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THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

BULLETIN No. 102

SAN DIEGO COUNTY LAND AND WATER USE SURVEY, 1958



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AUGUST 1963

HUGO FISHER
Administrator
The Resources Agency of California

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources



San Diego

State of California
THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

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THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

1120 N STREET, SACRAMENTO

June 6, 1963

Honorable Edmund G. Brown, Governor,
and Members of the Legislature of the
State of California
State Capitol
Sacramento, California

Gentlemen:

I am pleased to transmit herewith Department of Water Resources Bulletin No. 102, "San Diego County Land and Water Use Survey, 1958," which was prepared as a part of the department's continuing program of studies of the use of the water resources of the State, pursuant to Sections 225, 226, and 232 of the Water Code. This type of information is basic to sound planning for future water development.

All of San Diego County, and a portion of southwestern Riverside County were surveyed during the investigation; data on land use and estimates of water use for 1958 are presented in the report. Changes in land and water use since 1948, the year of the previous survey, are also evaluated.

During the 10-year period between 1948 and 1958, there was an increase of about 46 percent in the gross water service area, and the net water use in the area of investigation increased about 34 percent to approximately 249,200 acre-feet per season. It is predicted that with the full development of habitable lands within the coastal portion of this area, net water use will increase about 400 percent, to a total of 1,117,000 acre-feet, or about 993,000 acre-feet in excess of the safe yield of local water resources.

The ever increasing need for water in San Diego County and in other areas of Southern California, coupled with the already deficient local water supplies, points up the urgent need for the importation of additional water to this area.

Sincerely yours,

Director

ACKNOWLEDGMENT

Valuable assistance and data for this investigation and report were contributed by public and private agencies. Special mention is made of the cooperation received from the City of San Diego.

The cooperation and assistance received is gratefully acknowledged.

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

EDMUND G. BROWN, Governor
HUGO FISHER, Administrator, The Resources Agency of California
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CHAPTER I. INTRODUCTION

The story of California's spectacular and unprecedented growth has been typified during the past several decades by the rapid development experienced in San Diego County. San Diego, an area of productive lands and a mild, equable climate has become one of the fastest growing areas in the nation. Large numbers of people have been attracted by the climate and, certain industries, among which aircraft manufacturing is predominant, have located in the area to take advantage of the labor force. In addition, the long frost-free periods have been found highly favorable for production of certain valuable subtropical fruits and other specialty crops.

Development in San Diego County has greatly depended upon the availability of water supplies, and during the past several years, local water storage reserves have been virtually depleted, making large portions of the county almost fully dependent on imported Colorado River water. This report presents information on the rate of urban and agricultural development and the increasing needs of this cultural development for water. It is one of a series of bulletins presenting the results of studies made by the Department of Water Resources pursuant to legislative directive, and contains the results of a land and water use survey conducted in San Diego County and a portion of southwestern Riverside County during the summer of 1958.

Land use information is gathered to obtain basic data from which present water use can be computed and future requirements can be forecast. Knowledge of current patterns of land use not only permits

such computations but, of more importance to the overall planning concept, permits an analysis of the direction and magnitude of land use changes taking place from one survey to another. This information, coupled with computations of changes in unit water requirements, provides a basis upon which future water requirements can be determined and upon which the planning for importation and distribution systems is carried out. The material presented herein is intended for the use of responsible agencies in making the most effective use of existing water supplies and in developing additional supplies to meet current and expected deficiencies.

Authorization

The California Legislature of 1929 enacted legislation, providing for investigations of this kind, as follows:

"SECTION 1. Out of any money in the state treasury not otherwise appropriated, the sum of four hundred fifty thousand dollars*, or so much thereof as may be necessary, is hereby appropriated to be expended by the state department of public works in accordance with law in conducting work of exploration, investigation and preliminary plans in furtherance of a coordinated plan for the conservation, development and utilization of the water resources of California including the Santa Ana river and its tributaries, the Mojave river and its tributaries, and all other water resources of southern California." (California Statutes of 1929, Chapter 832, Section 1)

*Reduced by the Governor to \$390,000.

Subsequent sessions of the Legislature have appropriated funds for support of programs of the Department of Water Resources. Portions of these funds have been utilized for continuing investigations of the water resources of Southern California in accordance with the legislative intent expressed in the foregoing statute and in Sections 225 and 226 of the State Water Code.

In 1956, the Legislature further directed the Department of Water Resources to make continuing investigations to develop "information as to water which can be made available for exportation from the watersheds in which it originates without depriving those watersheds of water necessary for beneficial uses therein." This legislation specifically requested investigation of and reports on the following matters:

"(a) The boundaries of the respective watersheds of the State and the quantities of water originating therein; (b) The quantities of water reasonably required for ultimate beneficial use in the respective watersheds; (c) The quantities of water, if any, available for export from the respective watersheds; (d) The areas which can be served by the water available for export from each watershed; and (e) The present uses of water within each watershed together with the apparent claim of water right attaching thereto, excluding individual uses of water involving diversions of small quantities which, in the judgment of the Director of Water Resources, are insufficient in the aggregate to materially affect the quantitative determinations included in the report." (Calif. Stats. 1956 (Ex. Sess.), ch. 61; Water Code Section 232).

Pursuant to the foregoing legislative directives, the Department of Water Resources began a program of continuing surveys of land and water use in the Southern California area during 1957. Surveys are programmed to be made in one of five portions of the whole area each year on a continuing basis so that land and water use data are determined at regular intervals.

Scope of Investigation and Report

This report contains the results of a comprehensive survey of the nature and extent of land and water use within San Diego County and a portion of southwestern Riverside County. The area of investigation is shown on Plate 1, "Area of Investigation."

Present land use was determined from an assimilation of two field surveys. The Department of Water Resources surveyed most of the investigational area during the summer of 1958. The Planning Department of the City of San Diego inventoried all commercially and industrially zoned areas within its boundaries during 1958, and the results of the City's survey were integrated with the data obtained by the department.

In addition to showing present land use, this report presents estimates of present water use. Data obtained from the land use survey conducted in connection with the preparation of State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," were utilized as the basis for comparison between 1948 and 1958 land and water use patterns. Data on local water supplies, importations of water from outside sources, and sewage exports were developed from material in the department's files and from information obtained from operating agencies in the area of investigation.

Terms used in this report, which require clarification, are defined at the point where they first occur in the text, and are supplemented by a list of definitions, presented in Appendix A.

Land use information collected by the Department of Water Resources is processed by machine techniques which permit the evaluation of this data in terms of a sizable number of hydrologic, geographic, or political subdivisions with different boundaries. The tabulations in the main body of this report give land use within the boundaries which are thought to be the most generally useful. Additional land use tabulations for hydrologic units and subunits are given in Appendix B, and Appendix C contains a list of districts, areas, and units for which

individual tabulations of 1958 land uses can be obtained by machine methods, based on data available in the department's files.

Related Investigations and Reports

The California Legislature in 1947 amended the Water Resources Law of 1945 to authorize the Water Resources Board, a predecessor of the Department of Water Resources, to conduct a comprehensive investigation of water resources throughout the State of California (Calif. Stats. 1945, ch. 1514, p. 2830; as amended by Calif. Stats. 1947, ch. 908; Water Code Section 12616). The investigation had as its purpose the preparation of the California Water Plan. Results of the investigation are contained in three publications: California State Water Resources Board Bulletin No. 1, "Water Resources of California," 1951; California State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," June 1955; and California State Department of Water Resources Bulletin No. 3, "The California Water Plan," May 1957. The investigations for Bulletin No. 2 included a survey of land use in 1948 and determination of water utilization in San Diego County for conditions of 1948.

The following reports contain information pertinent to land and water use within the investigational area:

California State Department of Public Works, Division of Water Resources.

"San Diego County Investigation." Bulletin No. 48. 1935.

----. "Santa Margarita River Investigation." Bulletin No. 57. June 1956.

California State Department of Water Resources. "San Dieguito River Investigation." Bulletin No. 72. November 1959.

----. "Investigation of Alternative Aqueduct Routes to San Diego County." Bulletin No. 61. 1957.

----. "Investigation of Alternative Aqueduct Systems to Serve Southern California." Bulletin No. 78. December 1959.

Stanbery, Van Buren. "Population Analysis and Projections, 1960 and 1970, County and City of San Diego."

CHAPTER II. AREA OF INVESTIGATION

The area under investigation embraces a total of approximately 4,880 square miles and is located in the southwesterly corner of California. The general location of the area is shown on Plate 1, and in greater detail on Plate 2, "Major Water Agencies and Hydrographic Units."

Location and Description

The investigational area includes all of San Diego County and the portion of southwestern Riverside County which is drained by tributaries of the Santa Margarita River, San Luis Rey River and San Mateo Creek. The area is bounded on the south by the international boundary line between the United States and Mexico and by the Pacific Ocean on the west. Orange County bounds the area on the northwest and relatively low-lying drainage divides form the northern boundary in Riverside County. These divides separate the area from the adjacent watershed of the Santa Ana River. Imperial County lies to the east.

Topographically, San Diego County can be divided into two distinct zones: coastal and desert. The coastal zone lies on the western side of the Peninsular Range, which forms the main divide and crosses the county in a southeasterly direction. The coastal segment, which is characterized by rolling hills and mesa lands, includes approximately two-thirds of the area of investigation. The eastern portion or desert area comprises the remaining one-third of the area, and consists of about equal parts of valley and mesa lands.

The climate of San Diego County varies considerably with distance from the ocean, elevation, and topography. The coastal region

enjoys a mild, equable, Mediterranean-type climate, with cool, moist winters and dry summers. Temperatures rarely deviate more than 15 degrees from the annual mean of 71 degrees Fahrenheit, either from day to night, or from winter to summer. The mean seasonal precipitation is approximately 10 inches near the coast and occurs principally in the winter months.

Proceeding inland, as elevations increase, temperature variations become wider and precipitation becomes heavier. At the highest inland elevation of the tributary watershed, average seasonal rainfall is in excess of 40 inches. The climate of the eastern or desert portion of San Diego County is characterized by short, mild winters and exceptionally hot summers, with low humidity and scant rainfall. Average seasonal precipitation is only about 3.5 inches and the greater portion frequently results from localized thunderstorms.

The principal streams draining the coastal section of the area include the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tia Juana Rivers. The Santa Margarita River is formed by Temecula and Murrieta Creeks and begins at the junction of these creeks near the town of Temecula. From this point it flows about 27 miles in a southwesterly direction to a point three miles northwest of Oceanside where it discharges into the Pacific Ocean.

