<2	Moderate	0.32			
270---------- Vignolo	0-17	20-27	1.45-1.55	0.6-2.0	0.15-0.19	7.4-7.8	<2	Low--------	0.43	2	8	1-2
	17-33	20-27	1.50-1.65	0.2-0.6	0.15-0.19	7.4-7.8	<2	Low--------	0.43			
	33-60	---	---	---	---	---	---	----------	----			
271---------- Vignolo	0-14	27-30	1.40-1.50	0.2-0.6	0.17-0.21	7.4-7.8	<2	Moderate	0.37	2	8	1-2
	14-30	27-30	1.40-1.50	0.2-0.6	0.17-0.21	7.4-7.8	<2	Moderate	0.37			
	30-60	---	---	---	---	---	---	----------	----			
272---------- Vina	0-9	12-18	1.45-1.55	2.0-6.0	0.12-0.14	6.1-7.3	<2	Low--------	0.28	5	7	1-3
	9-37	12-18	1.45-1.55	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low--------	0.32			
	37-60	12-18	1.45-1.60	0.6-2.0	0.13-0.16	6.1-7.3	<2	Low--------	0.37			
273---------- Webile	0-39	---	0.80-1.00	6.0-20	0.26-0.30	4.5-5.5	<2	Low--------	0.02	5	2	40-65
	39-60	40-60	1.35-1.50	0.06-0.2	0.12-0.16	6.1-7.8	<2	High-------	0.28			
274---------- Willows	0-20	40-60	1.40-1.55	<0.06	0.10-0.12	7.9-9.0	2-8	High-------	0.28	5	8	1-3
	20-60	40-60	1.40-1.50	<0.06	0.05-0.10	8.5-9.0	>4	High-------	0.28			
275*, 276*:												
Wisflat---------	0-3	7-18	1.50-1.60	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low--------	0.37	1	8	<.1
	3-10	5-18	1.50-1.60	2.0-6.0	0.09-0.15	7.4-8.4	<2	Low--------	0.43			
	10	---	---	---	---	---	---	----------	----			
Arburua---------	0-6	27-30	1.40-1.55	0.6-2.0	0.15-0.18	7.4-8.4	<2	Moderate	0.37	2	8	0-1
	6-31	18-30	1.40-1.55	0.6-2.0	0.12-0.18	7.9-8.4	<2	Moderate	0.37			
	31	---	---	---	---	---	---	----------	----			
San Timoteo-----	0-5	8-18	1.50-1.60	2.0-6.0	0.11-0.14	7.4-8.4	<2	Low--------	0.37	2	8	<1
	5-29	8-18	1.50-1.60	2.0-6.0	0.11-0.15	7.9-8.4	<2	Low--------	0.43			
	29	---	---	---	---	---	---	----------	----			
277. Xerofluvents												
278*:												
Xerofluvents.												
Xerorthents.												
279, 280--------- Yellowlark	0-8	12-18	1.45-1.55	0.6-2.0	0.12-0.14	5.1-6.5	<2	Low--------	0.24	3	8	<2
	8-39	18-30	1.45-1.55	0.6-2.0	0.12-0.16	5.1-6.5	<2	Moderate	0.24			
	39-47	20-30	1.45-1.55	0.2-0.6	0.08-0.12	5.1-6.5	<2	Low--------	0.15			
	47-54	40-50	1.35-1.50	<0.06	0.04-0.06	5.6-6.5	<2	High-------	0.20			
	54-59	27-35	1.40-1.50	0.2-0.6	0.11-0.17	5.6-6.5	<2	Moderate	0.28			
	59-62	---	---	---	---	---	---	----------	----			
281---------- Zacharias	0-19	27-30	1.40-1.50	0.2-0.6	0.15-0.19	6.1-7.3	<2	Moderate	0.37	5	8	1-2
	19-53	25-35	1.40-1.55	0.2-0.6	0.13-0.18	6.6-7.8	<2	Moderate	0.37			
	53-60	25-35	1.40-1.55	0.2-0.6	0.10-0.15	6.6-8.4	<2	Moderate	0.24			
282---------- Zacharias	0-14	27-35	1.40-1.50	0.2-0.6	0.10-0.15	6.1-7.3	<2	Moderate	0.20	5	8	1-2
	14-30	25-35	1.40-1.55	0.2-0.6	0.10-0.14	6.6-7.8	<2	Moderate	0.24			
	30-60	15-25	1.50-1.60	0.6-2.0	0.08-0.12	6.6-8.4	<2	Low--------	0.24			

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
283---------- Zacharias	0-15	27-35	1.40-1.50	0.2-0.6	0.10-0.15	6.1-7.3	<2	Moderate	0.20	5	8	1-2
	15-33	25-35	1.40-1.55	0.2-0.6	0.10-0.14	6.6-7.8	<2	Moderate	0.24			
	33-60	15-25	1.50-1.60	0.6-2.0	0.08-0.12	6.6-8.4	<2	Low--------	0.24			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
101---------- Acampo	C	None----------	---	---	>6.0	---	---
102---------- Alamo	D	Rare----------	---	---	0-1.0	Perched	Dec-Apr
103*, 104*:							
Alo----------	D	None----------	---	---	>6.0	---	---
Vaquero----------	D	None----------	---	---	>6.0	---	---
105*:							
Amador----------	D	None----------	---	---	>6.0	---	---
Lithic Xerorthents.							
106, 107---------- Archerdale	C	Rare----------	---	---	>6.0	---	---
108. Arents							
109---------- Bisgani	B	Rare----------	---	---	3.5-5.0	Perched	Dec-Feb
110---------- Boggiano	B	Rare----------	---	---	>6.0	---	---
111---------- Bruella	B	None----------	---	---	>6.0	---	---
112---------- Bruella	C	None----------	---	---	>6.0	---	---
113---------- Calla	B	None----------	---	---	>6.0	---	---
114*, 115*:							
Calla----------	B	None----------	---	---	>6.0	---	---
Carbona----------	D	None----------	---	---	>6.0	---	---
116*:							
Calla----------	B	None----------	---	---	>6.0	---	---
Pleito----------	B	None----------	---	---	>6.0	---	---
117---------- Capay	D	Rare----------	---	---	>6.0	---	---
118, 119---------- Capay	D	None----------	---	---	>6.0	---	---
120, 121---------- Capay	D	None----------	---	---	4.0-6.0	Perched	Jan-Dec

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
122*:							
Capay	D	None	---	---	>6.0	---	---
Urban land.							
123 Carbona	D	None	---	---	>6.0	---	---
124*, 125*:							
Carbona	D	None	---	---	>6.0	---	---
Orognen	D	None	---	---	>6.0	---	---
126*:							
Carbona	D	None	---	---	>6.0	---	---
Carbona, bedrock substratum	D	None	---	---	>6.0	---	---
127 Chuloak	B	None	---	---	>6.0	---	---
128, 129 Cogna	B	Rare	---	---	>6.0	---	---
130 Columbia	B	Rare	---	---	>6.0	---	---
131 Columbia	C	Occasional	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Mar
132 Columbia	C	Frequent	Brief to long	Dec-Apr	3.0-5.0	Apparent	Dec-Mar
133 Columbia	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
134 Cometa	D	None	---	---	>6.0	---	---
135*, 136*:							
Corning	D	None	---	---	>6.0	---	---
Redding	D	None	---	---	>6.0	---	---
137 Cortina	B	None	---	---	>6.0	---	---
138 Cosumnes	C	Rare	---	---	>6.0	---	---
139 Cosumnes	C	Occasional	Brief to long	Dec-Apr	>6.0	---	---
140 Coyotecreek	B	Occasional	Very brief or brief.	Dec-Apr	>6.0	---	---
141, 142 Delhi	A	None	---	---	>6.0	---	---
143*:							
Delhi	A	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
143*:							
Urban land.							
144 Dello	C	Occasional	Long	Nov-Mar	3.0-4.0	Apparent	Jan-Dec
145 Dello	A	Rare	---	---	>6.0	---	---
146 Dello	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
147 Dello	B	Rare	---	---	>5.0	Apparent	Jan-Dec
148 Dello	A	Rare	---	---	>5.0	Apparent	Jan-Dec
149 Devries	C	Rare	---	---	>5.0	Apparent	Jan-Dec
150*, 151*.							
Dumps							
152, 153 Egbert	C	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
154 Egbert	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
155*:							
Egbert	C	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
Urban land.							
156 El Solyo	C	None	---	---	>6.0	---	---
157 Exeter	C	Rare	---	---	>6.0	---	---
158 Finrod	C	Rare	---	---	>6.0	---	---
159.							
Fluvaquents							
160 Galt	D	Rare	---	---	>6.0	---	---
161 Galt	D	None	---	---	>6.0	---	---
162*:							
Galt	D	Rare	---	---	>6.0	---	---
Urban land.							