The San Luis Rey River, draining the Aqua Tibia or Palomar Mountains, and the San Dieguito River, known as Santa Ysabel Creek from its source on the west slope of Volcan Mountain to the San Pasqual Valley, are two other main streams draining the northwestern portion of the area. Principal tributaries to the San Dieguito River are Black

Canyon, Temescal, Santa Maria and Guijito Creeks. The San Diego River, the principal stream draining the southern portion of San Diego County, rises near Julian and flows in a southwesterly direction to discharge into the Pacific Ocean. The main tributaries include Cedar, Boulder, Chocolate, Small Fork, Las Coches, and San Vicente Creeks.

The Tia Juana River comprises that part of the main stream below Rodriguez Dam in Mexico, and is about 17 miles long. It flows in a general northwesterly direction, entering the United States from Mexico near the town of San Ysidro. From thence, it drains into the Pacific Ocean about two miles north of the international boundary line. Cottonwood Creek, the principal tributary of the Tia Juana River, rises on the slopes of Laguna Mountain and drains practically all of that part of the basin lying in the United States. It flows in a general southwesterly direction to about four miles below the international boundary line where it joins the main Tia Juana River.

Other streams in San Diego County include the Sweetwater River which drains the Cuyamaca Mountains, and the Otay River draining the San Ysidro Mountains. The runoff in these streams is subject to wide variations from season to season and, because of the nature of its origin in precipitation, occurs almost entirely during the months from November through April.

Hydrographic Units

To aid in hydrologic analysis, the investigational area was subdivided into six hydrographic units, as delineated on Plate 2. For purposes of comparison, these units correspond to those used in State

Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," except that this investigation covered only the portion of the San Juan Capistrano Unit (9-7) lying southerly of the Orange County line, and those portions of Coachella Valley Unit (7-2) and Salton Sea Unit (7-3) which are within San Diego County.

The boundaries of the hydrographic units generally follow topographic divides, with the exceptions noted, but boundaries of San Diego Hydrographic Unit (9-10), also termed the San Diego Metropolitan Area, were selected on the basis of the probable ultimate limits of intensive urbanization. Table 1 lists the six hydrographic units and their areas within the area of investigation.

TABLE 1

AREAS OF HYDROGRAPHIC UNITS IN SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY

Hydrographic unit	:	Acres
San Juan Capistrano	(9-7)	118,500
Santa Margarita-San Luis Rey	(9-8)	870,500
San Dieguito-Cottonwood	(9-9)	988,300
San Diego	(9-10)	333,300
Coachella Valley	(7-2)	20,500
Salton Sea	(7-3)	<u>790,100</u>
TOTAL		<u>3,121,200</u>

Agricultural Development

The first known agricultural development in San Diego County came with the founding of San Diego Mission by the Franciscan Fathers in 1769. Water from the San Diego River, originally obtained by surface diversion and later supplemented by wells dug in the river, was used to



Irrigated Lands in San Diego County

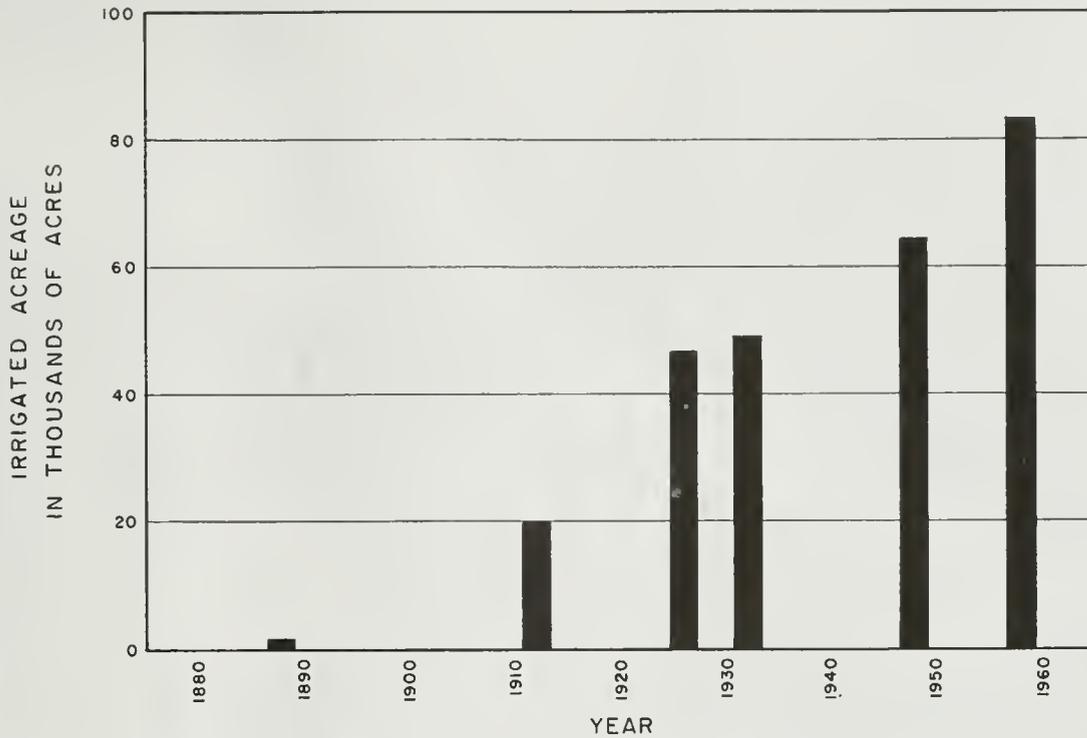
irrigate fields surrounding the Mission. Similar agricultural development accompanied the establishment of the Mission San Luis Rey.

It was not until the latter half of the 19th century that significant expansion of irrigation began. This development was brought about mainly by completion of the first railroad in 1885 and the resulting real estate boom. However, until the completion of the Sweetwater and Cuyamaca water systems, irrigation was confined to the small and scattered areas in the various stream basins. The irrigated acreage increased steadily as additional surface water storage and diversion facilities were constructed, and as ground water supplies were utilized.

Winter truck crops were first produced commercially near San Diego about 1910, and in 1915, avocados and other subtropical fruit were introduced to the area. The mild climate with long frost-free periods was found highly favorable for production of these crops and was, therefore, influential in stimulating an intensive agricultural development in areas where water was available. The growth of irrigated agriculture in San Diego County, based on surveys made in 1888, 1912, 1926, 1932, 1948, as well as 1958, is shown on Figure 1.

The amount of irrigated agriculture increased over 10 times between 1888 and 1912, and 133 percent between 1912 and 1926. These were the periods in which increasing amounts of water were developed for irrigation purposes. Increases in irrigated agriculture acreage between 1926 and 1932 were minor, but following that period lands were brought into production at an increasing rate.

The pattern of agricultural land use has remained fairly stable during the past half century, with avocados, citrus, and truck crops



HISTORICAL USE OF LAND FOR IRRIGATED AGRICULTURE IN
SAN DIEGO COUNTY

FIGURE I

continuing as the principal produce of the area. Although there has been a recent increase in the amount of acreage devoted to irrigated pasture, this use continues to be of lesser importance.

Urban and Suburban Development

In the past several years, San Diego has become one of the most rapidly developing urban areas in the nation. Although the total water service area is presently almost equally divided between irrigated agricultural and urban-suburban lands, the county is fast becoming a predominantly urban-suburban area.



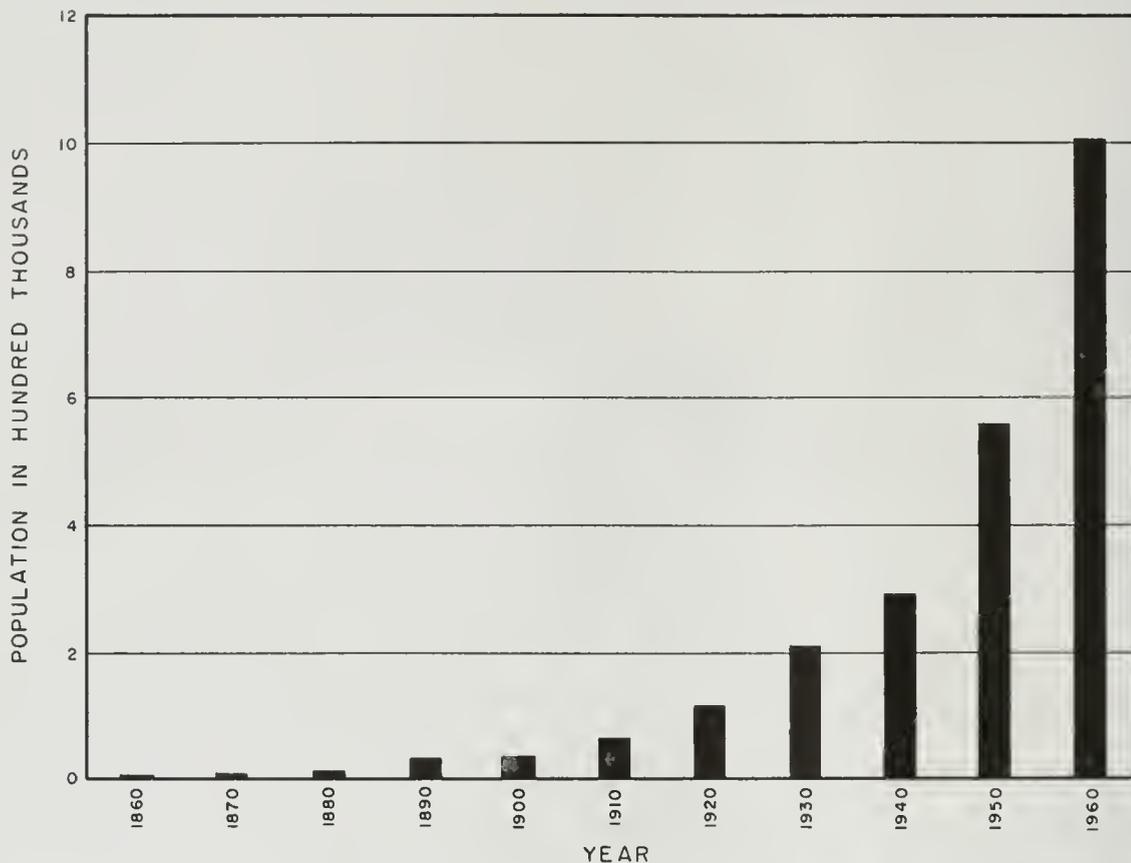
Urban Growth Along the Coast

During the period between 1948 and 1958, the increase in urban-suburban lands was 74 percent, or about 3 times as great as the percentage increase experienced in irrigated agriculture. This tremendous growth of urban-suburban lands is most apparent in the densely populated San Diego metropolitan area and the less populous but rapidly growing communities of Escondido, Oceanside, Carlsbad, Fallbrook, and Rainbow. This urbanization has largely taken place on agricultural lands immediately adjacent to existing urban areas, although the loss of agricultural land has been more than offset by expansion of agriculture on formerly undeveloped lands.