163*:							
Gonzaga	D	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
163*:							
Franciscan	C	None	---	---	>6.0	---	---
164*, 165*:							
Gonzaga	D	None	---	---	>6.0	---	---
Honker	D	None	---	---	>6.0	---	---
Franciscan	C	None	---	---	>6.0	---	---
166, 167 Grangeville	B	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
168 Guard	C	Rare	---	---	1.5-3.0	Perched	Jan-Dec
169 Guard	C	Rare	---	---	>5.0	Apparent	Jan-Dec
170 Hicksville	B	Occasional	Very brief	Dec-Apr	5.0-6.0	Apparent	Dec-Apr
171 Hicksville	C	Occasional	Very brief	Dec-Apr	3.0-4.0	Perched	Dec-Apr
172 Hicksville	B	Occasional	Very brief	Dec-Apr	5.0-6.0	Apparent	Dec-Apr
173, 174 Hollenbeck	D	Rare	---	---	>6.0	---	---
175 Honcut	B	None	---	---	>6.0	---	---
176*:							
Honker	D	None	---	---	>6.0	---	---
Vallecitos	D	None	---	---	>6.0	---	---
Gonzaga	D	None	---	---	>6.0	---	---
177*, 178*:							
Honker	D	None	---	---	>6.0	---	---
Vallecitos	D	None	---	---	>6.0	---	---
Honker, eroded	D	None	---	---	>6.0	---	---
179 Itano	C	Rare	---	---	3.0-4.5	Apparent	Jan-Dec
180 Jacktone	D	Rare	---	---	>5.0	Apparent	Dec-Apr
181*:							
Jacktone	D	Rare	---	---	>5.0	Apparent	Dec-Apr
Urban land.							
182, 183 Jahant	D	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
184, 185, 186 Kaseberg	D	None	---	---	>6.0	---	---
187*:							
Keyes	D	None	---	---	>6.0	---	---
Bellota	D	None	---	---	>6.0	---	---
188*:							
Keyes	D	None	---	---	>6.0	---	---
Redding	D	None	---	---	>6.0	---	---
189 Kingdon	B	None	---	---	>5.0	Perched	Dec-Mar
190 Kingile	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
191*:							
Kingile	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
Ryde	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
192*:							
Lithic Xerorthents.							
Toomes	D	None	---	---	>6.0	---	---
193, 194 Madera	D	None	---	---	>6.0	---	---
195*:							
Madera	D	Rare	---	---	>6.0	---	---
Alamo	D	Rare	---	---	0-1.0	Perched	Dec-Apr
196 Manteca	C	Rare	---	---	>6.0	---	---
197 Merritt	B	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
198 Merritt	B	Occasional	Long	Dec-Mar	4.0-6.0	Apparent	Jan-Dec
199 Montpellier	C	None	---	---	>6.0	---	---
200*:							
Montpellier	C	None	---	---	>6.0	---	---
Cometa	D	None	---	---	>6.0	---	---
201 Nord	B	Rare	---	---	>6.0	---	---
202, 203 Pardee	D	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
204, 205 Peltier	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
206, 207, 208 Pentz	D	None	---	---	>6.0	---	---
209*:							
Pentz	D	None	---	---	>6.0	---	---
Bellota	D	None	---	---	>6.0	---	---
210*:							
Pentz	D	None	---	---	>6.0	---	---
Redding	D	None	---	---	>6.0	---	---
211 Pescadero	D	Rare	---	---	3.0-6.0	Apparent	Dec-Mar
212 Peters	D	None	---	---	>6.0	---	---
213 Piper	C	Rare	---	---	3.0-5.0	Apparent	Jan-Dec
214*. Pits							
215 Pleito	B	None	---	---	>6.0	---	---
216, 217, 218 Ramoth	B	None	---	---	>6.0	---	---
219, 220, 221 Redding	D	None	---	---	>6.0	---	---
222 Reiff	B	Occasional	Very brief or brief.	Dec-Apr	>6.0	---	---
223 Reiff	B	Rare	---	---	>6.0	---	---
224, 225 Rindge	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
226 Rioblancho	C	Rare	---	---	>6.0	---	---
227*:							
Rioblancho	C	Rare	---	---	>6.0	---	---
Urban land.							
228, 229 Rocklin	D	None	---	---	>6.0	---	---
230, 231, 232 Ryde	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
233*:							
Ryde	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
Peltier	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
234 Sailboat	B	Rare	---	---	>6.0	---	---
235 Sailboat	B	Occasional	Brief	Dec-Apr	>6.0	---	---
236, 237, 238, 239, 240 San Joaquin	D	None	---	---	>6.0	---	---
241*:							
San Joaquin	D	None	---	---	>6.0	---	---
San Joaquin, thick surface	D	None	---	---	>6.0	---	---
242*:							
San Joaquin	D	None	---	---	>6.0	---	---
Urban land.							