Major industries in the area are aircraft manufacturing and fishing. In addition, the headquarters of the 11th Naval District, including training, repair, air, supply, and radio facilities are located in the San Diego metropolitan area. Camp Pendleton, the largest Marine Corps base in the nation, is located near Oceanside.

The population of San Diego County grew slowly until the latter part of the 19th century being in large part limited by lack of firm water supplies and adequate transportation facilities. After the turn of the century, however, with the initiation of several water development projects and the completion of the first railroad, the area's population began a generally steady but accelerated growth. This growth is shown graphically on Figure 2.

During the first half of the century, San Diego experienced a more rapid growth in population than either the State or nation. As



POPULATION IN SAN DIEGO COUNTY, 1860 TO 1960

FIGURE 2

shown on Figure 2, the population of San Diego County increased to 1,033,000 in 1960. Some 573,200 persons resided within the San Diego City limits in 1960.

The investigational area also includes a portion of southwestern Riverside County but population data for this area were not available for 1950. However, from the 1960 U. S. Bureau of the Census Report, it was determined that about 2,500 persons resided in the Riverside portion of the investigational area. The total population of the investigational area was about 1,035,500 in 1960.

Water Supply

Water supplies for the urban and agricultural developments in the coastal portion of the investigational area have historically been derived from surface storage developments and, to a lesser extent, by pumping from ground water storage. In recent years, increasing amounts of water imported from the Colorado River through the San Diego aqueduct have been utilized. The limited development in the desert areas is almost solely dependent on ground water extractions.

Local Water Supply

Historical development of local water supplies in the coastal portion of the investigational area was begun in connection with the San Diego missions in the early part of the nineteenth century, however, rapid growth did not begin until 1888, following construction of the surface water supply developments on the Sweetwater River and on Boulder Creek, a tributary of the San Diego River. Since that time, major surface water storage and diversion developments have been constructed on all of the principal streams in the investigational area, with the exception of the Santa Margarita River. The combined storage capacity of the surface reservoirs is about 736,800 acre-feet. Studies conducted in connection with the preparation of Department of Water Resources Bulletin No. 61, "Investigation of Alternative Aqueduct Routes to San Diego County," indicate that these reservoirs have a nominal safe yield of about 66,000 acre-feet per season.

Subsequent to the availability of Colorado River water, it has become the practice of the City of San Diego to operate their reservoirs

on a maximum yield basis. Under this type of operation winter runoff stored in the reservoirs is released for use as rapidly as possible in an endeavor to reduce evaporation losses and thus increase efficiency of use. This method of operation also provides greater storage capacity for conservation during the infrequent years of high runoff, so that waste to the ocean is reduced. However, this method of operation requires greater dependence on imported water supplies during drought periods.

Local water developments based on extractions from water-bearing formations have played a less significant role in urban and agricultural development of coastal San Diego County than in most other areas of Southern California. In general, ground water extractions have been limited to the recent alluvium, as older formations usually have a low yield and often contain water of poor quality. For the most part, the recent alluvial deposits are of limited extent and storage capacity, so that conservation of water supplies and cyclic regulation of erratic stream flows by ground water storage is limited. The areal extent of the ground water basins is delineated on Plate 3, "Ground Water Basins and Hydrologic Units and Subunits." Studies made in connection with the preparation of Division of Water Resources Bulletin No. 48, "San Diego County Investigation," published in 1935 indicate that the safe local yield (the yield assuming no imported supplies are available) of the ground water basins in the coastal portions of the area of investigation, including southwestern Riverside County, is on the order of 58,000 acre-feet.

The safe yield of the ground water basins in the desert portion of San Diego County is not known. However, in the preparation of

Bulletin No. 2, it was assumed that this yield was approximately equal to the requirements in 1950, or about 10,000 acre-feet, and this value is also adopted for use herein.

The total safe local yield in the area of investigation is therefore equal to approximately 134,000 acre-feet, comprising 66,000 acre-feet of surface water and 68,000 acre-feet of ground water. These estimates of local water supplies reflect mean hydrologic conditions for the period from 1887 to 1933 for the Bulletin No. 48 study, and 1887-88 to 1948-49 for the Bulletin No. 61 study. These derived values do not reflect the possible lowering effect of the extended period of below-normal rainfall which has continued in the investigated area for several years.

Imported Supply

Water is imported to coastal San Diego County through the facilities of the Colorado River Aqueduct of The Metropolitan Water District of Southern California and the First and Second San Diego Aqueducts. Table 2 presents the seasonal deliveries of imported Colorado River water to San Diego County.

The First San Diego Aqueduct was constructed with two barrels of approximately equal capacity totaling about 200 second-feet. The first barrel was constructed by the United States Navy and completed in 1947 as an emergency measure to provide water supplies made necessary by expansion of military and industrial installations and the attendant population increases resulting from World War II. The second barrel of the aqueduct was constructed by the U. S. Bureau of Reclamation and

TABLE 2

HISTORICAL SEASONAL DELIVERIES OF IMPORTED
COLORADO RIVER WATER TO SAN DIEGO COUNTY
BY THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

In acre-feet

Season ending September 30	:	Total delivered
1947-48		59,000
1948-49		70,900
1949-50		70,300
1950-51		75,100
1951-52		45,100
1952-53		45,300
1953-54		72,800
1954-55		111,500
1955-56		142,100
1956-57		144,400
1957-58		135,600
1958-59		110,600

completed in 1954. Ownership and operation of the aqueduct were assumed by the San Diego County Water Authority by contract with the United States which provides for repayment of the construction costs by the former agency with partial assistance by The Metropolitan Water District of Southern California.

Shortly after completion of the First San Diego Aqueduct, it became apparent that additional imported water would soon be required to supply the needs of the San Diego County Water Authority. The Metropolitan Water District of Southern California constructed the northern portion of the Second San Diego Aqueduct to a point six miles southerly of the Riverside-San Diego County line, and the San Diego

County Water Authority constructed the remaining portion in San Diego County, completing work in 1960. The Second Aqueduct lies generally parallel to and approximately six miles westerly of the First San Diego Aqueduct. The portion constructed by the San Diego County Water Authority has an initial capacity of about 250 second-feet. The completed First San Diego Aqueduct and the presently completed stage of the Second San Diego Aqueduct provide a combined capacity of 450 second-feet.

Waste Water Disposal

The waste water effluents within the investigational area are discharged to the Pacific Ocean or nearby tidal lagoons; discharged to stream channels, where effluent either percolates to underlying ground water basins, or is pumped directly for irrigation purposes; or are disposed of in cesspools or septic tanks. In addition, some discharges which would otherwise be lost to the ocean are reclaimed for reuse. For purposes of this investigation, it was assumed that waste water effluents discharged to the ocean or tidal lagoons were irrecoverably lost but that all other effluents were available for reuse.

In 1958 discharges to the ocean were made from a number of cities and communities in the area of investigation including San Diego, Chula Vista, Carlsbad, Imperial Beach, Palm City, Coronado, Del Mar, Cardiff, Solana Beach, and San Ysidro which discharges to the International Outfall Sewer. Available records of discharge to the ocean from these plants vary in length, and in a number of cases consist only of estimated flows. Based upon available data it was estimated that discharges to the ocean or its tidal waters during the 1957-58 water

year, totaled about 59,000 acre-feet. Estimates for the 1950-51 water year indicate the discharges to the ocean were on the order of 38,000 acre-feet.

An indication of problems of water shortage in San Diego County may be seen from the efforts which have recently been made to reclaim water from sewage formerly discharged to the ocean. This sewage was reclaimed for replenishment of ground water and for direct irrigation. Examples of reclamation projects include that of the City of Oceanside, which began reclaiming water for ground water replenishment and irrigation in 1958, and the Encinitas Sanitary District which began selling effluent for the irrigation of flowers in 1958.





Urban Development and Irrigated Agriculture in the Escondido Area

CHAPTER III. LAND USE

The type, location, and areal extent of land use within the study area were determined by a compilation of data from a survey conducted by the Department of Water Resources during the summer of 1958, and from a survey conducted by the City of San Diego Planning Department during 1958. The results of these surveys are presented in this chapter along with a discussion of methods and procedures, and tabulations of land use within the various hydrographic units or other appropriate subdivisions of the investigational area. This chapter also presents comparisons of land uses found during the present survey and during previous surveys.

Methods and Procedures

In order to relate present land use data to historical data, survey procedures similar to those used in Bulletin No. 2 were employed. Departmental survey teams delineated acreages of the various land use types in the field on the most recent vertical aerial photographs of the area which were available. In the office, field delineations were transferred by projection to acetate overlays of United States Geological Survey quadrangle maps with a scale of 1 inch equal to 2,000 feet. These maps served as area control maps, ensuring the accuracy of the succeeding processes while the acetate overlays served as masters for reproducing land use delineations on vellum prints. The areas of land use types were cut from the vellum prints and weighed, and by machine computing processes these weights were converted into total acreages of individual land use types. Because of the control developed as the result of the use of quadrangles, the resulting overall acreage values can be considered accurate to within about

plus or minus three percent. However, acreage values for individual areas should not be considered to have an accuracy of more than plus or minus five percent.

All commercially and industrially zoned areas within the City of San Diego were inventoried by the Planning Department of that city. These commercially and industrially zoned areas, in addition to containing commercial and industrial establishments, also contained some residential areas, and large acreages of vacant land. The results of the study by the city were adjusted to conform with the department's land use classes and incorporated into the summary tables. Plates 4A and 4B, "Present Land Use, 1958," which show the detailed pattern of land use in the investigational area, do not show any differentiation between the various classes of land use occurring in the commercially and industrially zoned areas.

For purposes of a critical hydrologic analysis, it would be desirable to determine and compile the types of land use, either undeveloped or developed, for the entire area of the hydrographic unit, permitting a comprehensive analysis and evaluation of the various levels of water use for the entire area. However, such a complete compilation is time consuming and expensive, and it is the usual practice to map only those types of land use requiring applied water in areas which are not underlain by water-bearing material. All other types of land use in the areas not underlain by water-bearing material are tabulated in a category called "Unclassified."