243, 244 Scribner	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
245*:							
Scribner	C	Rare	---	---	3.0-5.0	Apparent	Dec-Apr
Urban land.							
246 Shima	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
247 Shinkee	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
248, 249, 250 Stockton	D	Rare	---	---	>5.0	Perched	Nov-Mar
251*:							
Stockton	D	Rare	---	---	>5.0	Perched	Nov-Mar
Urban land.							
252 Stomar	C	None	---	---	>6.0	---	---
253 Stomar	C	None	---	---	4.0-6.0	Apparent	Jan-Dec
254 Timor	A	Rare	---	---	>6.0	---	---
255 Tinnin	A	None	---	---	---	---	---
256 Tokay	B	None	---	---	>6.0	---	---

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
257*:							
Tokay	B	None	---	---	>6.0	---	---
Urban land.							
258 Trahern	D	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
259 Tujunga	A	Rare	---	---	>6.0	---	---
260*. Urban land							
261 Valdez	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
262*:							
Vaquero	D	None	---	---	>6.0	---	---
Carbona	D	None	---	---	>6.0	---	---
263, 264 Venice	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
265 Veritas	B	Rare	---	---	4.0-5.0	Perched	Dec-Mar
266, 267 Veritas	B	Rare	---	---	>6.0	---	---
268 Vernalis	B	None	---	---	>6.0	---	---
269 Vernalis	B	None	---	---	4.0-6.0	Apparent	Jan-Dec
270, 271 Vignolo	C	Rare	---	---	>6.0	---	---
272 Vina	B	Rare	---	---	>6.0	---	---
273 Webile	C	Rare	---	---	3.0-4.0	Apparent	Jan-Dec
274 Willows	D	Rare	---	---	4.0-6.0	Apparent	Jan-Dec
275*, 276*:							
Wisflat	D	None	---	---	>6.0	---	---
Arburua	C	None	---	---	>6.0	---	---
San Timoteo	B	None	---	---	>6.0	---	---
277. Xerofluvents							
278*: Xerofluvents.							

See footnote at end of table.

TABLE 19.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
278*:							
Xerorthents.							
279, 280 Yellowlark	C	None	---	---	3.0-4.0	Perched	Dec-Mar
281, 282, 283 Zacharias	B	None	---	---	>6.0	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--SOIL FEATURES

(The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
101 Acampo	>60	---	40-60	Thin	---	---	High	Low.
102 Alamo	>60	---	20-40	Thick	---	---	High	Low.
103*, 104*:								
Alo	24-40	Soft	---	---	---	---	High	Low.
Vaquero	20-40	Soft	---	---	---	---	High	High.
105*:								
Amador	10-20	Hard	---	---	---	---	High	High.
Lithic Xerorthents.								
106, 107 Archerdale	>60	---	---	---	---	---	Moderate	Low.
108. Arents								
109 Bisgani	>60	---	---	---	---	---	High	Low.
110 Boggiano	>60	---	40-60	Thick	---	---	High	Low.
111, 112 Bruella	>60	---	---	---	---	---	High	Low.
113 Calla	>60	---	---	---	---	---	High	Low.
114*, 115*:								
Calla	>60	---	---	---	---	---	High	Low.
Carbona	>60	---	---	---	---	---	High	Low.
116*:								
Calla	>60	---	---	---	---	---	High	Low.
Pleito	>60	---	---	---	---	---	High	Low.
117 Capay	>60	---	---	---	---	---	High	Moderate.
118, 119, 120, 121 Capay	>60	---	---	---	---	---	High	Moderate.
122*:								
Capay	>60	---	---	---	---	---	High	Moderate.
Urban land.								
123 Carbona	>60	---	---	---	---	---	High	Low.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
124*, 125*:								
Carbona	>60	---	---	---	---	---	High	Low.
Orognen	>60	---	---	---	---	---	High	Low.
126*:								
Carbona	>60	---	---	---	---	---	High	Low.
Carbona, bedrock substratum	40-60	Soft	---	---	---	---	High	Low.
127 Chuloak	>60	---	---	---	---	---	High	Low.
128, 129 Cogna	>60	---	---	---	---	---	High	Low.