Classification of Land Use

For purposes of analysis and presentation, the various land uses were grouped into two major categories under water service areas - Urban

and Suburban, and Irrigated Agriculture; and into three major categories under nonwater service areas - Nonirrigated Agriculture, Native Vegetation and Unclassified. The major categories under water service areas each include several classes of land use, and these several classes consist of various types of land use. The objective of this classification procedure was to group the various types of land use into classes, each of which were considered to require similar amounts of water.

The major categories, specific classes, and types of land use included in the classification are as follows:

WATER SERVICE AREA

Urban and Suburban

- Residential Single and multiple family houses and apartments, rest homes, trailer parks, and residential subdivisions under construction at time of survey.
- Commercial All classes of commercial enterprises, including strip commercial and downtown commercial areas, schools, and hospitals.
- Industrial All classes of industrial land use involving manufacturing, processing, and packaging, but excluding extractive industries (oil, sand, and gravel), air fields, storage, distribution and transportation facilities.
- Unsegregated urban and suburban area Dairies, farmsteads, livestock ranches, parks, cemeteries, and golf courses.
- Included nonwater service area Oil fields, tank farms, vacant lots, quarries, gravel pits, warehouses and storage yards, railroads, public streets, and landing strips of air fields.

Irrigated Agriculture

Alfalfa	Alfalfa raised for hay, seed, or pasture.
Pasture.	Irrigated grasses and legumes other than alfalfa used for livestock forage.
Citrus and subtropical	Oranges, lemons, grapefruit, tangerines, avocados, dates, and olives.
Truck crops	Fresh vegetables of all varieties, melons, flower seed, and nursery crops.
Field crops	Cotton, sorghums, flax, sugar beets, and field corn.
Deciduous fruits and nuts	All varieties of deciduous fruits and nuts.
Small grains.	Barley, wheat and oats.
Vineyards	All varieties.
Included nonwater service area	Public highways and roads, farm access roads, canals, drainage ditches and other inclusions not devoted to crop production, including fallow, idle, and abandoned lands.

NONWATER SERVICE AREA

Nonirrigated Agriculture	All varieties of dry-farmed crops, including pasture overlying defined ground water basins.
Native Vegetation	Native grasses, brush and trees, including phreatophytes overlying defined ground water basins.
Unclassified	Bare ground, including river washes, beaches, and water surface overlying defined ground water basins. It also includes nonirrigated agriculture and native vegetation not overlying defined ground water basins.

The classes of land use given here are similar to those used in Bulletin No. 2, except that schools, included in "Unsegregated Urban and Suburban Area," in Bulletin No. 2 are herein classified as "Commercial"; in addition, parks, golf courses and cemeteries classified as "Irrigated Pasture" in Bulletin No. 2 are considered "Unsegregated Urban and Suburban Area" in this report.

In delineating land use types in the field, no attempt was made to exclude such items as streets, roads, railroads, power line rights-of-way and other essentially nonwater-using lands occurring within the surveyed areas. Instead, these land uses were classified as "Included Nonwater Service Area," and were extracted from gross land use totals by applying to each land use class a percentage value appropriate for that class. The major classes of land use and appropriate reduction factors are presented in Table 3. The net acreage values used in the tables summarizing land use represent the gross acreage values minus those portions of the gross values which have been deducted for these "Included Nonwater Service Areas."

TABLE 3

FACTORS FOR REDUCTION OF GROSS AREAS
TO NET WATER SERVICE AREAS

Land use	: Percent deducted : from gross area
Residential	25
Commercial	35
Industrial manufacturing	25
Parks, cemeteries and golf courses	15
Farmsteads, feed lots, dairies	10
Irrigated agriculture	5

Many areas located within military reservations throughout the area of investigation are restricted to entry and have not been field mapped. Therefore, the land use occurring within the boundaries of such large military reservations as Camp Pendleton and Camp Elliot is included in the summary tables under the category "Unclassified."

Results of Land Use Survey

Data derived from this land use survey are compiled in Table 4 according to hydrographic units, and in Table 5 by counties. In Appendix B, these data are tabulated according to the hydrologic units and subunits delineated on Plate 3. These tables show that at the time of the survey the gross acreage requiring water service within the area of investigation was about 179,800 acres, of which about 89,300 acres, or 50 percent, were devoted to irrigated agriculture. With regard to Table 5, it should be noted that all land use requiring applied water in the San Juan Capistrano Unit is within a military reservation, and in accordance with the land use definitions used herein is placed in the "Unclassified" category.

Detailed information concerning the pattern of land use as determined from this survey may be found on Plates 4A and 4B. Although the acreages of nonwater service areas within urban and suburban and irrigated agricultural areas are shown separately on the summary tables, they were not differentiated on the plates. Also, not differentiated on these plates were developed nonwater service lands, such as nonirrigated agriculture, and undeveloped nonwater service lands, such as native vegetation.

A determination of the amount and location of lands considered susceptible of intensive water-using development in coastal San Diego County and southwestern Riverside County was made in connection with the

UNITS OF SAN DIEGO COUNTY
IN RIVERSIDE COUNTY IN 1958

res

Coastal		Hydrographic Unit			Totals
		Desert			
San Dieguito- Cottonwood (9-9)	San Diego (9-10)	Coachella Valley (7-2)	Salton Sea (7-3)		
5,020	32,920	0	280		41,120
550	2,780	0	30		3,740
70	840	0	10		990
<u>2,830</u>	<u>4,160</u>	<u>0</u>	<u>90</u>		<u>9,070</u>
8,470	40,700	0	410		54,920
<u>3,310</u>	<u>29,530</u>	<u>0</u>	<u>490</u>		<u>35,500</u>
11,780	70,230	0	900		90,420
1,010	1,100	0	1,610		6,140
3,560	1,950	0	470		10,300
13,320	5,220	0	90		31,870
1,240	5,750	0	420		13,090
50	460	0	380		1,750
960	140	0	60		2,020
3,500	890	0	580		6,390
<u>550</u>	<u>40</u>	<u>0</u>	<u>1,990</u>		<u>2,750</u>
24,190	15,550	0	5,600		74,310
960	4,260	0	70		6,650
<u>2,180</u>	<u>2,650</u>	<u>0</u>	<u>1,390</u>		<u>8,380</u>
<u>27,330</u>	<u>22,460</u>	<u>0</u>	<u>7,060</u>		<u>89,340</u>
39,110	92,690	0	7,960		179,760
48,190	6,240	0	2,280		156,570
35,840	21,510	8,510	304,960		488,060
<u>865,120</u>	<u>212,800</u>	<u>12,010</u>	<u>474,900</u>		<u>2,296,770</u>
<u>949,150</u>	<u>240,550</u>	<u>20,520</u>	<u>782,140</u>		<u>2,941,400</u>
988,260	333,240	20,520	790,100		3,121,160

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TABLE 4

LAND USE IN HYDROGRAPHIC UNITS OF SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958

In Acres

Category and Class of Land Use	Hydrographic Unit						Totals
	Coastal				Desert		
	San Juan Capistrano* (9-7)	Santa Margarita- San Luis Rey (9-8)	San Dieguito- Cottonwood (9-9)	San Diego (9-10)	Coachella Valley (7-2)	Salton Sea (7-3)	
WATER SERVICE AREA							
<u>Urban and Suburban</u>							
Residential	0	2,900	5,020	32,920	0	280	41,120
Commercial	0	380	550	2,780	0	30	3,740
Industrial	0	70	70	840	0	10	990
Unsegregated urban and suburban area	0	<u>1,990</u>	<u>2,830</u>	<u>4,160</u>	0	<u>90</u>	<u>9,070</u>
Subtotals	0	5,340	8,470	40,700	0	410	54,920
Included Nonwater Service Area	0	<u>2,170</u>	<u>3,310</u>	<u>29,530</u>	0	<u>490</u>	<u>35,500</u>
Gross Urban and Suburban Area	0	7,510	11,780	70,230	0	900	90,420
<u>Irrigated Agriculture</u>							
Alfalfa	0	2,420	1,010	1,100	0	1,610	6,140
Pasture	0	4,320	3,560	1,950	0	470	10,300
Citrus and subtropical	0	13,240	13,320	5,220	0	90	31,870
Truck crops	0	5,680	1,240	5,750	0	420	13,090
Field crops	0	860	50	460	0	380	1,750
Deciduous fruits and nuts	0	860	960	140	0	60	2,020
Small grains	0	1,420	3,500	890	0	580	6,390
Vineyards	0	<u>170</u>	<u>550</u>	<u>40</u>	0	<u>1,990</u>	<u>2,750</u>
Subtotals	0	28,970	24,190	15,550	0	5,600	74,310
Fallow	0	1,360	960	4,260	0	70	6,650
Included Nonwater Service Area	0	<u>2,160</u>	<u>2,180</u>	<u>2,650</u>	0	<u>1,390</u>	<u>8,380</u>
Gross Irrigated Agriculture	0	<u>32,490</u>	<u>27,330</u>	<u>22,460</u>	0	<u>7,060</u>	<u>89,340</u>
GROSS WATER SERVICE AREA	0	40,000	39,110	92,690	0	7,960	179,760
<u>NONWATER SERVICE AREA</u>							
Nonirrigated Agriculture	0	99,860	48,190	6,240	0	2,280	156,570
Native Vegetation	0	117,240	35,840	21,510	8,510	304,960	488,060
Unclassified	<u>118,520</u>	<u>613,420</u>	<u>865,120</u>	<u>212,800</u>	<u>12,010</u>	<u>474,900</u>	<u>2,296,770</u>
GROSS NONWATER SERVICE AREA	<u>118,520</u>	<u>830,520</u>	<u>949,150</u>	<u>240,550</u>	<u>20,520</u>	<u>782,140</u>	<u>2,941,400</u>
TOTALS	118,520	870,520	988,260	333,240	20,520	790,100	3,121,160

*All land use requiring applied water is within a military reservation, and appears in the category "unclassified".

TABLE 5

LAND USE IN SAN DIEGO COUNTY AND A PORTION OF
SOUTHWESTERN RIVERSIDE COUNTY IN 1958

In Acres

Category and Class of Land Use	:Riverside:	San Diego:	Totals
	: County	: County	
<u>WATER SERVICE AREA</u>			
<u>Urban and Suburban</u>			
Residential	160	40,960	41,120
Commercial	70	3,670	3,740
Industrial	*	990	990
Unsegregated urban and suburban area	<u>720</u>	<u>8,350</u>	<u>9,070</u>
Subtotals	950	53,970	54,920
Included Nonwater Service Area	<u>220</u>	<u>35,280</u>	<u>35,500</u>
Gross Urban and Suburban Area	1,170	89,250	90,420
<u>Irrigated Agriculture</u>			
Alfalfa	1,840	4,300	6,140
Pasture	1,300	9,000	10,300
Citrus and subtropical	300	31,570	31,870
Truck crops	1,240	11,850	13,090
Field crops	340	1,410	1,750
Deciduous fruits and nuts	160	1,860	2,020
Small grains	100	6,290	6,390
Vineyards	*	<u>2,750</u>	<u>2,750</u>
Subtotals	5,280	69,030	74,310
Fallow	550	6,100	6,650
Included Nonwater Service Area	<u>400</u>	<u>7,980</u>	<u>8,380</u>
Gross Irrigated Agriculture	<u>6,230</u>	<u>83,110</u>	<u>89,340</u>
GROSS WATER SERVICE AREA	7,400	172,360	179,760
<u>NONWATER SERVICE AREA</u>			
<u>Nonirrigated Agriculture</u>	68,440	88,130	156,570
<u>Native Vegetation</u>	86,220	401,840	488,060
<u>Unclassified</u>	<u>244,190</u>	<u>2,052,580</u>	<u>2,296,770</u>
GROSS NONWATER SERVICE AREA	<u>398,850</u>	<u>2,542,550</u>	<u>2,941,400</u>
TOTALS	406,250	2,714,910	3,121,160

*Less than 5 acres.

preparation of Department of Water Resources Bulletin No. 78, "Investigation of Alternative Aqueduct Systems to Serve Southern California." In that report the estimated gross urban and suburban acreage in the year 2020, in coastal San Diego County and the portion of Riverside County within the area of this investigation, in Hydrographic Units 7, 8, 9 and 10, was 352,000 acres. The gross urban and suburban water service area determined from the 1958 survey in these Hydrographic Units occupies 89,500 acres, or 25 percent of the forecast area. The estimated net irrigated acreage for the year 2020 was forecast to be 178,000 acres. This compares to a net acreage of 68,700 acres in 1958 or 39 percent of the forecast value. The results of another study conducted in the desert portion of San Diego County in Hydrographic Unit 3, in connection with the preparation of Bulletin No. 2, indicated 78,800 gross acres susceptible of intensive water-using development under ultimate conditions, which compares with the present gross water service area of about 8,000 acres, or 10 percent of the total susceptible of development.

A tabulation of land use as observed within the boundaries of the water agencies which are constituent members of the San Diego County Water Authority is presented in Table 6. This table shows that about 489,300 acres are included within the boundaries of the San Diego County Water Authority, which is a member agency of The Metropolitan Water District of Southern California. Of this total, about 134,700 acres, or 28 percent of the area, are devoted to land uses requiring water service. This water service area represents 78 percent of the total water service area in San Diego County, and 75 percent of the total for the entire investigational area.

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00	610	50	630	37,670
70	60	20	30	3,200
20	10	^b	10	940
20	<u>400</u>	<u>320</u>	<u>40</u>	<u>5,650</u>
10	1,080	390	710	47,460
00	<u>520</u>	<u>70</u>	<u>240</u>	<u>31,500</u>
10	1,600	460	950	78,960
70	50	70	0	650
80	740	1,210	0	4,230
70	570	790	4,210	27,540
70	260	220	50	9,140
0	0	10	0	220
60	30	520	0	1,230
40	190	1,220	0	2,250
70	<u>30</u>	<u>180</u>	<u>0</u>	<u>700</u>
60	1,870	4,220	4,260	45,960
60	170	290	0	4,790
10	<u>120</u>	<u>440</u>	<u>220</u>	<u>5,030</u>
30	<u>2,160</u>	<u>4,950</u>	<u>4,480</u>	<u>55,780</u>
40	3,760	5,410	5,430	134,740
30	1,040	1,380	0	31,160
30	2,860	1,580	70	36,210
60	<u>12,370</u>	<u>46,880</u>	<u>2,650</u>	<u>287,210</u>
10	<u>16,270</u>	<u>49,840</u>	<u>2,720</u>	<u>354,580</u>
50	20,030	55,250	8,150	489,320

preparation of Department of Water Resources Bulletin No. 78, "Investigation of Alternative Aqueduct Systems to Serve Southern California." In that report the estimated gross urban and suburban acreage in the year 2020, in coastal San Diego County and the portion of Riverside County within the area of this investigation, in Hydrographic Units 7, 8, 9 and 10, was 352,000 acres. The gross urban and suburban water service area determined from the 1958 survey in these Hydrographic Units occupies 89,500 acres, or 25 percent of the forecast area. The estimated net irrigated acreage for the year 2020 was forecast to be 178,000 acres. This compares to a net acreage of 68,700 acres in 1958 or 39 percent of the forecast value. The results of another study conducted in the desert portion of San Diego County in Hydrographic Unit 3, in connection with the preparation of Bulletin No. 2, indicated 78,800 gross acres susceptible of intensive water-using development under ultimate conditions, which compares with the present gross water service area of about 8,000 acres, or 10 percent of the total susceptible of development.

A tabulation of land use as observed within the boundaries of the water agencies which are constituent members of the San Diego County Water Authority is presented in Table 6. This table shows that about 489,300 acres are included within the boundaries of the San Diego County Water Authority, which is a member agency of The Metropolitan Water District of Southern California. Of this total, about 134,700 acres, or 28 percent of the area, are devoted to land uses requiring water service. This water service area represents 78 percent of the total water service area in San Diego County, and 75 percent of the total for the entire investigational area.

TABLE 6
 LAND USE IN MEMBER AGENCIES OF THE SAN DIEGO COUNTY
 WATER AUTHORITY IN 1958

In acres

Category and class of land use	San Diego County Water Authority																								Total
	City of	City of	City of	City of	Helix	Helix	San Diego	Santa Fe	South Bay	South Bay	Bueno	Colorado	Carlsbad	Carlsbad	Otay	Otay	Poway	Rainbow	Rainbow	Ranona	Rincon	Rio	Valley	Fallbrook	
	Eacondido	National City	Oceanside	San Diego	Irrigation District	Overlapping District	Irrigation District	Irrigation District	Irrigation District	Overlapping District	Water District														
WATER SERVICE AREA																									
Urban and Suburban																									
Residential	840	1,150	1,010	17,970	7,370	23	730	430	2,740	a	2,240	b	640	0	100	b	140	180	0	160	700	610	50	630	37,670
Commercial	70	197	150	1,420	510	0	70	40	280	0	160	0	60	0	10	0	20	10	0	30	70	60	20	30	3,200
Industrial	20	20	30	700	40	0	0	50	50	0	20	0	10	0	0	0	0	0	0	0	20	10	10	10	940
Unsegregated urban and suburban area	b	20	250	1,420	230	0	30	270	440	0	520	0	80	0	240	50	120	230	0	670	420	400	320	40	5,650
Subtotals	930	1,380	1,440	21,510	8,150	20	830	750	3,510	a	2,940	b	790	0	350	50	280	420	0	860	1,210	1,080	390	710	47,460
Included Nonwater Service Area	470	1,030	850	17,500	5,580	10	290	380	2,020	100	1,040	b	540	0	210	30	80	100	0	320	400	520	70	240	31,500
Gross Urban and Suburban Area	1,400	2,410	2,290	39,010	13,730	30	1,120	1,130	5,530	100	3,980	b	1,330	0	560	80	360	520	0	1,180	1,610	1,600	460	940	78,960
Irrigated Agriculture																									
Alfalfa	30	0	0	330	0	0	0	0	0	0	60	0	0	0	40	20	10	0	0	10	70	50	70	0	650
Pasture	30	0	170	430	260	0	20	60	150	0	240	0	10	0	80	0	110	150	0	190	380	740	1,210	0	4,230
Citrus and subtropical	180	0	290	20	1,990	0	550	1,520	300	a	5,630	b	0	0	340	0	730	3,670	0	120	6,070	570	790	4,210	27,540
Truck crops	10	30	430	2,360	410	0	550	100	1,220	40	820	0	1,000	0	880	240	30	1,000	20	0	70	260	220	50	9,140
Field crops	20	0	70	50	0	0	10	10	0	0	10	0	10	0	30	0	0	0	0	0	0	0	0	0	220
Deciduous fruits and nuts	0	0	10	0	30	0	10	30	0	b	360	0	0	0	10	0	40	20	0	10	160	30	520	0	1,230
Small grains	0	0	70	0	40	0	0	10	0	0	90	0	0	0	450	0	30	10	0	100	40	190	1,220	0	2,250
Vineyards	40	0	20	0	10	0	0	0	0	0	90	0	0	0	0	0	160	0	0	0	170	30	180	0	700
Subtotals	310	30	1,060	3,180	2,740	0	1,140	1,720	1,680	40	7,300	b	1,590	0	1,830	260	1,110	4,850	20	430	6,960	1,870	4,220	4,260	45,960
Fallow	b	0	90	1,590	220	0	60	20	610	0	320	0	100	0	1,270	360	40	90	0	120	160	170	290	0	4,790
Included Nonwater Service Area	20	10	60	950	320	0	90	180	630	0	530	0	120	0	410	210	160	280	0	90	610	120	440	220	5,030
Gross Irrigated Agriculture	330	40	1,210	5,720	3,280	0	1,290	1,920	2,920	40	8,150	b	1,810	0	3,510	830	1,310	5,220	20	640	7,730	2,160	4,950	4,480	55,780
GROSS WATER SERVICE AREA	1,730	2,450	3,500	44,730	17,010	30	2,410	3,050	8,450	140	12,130	b	3,140	0	4,070	910	1,670	5,740	20	1,820	9,340	3,760	5,410	5,430	134,740
NONWATER SERVICE AREA																									
Nonirrigated Agriculture																									
Native Vegetation	320	390	1,570	4,920	3,240	0	50	340	2,770	b	4,410	20	880	0	3,030	240	1,800	4,490	0	1,270	2,480	2,860	1,580	70	36,210
Unclassified	10	1,910	10,720	57,100	9,780	60	1,530	6,510	5,060	10	29,920	1,280	15,830	50	49,080	3,810	6,320	24,990	140	4,260	7,550	12,370	46,880	2,550	287,210
GROSS NONWATER SERVICE AREA	520	2,300	12,620	63,020	13,500	60	1,590	7,030	8,180	10	39,570	1,360	17,940	50	53,810	4,050	9,450	30,660	140	18,220	13,010	16,270	49,840	2,720	354,580
TOTALS	2,250	4,750	16,120	107,750	30,510	90	4,000	10,080	16,630	150	51,700	1,360	21,080	50	57,880	4,960	11,120	36,400	160	20,040	22,350	20,030	55,250	8,150	489,320

a. Overlapping acreage considered here as being part of the city.
 b. Less than 10 acres.