130 Columbia	>60	---	---	---	---	---	Moderate	Low.
131 Columbia	>60	---	---	---	---	---	Moderate	Low.
132 Columbia	>60	---	---	---	---	---	Moderate	Low.
133 Columbia	>60	---	---	---	---	---	Moderate	Low.
134 Cometa	>60	---	---	---	---	---	Moderate	Moderate.
135*, 136*:								
Corning	>60	---	---	---	---	---	High	High.
Redding	>60	---	20-40	Thick	---	---	High	Moderate.
137 Cortina	>60	---	---	---	---	---	Moderate	Moderate.
138 Cosumnes	>60	---	---	---	---	---	High	Low.
139 Cosumnes	>60	---	---	---	---	---	High	Low.
140 Coyotecreek	>60	---	---	---	---	---	Moderate	Low.
141, 142 Delhi	>60	---	---	---	---	---	Moderate	Low.
143*:								
Delhi	>60	---	---	---	---	---	Moderate	Low.
Urban land.								
144 Dello	>60	---	---	---	---	---	High	Low.
145, 146, 147, 148 Dello	>60	---	---	---	---	---	High	Low.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
149 Devries	>60	---	20-40	Thick	---	---	High	Low.
150*, 151*. Dumps								
152, 153, 154 Egbert	>60	---	---	---	---	---	High	Moderate.
155*:								
Egbert	>60	---	---	---	---	---	High	Moderate.
Urban land.								
156 El Solyo	>60	---	---	---	---	---	High	Low.
157 Exeter	>60	---	20-40	Thick	---	---	High	Low.
158 Finrod	>60	---	40-60	Thick	---	---	High	Low.
159. Fluvaquents								
160 Galt	>60	---	20-40	Thick	---	---	High	Low.
161 Galt	>60	---	20-40	Thick	---	---	High	Low.
162*:								
Galt	>60	---	20-40	Thick	---	---	High	Low.
Urban land.								
163*:								
Gonzaga	20-40	Hard	---	---	---	---	High	Low.
Franciscan	20-40	Hard	---	---	---	---	Moderate	Low.
164*, 165*:								
Gonzaga	20-40	Hard	---	---	---	---	High	Low.
Honker	20-40	Hard	---	---	---	---	Moderate	Low.
Franciscan	20-40	Hard	---	---	---	---	Moderate	Low.
166, 167 Grangeville	>60	---	---	---	---	---	High	Low.
168, 169 Guard	>60	---	---	---	---	---	High	Low.
170 Hicksville	>60	---	---	---	---	---	Moderate	Low.
171 Hicksville	40-60	Soft	---	---	---	---	Moderate	Low.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
172 Hicksville	>60	---	---	---	---	---	Moderate	Low.
173, 174 Hollenbeck	>60	---	40-60	Thick	---	---	High	Low.
175 Honcut	>60	---	---	---	---	---	High	Low.
176*:								
Honker	20-40	Hard	---	---	---	---	Moderate	Low.
Vallecitos	10-20	Hard	---	---	---	---	High	Low.
Gonzaga	20-40	Hard	---	---	---	---	High	Low.
177*, 178*:								
Honker	20-40	Hard	---	---	---	---	Moderate	Low.
Vallecitos	10-20	Hard	---	---	---	---	High	Low.
Honker, eroded	20-40	Hard	---	---	---	---	Moderate	Low.
179 Itano	>60	---	---	---	2-5	>24	High	High.
180 Jacktone	>60	---	20-40	Thick	---	---	High	Low.
181*:								
Jacktone	>60	---	20-40	Thick	---	---	High	Low.
Urban land.								
182, 183 Jahant	>60	---	40-60	Thick	---	---	Moderate	Moderate.
184 Kaseberg	>60	---	10-20	Thin	---	---	Low	Low.
185, 186 Kaseberg	11-21	Soft	10-20	Thin	---	---	Moderate	Moderate.
187*:								
Keyes	14-40	Soft	10-20	Thick	---	---	High	Low.
Bellota	21-50	Soft	20-40	Thin	---	---	High	Moderate.
188*:								
Keyes	14-40	Soft	10-20	Thick	---	---	High	Low.
Redding	>60	---	20-40	Thick	---	---	High	Moderate.
189 Kingdon	>60	---	---	---	---	---	High	Moderate.
190 Kingile	>60	---	---	---	6-12	>60	Moderate	Moderate.
191*:								
Kingile	>60	---	---	---	6-12	>60	Moderate	Moderate.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
191*:								
Ryde	>60	---	---	---	5-8	16-36	Moderate	Moderate.
192*:								
Lithic Xerorthents.								