Spence Air Photos
1950



Urban Expansion in San Diego, 1950 to 1957

Spence Air Photos
1957

Recent Changes in Land Use

Recent changes in land use in the area of investigation, are indicated by the data presented in Table 7. This table lists the acreages of the various classes of land use determined from a survey made in the coastal portion of the investigational area in 1948, and from a 1950 survey of the desert portion of the area, together with those resulting from the 1958 survey.

The data indicate that during the period between the surveys, the gross area requiring water service increased 56,400 acres, from 123,400 acres to 179,800 acres, or 46 percent. The gross urban and suburban water service area increased by 38,400 acres, or about 74 percent, and the gross irrigated agricultural water service area increased by 18,000 acres, or about 25 percent.

Much of the urban and suburban development since 1948 has occurred along the coastal strip from Oceanside south to San Diego, and also inland in the vicinity of El Cajon. Some of this urban and suburban development has been on lands formerly devoted to irrigated agriculture, particularly in the general vicinity of the City of San Diego. However, this has been more than offset by the expansion of irrigated agriculture into adjacent areas which were formerly undeveloped. The increases in both urban and suburban and irrigated agricultural acreages, in coastal San Diego County, have been made possible primarily through the increased availability and the use of water imported from the Colorado River.

The recent changes which have occurred in the uses of land in the investigational area are delineated on Plates 5A and 5B, "Change in Land Use, 1948 to 1958."

Santa Margarita-San Luis Rey Unit (9-8)

The gross water service area in the Santa Margarita-San Luis Rey Unit increased about 11,200 acres, or 39 percent, between 1948 and 1958. Approximately 3,000 acres of this total expansion were in urban and suburban development, and 8,200 acres were in irrigated agricultural development. The crops accounting for most of the agricultural acreage increase were citrus and subtropical fruits, pasture, and truck crops.

San Dieguito-Cottonwood Unit (9-9)

The gross urban and suburban area requiring water service in the San Dieguito-Cottonwood Unit increased from 3,900 acres in 1948 to 11,800 acres in 1958, or about 200 percent, while the irrigated agricultural acreage increased from 21,000 acres to 24,200 acres, or 15 percent. The largest increases in agricultural acreages resulted from increases in small grains and pasture areas, while acreages of citrus and subtropical fruits, and deciduous fruits and nuts decreased.

San Diego Unit (9-10)

Gross urban and suburban area in the San Diego Unit increased from 43,300 acres in 1948 to 70,200 acres in 1958, or about 62 percent. A portion of this increase occurred on lands formerly used for irrigated agriculture although, during the 10-year period, the gross irrigated agricultural acreage also increased about 5 percent, from 21,400 acres in 1948 to 22,500 acres in 1958.

Salton Sea Unit (7-3)

The gross water service area in that portion of the Salton Sea Unit located in San Diego County expanded from 2,900 acres in 1950 to 8,000

Totals 1948 ^b	:	Totals 1958
	:	
	:	
	:	
	:	
	:	
c		41,120
c		3,740
c		990
c		<u>9,070</u>
		54,920
c		<u>35,500</u>
52,000		90,420
5,800		6,140
5,700		10,300
30,800		31,870
13,500		13,090
1,700		1,750
3,400		2,020
3,200		6,390
<u>1,400</u>		<u>2,750</u>
65,500		74,300
c		6,650
<u>5,900</u>		<u>8,380</u>
<u>71,400</u>		<u>89,340</u>
123,400		179,760

Santa Margarita-San Luis Rey Unit (9-8)

The gross water service area in the Santa Margarita-San Luis Rey Unit increased about 11,200 acres, or 39 percent, between 1948 and 1958. Approximately 3,000 acres of this total expansion were in urban and suburban development, and 8,200 acres were in irrigated agricultural development. The crops accounting for most of the agricultural acreage increase were citrus and subtropical fruits, pasture, and truck crops.

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Salton Sea Unit (7-3)

The gross water service area in that portion of the Salton Sea Unit located in San Diego County expanded from 2,900 acres in 1950 to 8,000

TABLE 7

LAND USE IN COASTAL SAN DIEGO COUNTY AND SOUTHWESTERN RIVERSIDE COUNTY
IN 1948 AND 1958 AND IN THE DESERT PORTION OF SAN DIEGO COUNTY IN 1950 AND 1958

In Acres

Category and Class of Land Use	Hydrographic Unit												Totals 1948 ^b	Totals 1958
	San Juan		Santa Margarita-		San Dieguito-		San Diego		Coachella		Salton Sea			
	Capistrano ^a		San Luis Rey		Cottonwood		Valley		(7-2)		(7-3)			
	(9-7)	(9-8)	(9-9)	(9-10)	(9-10)	(9-10)	(7-2)	(7-3)	(7-2)	(7-3)	(7-2)	(7-3)		
1948	1958	1948	1958	1948	1958	1948	1958	1950	1958	1950	1958			
WATER SERVICE AREA														
Urban and Suburban														
Residential	0	0	^c 2,900		^c 5,020	17,800	32,920	0	0	^c 280		^c 41,120		
Commercial	0	0	^c 380		^c 550	1,800	2,780	0	0	^c 30		^c 3,740		
Industrial	0	0	^c 70		^c 70	300	840	0	0	^c 10		^c 990		
Unsegregated urban and suburban area	<u>0</u>	<u>0</u>	<u>^c 1,990</u>		<u>^c 2,830</u>	<u>5,300^d</u>	<u>4,160</u>	<u>0</u>	<u>0</u>	<u>^c 90</u>		<u>^c 9,070</u>		
Subtotals	0	0	3,100	5,340	2,700	8,470	25,200	40,700	0	0	^c 410	^c 54,920		
Included Nonwater Service Area	<u>0</u>	<u>0</u>	<u>1,400</u>	<u>2,170</u>	<u>1,200</u>	<u>3,310</u>	<u>18,100</u>	<u>29,530</u>	<u>0</u>	<u>0</u>	<u>^c 490</u>	<u>^c 35,500</u>		
Gross Urban and Suburban Area	0	0	4,500	7,510	3,900	11,780	43,300	70,230	0	0	300	900	52,000	90,420
Irrigated Agriculture														
Alfalfa	0	0	2,800	2,420	1,000	1,010	1,500	1,100	0	0	500	1,610	5,800	6,140
Pasture	0	0	2,300	4,320	1,700	3,560	1,600	1,950	0	0	100	470	5,700	10,300
Citrus and subtropical	0	0	8,000	13,240	14,700	13,320	8,000	5,220	0	0	100	90	30,800	31,870
Truck crops	0	0	4,400	5,680	1,600	1,240	7,400	5,750	0	0	100	420	13,500	13,090
Field crops	0	0	700	860	300	50	400	460	0	0	300	380	1,700	1,750
Deciduous fruits and nuts	0	0	1,200	860	1,600	960	600	140	0	0	0	60	3,400	2,020
Small grains	0	0	3,100	1,420	100	3,500	0	890	0	0	0	580	3,200	6,390
Vineyards	<u>0</u>	<u>0</u>	<u>^e 170</u>		<u>^e 550</u>		<u>^e 40</u>		<u>0</u>	<u>0</u>	<u>1,400</u>	<u>1,990</u>	<u>1,400</u>	<u>2,750</u>
Subtotals	0	0	22,500	28,970	21,000	24,190	19,500	15,550	0	0	2,500	5,600	65,500	74,300
Fallow	0	0	^c 1,360		^c 960		^c 4,260		0	0	^c 110		^c 6,650	
Included Nonwater Service Area	<u>0</u>	<u>0</u>	<u>1,800</u>	<u>2,160</u>	<u>2,100</u>	<u>2,180</u>	<u>1,900</u>	<u>2,650</u>	<u>0</u>	<u>0</u>	<u>100</u>	<u>1,360</u>	<u>5,900</u>	<u>8,380</u>
Gross Irrigated Agriculture	<u>0</u>	<u>0</u>	<u>24,300</u>	<u>32,490</u>	<u>23,100</u>	<u>27,330</u>	<u>21,400</u>	<u>22,460</u>	<u>0</u>	<u>0</u>	<u>2,600</u>	<u>7,060</u>	<u>71,400</u>	<u>89,340</u>
GROSS WATER SERVICE AREA	0	0	28,800	40,000	27,000	39,110	64,700	92,690	0	0	2,900	7,960	123,400	179,760

a. All land use requiring applied water is within a military reservation, and appears in the category "unclassified".

b. Includes acreages in Salton Sea Hydrographic Unit in 1950.

c. Value not available.

d. Value includes schools and institutions, which have been grouped with the commercial category in 1958.

e. Acreages for vineyards are grouped with field crops.

acres in 1958, or about 176 percent. The gross urban and suburban acreage increased from 300 acres in 1950 to 900 acres in 1958, and the gross irrigated agricultural acreage increased from 2,600 acres to 7,100 acres or about 173 percent, during the 8-year period. Much of the expansion in irrigated agriculture occurred in Borrego Valley where relatively large acreages of alfalfa and vineyards were planted.

Multiple Cropped Areas

In all of the major agricultural areas covered by the investigation, short, mild winters make possible raising crops on a year-round basis. In these intensively farmed areas, field mapping conducted during the summer season characteristically reveals large acreages of land in a fallow or between-crop condition. Under normal cropping practices, a large portion of this fallow land will be subsequently planted at some point during the study period. The net water use of fallow lands is negligible and, therefore, estimates of net water use based on data collected during the summer survey would not be truly representative of conditions in the study area.

Previous studies, conducted by the department to determine the disposition of fallow acreage for the entire year in areas with somewhat similar climatic conditions and farming cultural practices, such as Orange, Santa Barbara, and San Luis Obispo Counties, were used in this report as the basis for distributing fallow acreage in the coastal portion of the investigational area into the appropriate type of irrigated crop. These studies consisted of making three supplemental resurveys to determine the types of crops planted in this fallow acreage. Distribution of fallow acreage in the desert portion of the investigational area was based on three supplemental

resurveys conducted during November, February, and May following the main survey in Borrego Valley.

During each of the resurveys, the type and areal extent of crops planted in this fallow acreage, subsequent to the main summer survey, were determined. Field mapping during these resurveys indicated that portions of the fallow acreages were planted, then subsequently replanted to different crops or allowed to revert to fallow conditions. However, during the analysis of the resurvey data from which the percentages shown in Table 8 were derived, these factors were not considered. Instead, the type and areal extent of crops were considered on a cumulative basis.

Under this method, the first crop mapped on a previously fallow parcel was used as the basis for assigning unit use values. That parcel was then removed from the fallow classification for the remainder of the study period. It should be pointed out that the increased use of water resulting from multiple cropping practices, including fallow periods between crops, was considered in estimating average unit values of water use for truck crops.

Analysis of the data from the resurveys indicates that in coastal San Diego County and the desert portion of the county, about 20 percent and 84 percent, respectively, of the total area indicated as fallow during the summer survey remained fallow throughout the entire year. The remaining land, which had been mapped fallow during the main survey, was found during the subsequent resurveys to be planted to the various crops in the percentages shown on Table 8.

TABLE 8

DISPOSITION OF ACREAGE FOUND FALLOW
IN SUMMER 1958

In percent of summer fallow acreage

Type of land use	: Coastal : San Diego County:	: Borrego : Valley
Area remaining fallow all year	20	84
Irrigated crop plantings		
Pasture	5	0
Truck crops	65	14
Field crops	10	0
Small grains	<u>0</u>	<u>2</u>
Totals	100	100

The percentage values given in Table 8 were used as the basis for distributing the fallow acreages determined from the 1958 summer survey into the appropriate crops for determining water requirements. However, the acreage values for irrigated crops presented in Tables 4, 5, 6, 7 and Appendix B which show the land use during the summer of 1958 have not been modified to reflect these increases.

CHAPTER IV. WATER USE

Land areas occupied by various types of water-using development in San Diego County and the portion of southwestern Riverside County described in Chapter III, and appropriate unit values of water use were employed in this investigation to estimate the 1958 level of water use. This chapter presents the estimates of water use so derived, and the change in water use since previous estimates were made. Also presented is a discussion of the relationships between estimated levels of water use and available water supplies for the coastal portion of the investigational area comprising Hydrographic Units 7, 8, 9, and 10.

Definition of Water Use

The term "water use" is employed in the broadest sense to include all uses of water by nature under native conditions, and by man-made modifications of those natural conditions. It implies the application of water to any one, or all, of innumerable kinds of uses, both consumptive and nonconsumptive.

Consumptive use includes the water from any source utilized in the process of vegetative growth, such as transpiration and the building of plant tissue, and the water evaporated from the soil around the plant and foliage, as well as from water surfaces. It also includes the water consumed or evaporated by urban and nonvegetative types of land use.

In addition to the consumptive use of water, as defined above, there may be irrecoverable losses incidental to such use. These irrecoverable losses include such items as disposal or seepage of the unconsumed water to bodies of unsuitable quality including the ocean,

and disposal or seepage of the unconsumed water in such a manner as to be uneconomical of recapture for use.

The water for consumptive use is obtained from two general sources: natural sources including direct precipitation and surface runoff, and, as a special case, from a high ground water table; and man-developed sources, that is, water applied through the activities of man. Water furnished from this latter source is termed "applied water."

Man applies water to satisfy the consumptive use in excess of that supplied from natural sources. However, as a practical matter, the quantity of water applied is usually in excess of the consumptive use of applied water, and that portion of the water applied to any use that is not consumed or irrecoverably lost remains part of the water supply.

In evaluating the overall needs for water in an area, it is necessary to determine the portion of the applied water that is consumptively used. That portion of the applied water that is consumptively used and irrecoverably lost is known as the "net water use." The difference between the applied water and the net water use is the amount of applied water that is subject to reuse as a part of the common supply.

Methods of Estimating Water Use

It follows from the previous discussion that in areas where none of the applied water becomes available for reuse, it is possible to determine the net water use by measuring the total water applied. On the other hand, in areas where a portion of the applied water becomes available for reuse, economic and technological limitations generally preclude measurement of the volume of return flow of reusable water. The net water use in these areas must be determined in another manner; therefore, an indirect method is used.

Using the indirect method commonly employed, estimates of net water use are obtained by multiplying the areas of the various classes of water-using developments by appropriate average values of unit water use. These unit values of water use reflect average conditions of precipitation and the normal practices associated with urban water distribution and with irrigated agriculture. Variations from normal or average in these factors during the specific year that a land use survey is conducted may result in a difference between the estimated and actual water use during that year. Despite this possibility, it is considered that the procedures used in this survey are adequate, and that the figures on current levels of water use are reasonable. Furthermore, it is believed that these estimates of net water use are sufficiently sound to permit their use in determining the adequacy of presently available water supplies and in planning for such additional supplies as will be necessary to meet current or expected future deficiencies.

Unit Values of Water Use

During this investigation unit values of water use derived in Bulletin No. 2 were reviewed in order to determine the applicability of the values to 1958 conditions of development. The results of this review indicate that, in general, mean seasonal unit values derived in that bulletin for urban and suburban areas for 1948 are still applicable.

Mean seasonal unit values of consumptive use of applied water for irrigated agricultural land were derived from data developed during prior investigations by the department, including the statewide studies reported in Bulletin No. 2, and detailed studies in Ventura County and in the Santa Margarita River watershed in San Diego County.

A complete discussion of the techniques employed in the derivation of units of water use is contained in Bulletin No. 2, therefore, only a general description of those procedures is set forth herein.

Urban Water Use Values

Mean seasonal unit values of consumptive use of water on urban and suburban lands were derived from (1) estimates of the consumptive use on the area occupied by impervious cover, bare lands, lawns, shrubs, etc., and (2) estimates of other urban consumptive uses, such as household uses, etc. The mean seasonal unit values of consumptive use of water so determined are presented in Table 9. These values were utilized to compute net water use in areas of the investigation where applied water in excess of consumptive use is generally considered to be available for reuse through deep percolation or salvage.

TABLE 9

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF WATER ON URBAN AND SUBURBAN LANDS IN SAN DIEGO COUNTY

In feet of depth per unit of area

Hydrographic unit	:	Consumptive use of applied water
Santa Margarita-San Luis Rey (9-8)		0.7
San Dieguito-Cottonwood (9-9)		0.6
San Diego (9-10)		0.6
Salton Sea (7-3)		1.6

Mean seasonal unit values of delivery of water to urban and suburban types of land use in the San Diego Hydrographic Unit No. 10, were estimated from surveys which determined total water deliveries to known areas occupied by the various types of land use.

Table 10 lists estimated net deliveries of water to various land use types in the San Diego Hydrographic Unit.

TABLE 10
ESTIMATED MEAN SEASONAL UNIT VALUES OF WATER DELIVERY
TO URBAN AND SUBURBAN LANDS, SAN DIEGO HYDROGRAPHIC UNIT

In feet of depth per unit of area

Land use type	: Unit : delivery
Residential, single	2.4
Residential, multiple	7.4
Residential, rural	2.2
Commercial, strip	3.7
Commercial, downtown	28.6
Industrial, manufacturing	11.8
Schools	1.8
Institutions	1.8
Dairies	1.1
Livestock and poultry ranches	0.6
Parks, etc., with lawns	1.1

These unit values of water delivery were utilized to compute net water use in the areas of Hydrographic Unit No. 10 where percolation losses incidental to the delivery and use of water are generally not considered available for reuse.

Unit Values of Water on Irrigated Agriculture

Unit seasonal values of consumptive use of water by irrigated crops were derived by a modification of a method developed by Harry F. Blaney and Wayne D. Criddle of the United States Department of Agriculture. The increased use of water resulting from multiple cropping practices was considered in estimating average unit values of applied water use for truck crops. The values thus derived are presented in Table 11.

The values shown in Table 11 represent estimates of the average consumptive use of applied water and precipitation by the various types of irrigated agriculture. Available data indicate that an average irrigation efficiency of about 70 percent is being achieved in the investigational area, and this value was utilized to estimate total use of applied water in areas where runoff from irrigation and deep percolation are not available for reuse. The total use of applied water was computed by dividing the consumptive use of applied water by 0.70. It should be pointed out that, in the derivation of the net water use for any given year, the volume of applied water required is based on the assumption that the precipitation for the season was approximately equal to the long-time mean. However, the use of applied water will actually be somewhat larger or smaller in individual years, varying inversely with the amount of rainfall. A similar effect occurs in the instance of urban use. However, the use of precipitation by residential, commercial and industrial classifications is relatively small. Therefore, variations of rainfall from year to year have a lesser effect upon the use of applied water on these land use classes than on irrigated lands.

Net Water Use

Estimates of the amount of net water use in the investigational area, under 1958 conditions of development, assuming normal precipitation, are presented in this section. As previously indicated, net water use was estimated by applying to the net areas of each type of land use the mean seasonal unit values of water delivery in areas where no water is available for reuse, and unit values of consumptive use of water where the unused portion is available for reuse. Thus, consideration

	Small grains				Vineyards		
	Applied	Precipi-	Total	Applied	Precipi-	Total	
uous d nuts ipi- ion :	water	tation		water	tation		
2	2.8	0.3	1.1	1.4	1.1	1.0	2.1
0	2.9	0.4	0.9	1.3	1.3	0.8	2.1
3	2.5	0.5	1.0	1.5	0.8	1.1	1.9
0	2.6	0.5	1.0	1.5	1.4	0.9	2.3
1	2.8	0.6	0.9	1.5	1.5	0.8	2.3
3	2.7	0.5	1.0	1.5	1.1	0.8	1.9
0	2.6	0.6	0.8	1.4	1.6	1.0	2.6
2	2.8	0.6	0.9	1.5	1.6	1.2	2.8
2	2.6	0.5	1.0	1.5	1.4	1.2	2.6
2	2.7	0.3	1.2	1.5	1.5	1.2	2.7
2	2.7	0.2	1.4	1.6	1.5	1.2	2.7
3	2.6	0.4	1.2	1.6	1.8	0.8	2.6
3	2.6	1.8	0.3	2.1	3.6	0.3	3.9

The values shown in Table 11 represent estimates of the average consumptive use of applied water and precipitation by the various types of irrigated agriculture. Available data indicate that an average irrigation efficiency of about 70 percent is being achieved in the investigational area, and this value was utilized to estimate total use of applied water in areas where runoff from irrigation and deep percolation are not available for reuse. The total use of applied water was computed by dividing the consumptive use of applied water by 0.70. It should be pointed out that, in the derivation of the net water use for any given year, the volume of applied water required is based on the assumption that the precipitation for the season was approximately equal to the long-time mean. However, the use of applied water will actually be somewhat larger or smaller in individual years, varying inversely with the amount of rainfall. A similar effect occurs in the instance of urban use. However, the use of precipitation by residential, commercial and industrial classifications is relatively small. Therefore, variations of rainfall from year to year have a lesser effect upon the use of applied water on these land use classes than on irrigated lands.