Toomes	4-20	Hard	---	---	---	---	Moderate	Moderate.
193, 194 Madera	>60	---	20-40	Thick	---	---	High	Low.
195*:								
Madera	>60	---	20-40	Thick	---	---	High	Low.
Alamo	>60	---	20-40	Thick	---	---	High	Low.
196 Manteca	>60	---	20-40	Thick	---	---	High	Low.
197 Merritt	>60	---	---	---	---	---	High	Low.
198 Merritt	>60	---	---	---	---	---	High	Low.
199 Montpellier	>60	---	---	---	---	---	Moderate	Low.
200*:								
Montpellier	>60	---	---	---	---	---	Moderate	Low.
Cometa	>60	---	---	---	---	---	Moderate	Moderate.
201 Nord	>60	---	---	---	---	---	High	Low.
202, 203 Pardee	10-20	Hard	---	---	---	---	Moderate	Moderate.
204 Peltier	>60	---	---	---	6-10	36-60	High	Moderate.
205 Peltier	>60	---	---	---	4-6	36-60	High	High.
206, 207, 208 Pentz	10-20	Soft	---	---	---	---	Moderate	Moderate.
209*:								
Pentz	10-20	Soft	---	---	---	---	Moderate	Moderate.
Bellota	21-50	Soft	20-40	Thin	---	---	High	Moderate.
210*:								
Pentz	10-20	Soft	---	---	---	---	Moderate	Moderate.
Redding	>60	---	20-40	Thick	---	---	High	Moderate.
211 Pescadero	>60	---	---	---	---	---	High	Low.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
212 Peters	10-20	Soft	---	---	---	---	Moderate	Low.
213 Piper	>60	---	---	---	---	---	High	Low.
214*. Pits								
215 Pleito	>60	---	---	---	---	---	High	Low.
216, 217, 218 Ramoth	>60	---	---	---	---	---	Low	Moderate.
219, 220, 221 Redding	>60	---	20-40	Thick	---	---	High	Moderate.
222 Reiff	>60	---	---	---	---	---	Moderate	Low.
223 Reiff	>60	---	---	---	---	---	Moderate	Low.
224, 225 Rindge	>60	---	---	---	5-10	>60	High	High.
226 Rioblancho	>60	---	20-40	Thick	---	---	High	Low.
227*:								
Rioblancho	>60	---	20-40	Thick	---	---	High	Low.
Urban land.								
228, 229 Rocklin	>60	---	20-40	Thick	---	---	Moderate	Low.
230 Ryde	>60	---	---	---	5-8	16-36	Moderate	Moderate.
231 Ryde	>60	---	---	---	4-6	36-60	High	High.
232 Ryde	>60	---	---	---	5-8	10-30	Moderate	Moderate.
233*:								
Ryde	>60	---	---	---	5-8	16-36	Moderate	Moderate.
Peltier	>60	---	---	---	6-10	36-60	High	Moderate.
234 Sailboat	>60	---	---	---	---	---	High	Low.
235 Sailboat	>60	---	---	---	---	---	High	Low.
236, 237, 238, 239, 240 San Joaquin	>60	---	20-40	Thick	---	---	Moderate	Moderate.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
241*:								
San Joaquin	>60	---	20-40	Thick	---	---	Moderate	Moderate.
San Joaquin, thick surface	>60	---	20-40	Thick	---	---	Moderate	Moderate.
242*:								
San Joaquin	>60	---	20-40	Thick	---	---	Moderate	Moderate.
Urban land.								
243, 244 Scribner	>60	---	---	---	2-5	>24	High	Low.
245*:								
Scribner	>60	---	---	---	2-5	>24	High	Low.
Urban land.								
246 Shima	>60	---	---	---	5-9	>60	High	High.
247 Shinkee	>60	---	---	---	5-10	18-26	High	Moderate.
248, 249, 250 Stockton	>60	---	40-60	Thick	---	---	High	Low.
251*:								
Stockton	>60	---	40-60	Thick	---	---	High	Low.
Urban land.								
252, 253 Stomar	>60	---	---	---	---	---	High	Low.
254 Timor	>60	---	40-60	Thin	---	---	High	Low.
255 Tinnin	>60	---	---	---	---	---	High	Low.
256 Tokay	>60	---	---	---	---	---	High	Moderate.
257*:								
Tokay	>60	---	---	---	---	---	High	Moderate.
Urban land.								
258 Trahern	>60	---	20-40	Thick	---	---	High	Low.
259 Tujunga	>60	---	---	---	---	---	Moderate	Low.
260*. Urban land								
261 Valdez	>60	---	---	---	6-10	>60	Moderate	Moderate.

See footnote at end of table.

TABLE 20.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Subsidence		Risk of corrosion	
	Depth	Hardness	Depth	Hardness	Initial	Total	Uncoated steel	Concrete
	In		In		In	In		
262*:								
Vaquero	20-40	Soft	---	---	---	---	High	High.
Carbona	>60	---	---	---	---	---	High	Low.
263, 264 Venice	>60	---	---	---	5-10	>60	High	High.
265, 266, 267 Veritas	>60	---	40-60	Thick	---	---	High	Low.
268, 269 Vernalis	>60	---	---	---	---	---	High	Low.
270, 271 Vignolo	>60	---	20-40	Thick	---	---	Moderate	Low.
272 Vina	>60	---	---	---	---	---	Moderate	Moderate.
273 Webile	>60	---	---	---	5-10	36-51	High	High.
274 Willows	>60	---	---	---	---	---	High	Low.
275*, 276*:								
Wisflat	10-20	Hard	---	---	---	---	High	Low.
Arburua	20-40	Hard	---	---	---	---	High	Low.
San Timoteo	20-40	Soft	---	---	---	---	High	Low.
277. Xerofluvents								
278*:								
Xerofluvents.								
Xerorthents.								
279, 280 Yellowlark	>60	---	45-60	Thick	---	---	Moderate	Moderate.
281, 282, 283 Zacharias	>60	---	---	---	---	---	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 21.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Acampo	Coarse-loamy, mixed, thermic Typic Haploxerolls
Alamo	Fine, montmorillonitic, thermic Typic Duraquolls
Alo	Fine, montmorillonitic, thermic Typic Chromoxererts
*Amador	Loamy, mixed, thermic, shallow Typic Xerochrepts
Arburua	Fine-loamy, mixed (calcareous), thermic Typic Xerorthents
Archerdale	Fine, mixed, thermic Pachic Haploxerolls
Arents	Arents
Bellota	Fine-loamy, mixed, thermic Abruptic Durixeralfs
Bisgani	Sandy, mlxed, thermic Typic Haplaquolls
Boggiano	Fine-silty, mixed, thermic Calcic Pachic Haploxerolls
Bruella	Fine-loamy, mixed, thermic Ultic Palexeralfs
Calla	Fine-loamy, mixed, thermic Calcixerollic Xerochrepts
Capay	Fine, montmorillonitic, thermic Typic Chromoxererts
Carbona	Fine, montmorillonitic, thermic Vertic Haploxerolls
Chuloak	Fine-loamy, mixed, thermic Typic Argixerolls
Cogna	Fine-silty, mixed, thermic Calcic Pachic Haploxerolls
Columbia	Coarse-loamy, mixed, nonacid, thermic Aquic Xerofluvents
Cometa	Fine, mixed, thermic Typic Palexeralfs
*Corning	Fine, mixed, thermic Typic Palexeralfs
*Cortina	Loamy-skeletal, mixed, nonacid, thermic Typic Xerofluvents
Cosumnes	Fine, mixed, nonacid, thermic Aquic Xerofluvents
Coyotecreek	Fine-silty, mixed, thermic Cumulic Haploxerolls
Delhi	Mixed, thermic Typic Xeropsamments
Dello	Mixed, thermic Typic Psammaquents
Devries	Coarse-loamy, mixed, thermic Typic Duraquolls
Egbert	Fine, mixed, thermic Cumulic Haplaquolls
El Solyo	Fine, mixed, thermic Calcixerollic Xerochrepts
Exeter	Fine-loamy, mixed, thermic Typic Durixeralfs
Finrod	Fine, mixed, thermic Pachic Haploxerolls
Fluvaquents	Fluvaquents
Franciscan	Fine-loamy, mixed, thermic Typic Argixerolls
Galt	Fine, montmorillonltic, thermic Typlc Chromoxererts
Gonzaga	Fine, mixed, thermic Typic Palexerolls
Grangeville	Coarse-loamy, mixed, thermic Fluvaquentic Haploxerolls
Guard	Fine-loamy, mixed (calcareous), thermic Duric Haplaquolls
Hicksville	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Hollenbeck	Fine, montmorillonitic, thermic Typic Chromoxererts
Honcut	Coarse-loamy, mixed, nonacid, thermic Typic Xerorthents
Honker	Fine, mixed, thermic Mollic Palexeralfs
Itano	Fine-silty, mixed, acid, thermic Typic Fluvaquents
Jacktone	Fine, montmorillonitic, thermic Typic Pelloxererts
Jahant	Fine-loamy, mixed, thermic Mollic Palexeralfs
Kaseberg	Loamy, mixed, thermic, shallow Typic Durochrepts
Keyes	Clayey, mixed, thermic, shallow Abruptic Durixeralfs
Kingdon	Coarse-loamy, mixed, thermic Typic Argixerolls
Kingile	Clayey, mixed, euic, thermic Terric Medisaprists
Lithic Xerorthents	Lithic Xerorthents
Madera	Fine, montmorillonitic, thermic Abruptic Durixeralfs
Manteca	Coarse-loamy, mixed, thermic Haplic Durixerolls
Merritt	Fine-silty, mixed, thermic Fluvaquentic Haploxerolls
Montpellier	Fine-loamy, mixed, thermic Typic Haploxeralfs
Nord	Coarse-loamy, mixed, thermic Cumulic Haploxerolls
*Orognen	Fine, mixed, thermic Typic Palexeralfs
Pardee	Loamy-skeletal, mixed, thermic Lithic Mollic Haploxeralfs
Peltier	Fine, mixed, thermic Cumulic Haplaquolls
Pentz	Loamy, mixed, thermic, shallow Ultic Haploxerolls
Pescadero	Fine, montmorillonitic, thermic Aquic Natrixeralfs
Peters	Clayey, montmorillonitic, thermic, shallow Typic Haploxerolls
Piper	Coarse-loamy, mixed (calcareous), thermic Aeric Haplaquents
*Pleito	Fine-loamy, mixed, thermic Calcic Pachic Haploxerolls

TABLE 21.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Ramoth	Coarse-loamy, mixed, thermic Mollic Haploxeralfs
Redding	Fine, mixed, thermic Abruptic Durixeralfs
Reiff	Coarse-loamy, mixed, nonacid, thermic Mollic Xerofluvents
Rindge	Euic, thermic Typic Medisaprists
Rioblancho	Fine-loamy, mixed (calcareous), thermic Typic Duraquolls
Rocklin	Fine-loamy, mixed, thermic Typic Durixeralfs
Ryde	Fine-loamy, mixed, thermic Cumulic Haplaquolls
Sailboat	Fine-loamy, mixed, nonacid, thermic Aquic Xerofluvents
San Joaquin	Fine, mixed, thermic Abruptic Durixeralfs
San Timoteo	Coarse-loamy, mixed (calcareous), thermic Typic Xerorthents
Scribner	Fine-loamy, mixed, thermic Cumulic Haplaquolls
Shima	Sandy or sandy-skeletal, mixed, euic, thermic Terric Medisaprists
Shinkee	Loamy, mixed, euic, thermic Terric Medisaprists
Stockton	Fine, montmorillonitic, thermic Typic Pelloxererts
Stomar	Fine, montmorillonitic, thermic Mollic Haploxeralfs
Timor	Sandy, mixed, thermic Entic Haploxerolls
Tinnin	Sandy, mixed, thermic Entic Haploxerolls
Tokay	Coarse-loamy, mixed, thermic Typic Haploxerolls
Toomes	Loamy, mixed, thermic Lithic Ruptic-Xerorthentic Xerochrepts
Trahern	Fine, montmorillonitic, thermic Natric Duraquolls
Tujunga	Mixed, thermic Typic Xeropsamments
Valdez	Fine-silty, mixed, nonacid, thermic Aeric Fluvaquents
Vallecitos	Clayey, montmorillonitic, thermic Lithic Ruptic-Xerochreptic Haploxeralfs
Vaquero	Fine, montmorillonitic, thermic Entic Chromoxererts
Venice	Euic, thermic Typic Medihemists
Veritas	Coarse-loamy, mixed, thermic Typic Haploxerolls
Vernalis	Fine-loamy, mixed, thermic Calcixerollic Xerochrepts
Vignolo	Fine-silty, mixed, thermic Haplic Durixerolls
Vina	Coarse-loamy, mixed, thermic Cumulic Haploxerolls
Webile	Clayey, mixed, euic, thermic Terric Medisaprists
Willows	Fine, montmorillonitic, thermic Typic Pelloxererts
Wisflat	Loamy, mixed (calcareous), thermic Lithic Xerorthents
Xerofluvents	Xerofluvents
Xerorthents	Xerorthents
Yellowlark	Fine-loamy, mixed, thermic Ultic Haploxeralfs
Zacharias	Fine-loamy, mixed, thermic Typic Xerochrepts

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