Net Water Use

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TABLE 11

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF WATER
ON IRRIGATED LANDS IN SAN DIEGO COUNTY

In feet of depth per unit of area

Hydrographic Unit	Alfalfa			Pasture			Citrus			Avocados			Truck Crops			Beans			Miscellaneous field crops			Deciduous fruit and nuts			Small grains			Vineyards		
	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total	Applied:	Precipi-:	Total									
	: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :		: water :	: tation :	
Santa Margarita-San Luis Rey																														
Santa Margarita River																														
Coastal	2.1	1.1	3.2	2.1	1.1	3.2	1.1	1.0	2.1	1.3	1.0	2.3	1.0	1.0	2.0	0.8	1.1	1.9	1.1	1.0	2.1	1.6	1.2	2.8	0.3	1.1	1.4	1.1	1.0	2.1
Central	2.8	0.9	3.7	2.8	0.9	3.7	1.3	0.8	2.1	1.5	0.8	2.3	1.1	0.8	1.9	1.0	0.9	1.9	1.2	0.8	2.0	1.9	1.0	2.9	0.4	0.9	1.3	1.3	0.8	2.1
Interior	2.1	1.2	3.3	2.1	1.2	3.3	-	-	-	-	-	-	0.8	1.1	1.9	-	-	-	0.9	1.1	2.0	1.2	1.3	2.5	0.5	1.0	1.5	0.8	1.1	1.9
San Luis Rey River																														
Coastal	2.2	1.0	3.2	2.2	1.0	3.2	1.2	1.0	2.2	1.5	1.0	2.5	1.1	0.8	1.9	0.8	0.8	1.6	1.4	0.6	2.0	1.6	1.0	2.6	0.5	1.0	1.5	1.4	0.9	2.3
Central	2.6	1.0	3.6	2.6	1.0	3.6	1.3	1.1	2.4	1.6	0.9	2.5	1.2	0.8	2.0	1.1	0.8	1.9	1.2	0.9	2.1	1.7	1.1	2.8	0.6	0.9	1.5	1.5	0.8	2.3
Interior	2.2	1.2	3.4	2.2	1.2	3.4	1.3	1.0	2.3	1.5	1.0	2.5	1.0	0.8	1.8	0.9	0.8	1.7	1.1	1.1	2.2	1.4	1.3	2.7	0.5	1.0	1.5	1.1	0.8	1.9
San Dieguito-Cottonwood																														
San Dieguito River																														
Coastal	2.3	1.0	3.3	2.3	1.0	3.3	1.3	0.9	2.2	1.5	0.9	2.4	1.2	0.8	2.0	0.8	0.8	1.6	1.4	0.6	2.0	1.6	1.0	2.6	0.6	0.8	1.4	1.6	1.0	2.6
Central	2.5	1.1	3.6	2.5	1.1	3.6	1.4	0.9	2.3	1.6	0.9	2.5	1.3	0.8	2.1	1.2	0.8	3.0	1.2	1.1	2.3	1.6	1.2	2.8	0.6	0.9	1.5	1.6	1.2	2.8
Interior	2.3	1.2	3.5	2.3	1.2	3.5	1.3	1.0	2.3	1.5	1.0	2.5	1.1	0.9	2.0	0.8	0.8	1.6	1.2	1.1	2.3	1.4	1.2	2.6	0.5	1.0	1.5	1.4	1.2	2.6
Cottonwood																														
Coastal	2.1	1.2	3.3	2.2	1.1	3.3	1.2	1.1	2.3	1.4	1.1	2.5	1.2	0.9	2.1	1.2	0.8	2.0	1.4	0.6	2.0	1.5	1.2	2.7	0.3	1.2	1.5	1.5	1.2	2.7
Interior	2.2	1.4	3.6	2.4	1.2	3.6	1.3	1.2	2.5	1.5	1.2	2.7	1.3	0.8	2.1	1.2	0.8	2.0	1.2	1.1	2.3	1.5	1.2	2.7	0.2	1.4	1.6	1.5	1.2	2.7
San Diego																														
Coastal	2.4	0.9	3.3	2.4	0.9	3.3	1.4	0.9	2.3	1.5	0.9	2.4	1.4	0.7	2.1	1.3	0.7	2.0	1.4	0.6	2.0	1.8	0.8	2.6	0.4	1.2	1.6	1.8	0.8	2.6
Salton Sea																														
	4.2	0.3	4.5	5.0	0.3	5.3	4.0	0.3	4.3	-	-	-	3.0	0.3	3.3	-	-	-	2.4	0.3	2.7	2.3	0.3	2.6	1.8	0.3	2.1	3.6	0.3	3.9



was given to the disposition of the unconsumed portion of the water delivered, with regard to its availability for reuse, and to losses incurred in conveyance of water to its place of use.

The estimated amounts of mean seasonal net water use in hydrographic units of San Diego County and a portion of southwestern Riverside County for conditions of 1958 are presented in Table 12. For comparative purposes, values estimated for conditions of 1948 are also presented. As indicated previously, the unit values used to derive the net water use represent the optimum needs of the various types of water-using developments for average conditions of rainfall and climate, and therefore provide comparable estimates which show general level of water use. The actual water use may have differed from the estimated values derived herein because of variations from the mean in precipitation. Averages of data from representative precipitation stations located in the investigational area indicate that rainfall during 1948 was about 60 percent of normal for the 50-year period, 1897-98 through 1946-47, and during 1958 about 135 percent of this normal, although runoff in the southern part of the county was considerably below normal. Therefore, the estimates of the level of net water use shown in Table 12 for 1948 are probably on the low side as compared to actual water use, and on the high side for 1958. The difference between estimates for the two years shown, however, is considered to represent a reasonable estimate of the increase in water use.

The data presented in Table 12 indicate that changes in net water use generally reflect the changes in land use presented in Chapter III. There was an increase in estimated seasonal net water use of about

62,900 acre-feet between 1948 and 1958 with the increase being rather equally distributed between irrigated agriculture and urban uses.

TABLE 12
ESTIMATED NET WATER USE
IN SAN DIEGO COUNTY AND A PORTION OF SOUTHWESTERN
RIVERSIDE COUNTY FOR CONDITIONS OF DEVELOPMENT IN 1948 AND 1958

In acre-feet

Hydrographic unit	:	1948	:	1958	:Difference
<u>Santa Margarita-San Luis Rey Unit</u>					
Irrigated Lands		31,100		45,700	14,600
Urban-Suburban Areas		<u>4,400</u>		<u>7,500</u>	<u>3,100</u>
Totals		35,500		53,200	17,700
<u>San Dieguito-Cottonwood Unit</u>					
Irrigated Lands		29,800		34,300	4,500
Urban-Suburban Areas		<u>2,500</u>		<u>7,700</u>	<u>5,200</u>
Totals		32,300		42,000	9,700
<u>San Diego Unit</u>					
Irrigated Lands		31,000		34,700	3,700
Urban-Suburban Areas		<u>77,900</u>		<u>97,800</u>	<u>19,900</u>
Totals		108,900		132,500	23,600
<u>Salton Sea Unit</u>					
Irrigated Lands		9,100		20,000	10,900
Urban-Suburban Areas		<u>500</u>		<u>1,500</u>	<u>1,000</u>
Totals		9,600		21,500	11,900
<u>Total Investigational Area</u>					
Irrigated Lands		101,000		134,700	33,700
Urban-Suburban Areas		<u>85,300</u>		<u>114,500</u>	<u>29,200</u>
GRAND TOTALS		186,300		249,200	62,900

Comparison of Water Supply and Water Use

The amounts of net water use for various years, determined from land use surveys conducted in the coastal portion of the investigational area beginning in 1933, are shown on Table 13, together with the mean annual net local water supply which was derived in Chapter II. Also shown on Table 13 is an historical comparison between the excess of water use over the approximate mean annual safe yield of local water supplies, and the quantity of imported water. The forecast net water requirement for the year 2020 for the coastal portion of the investigated area, as derived from studies for Bulletin No. 78, is also presented in Table 13.

TABLE 13

COMPARISON OF NET WATER USE AND WATER SUPPLY OF
COASTAL SAN DIEGO COUNTY AND A PORTION OF
SOUTHWESTERN RIVERSIDE COUNTY

In acre-feet

Date of survey :	Net water use :	:Approximate mean :annual safe yield: of local water supplies :	:Excess of water use: over mean annual :safe yield of local : water supplies :	: Historical imports from Colorado River :
1933	77,000 ^a	79,000 ^a	--	
1948	177,000	124,000	53,000	59,000
1958	228,000	124,000	104,000	136,000
2020	1,117,000 ^b	124,000	993,000	

- a. Includes only coastal San Diego County.
- b. Water requirement.

The data presented in Table 13 indicate that sometime during the middle 1930's, the net water use in the investigational area began to exceed the approximate mean annual net local water supply. The deficiency in local supplies was met, in part, by overdraft of the surface

water reservoirs and ground water basins. In 1947-48 the deficiency was alleviated by importation through the San Diego Aqueduct and the Colorado River Aqueduct of The Metropolitan Water District of Southern California.

Table 13 also shows that after 1947-48 the sum of the approximate mean annual safe yield of local water supplies, and the imports, exceeded the net water use. As indicated earlier, during periods of deficient supply between the time when the net water use began to exceed the approximate mean annual net local water supply, and 1947-48, when imported water became available, the net water use in excess of safe yield was met by overdraft on the accumulated surface and ground water storage. The supplies in storage reached critical stages of depletion by 1947-48, and the recent succession of dry years has precluded replenishment of reserves; therefore, only a portion of the local safe yield has been available. A portion of the difference between the deficit and the importation shown in Table 13 is accounted for by increased storage in San Vicente Reservoir which is one of the major points of retention of Colorado River water.

As previously pointed out, in certain of the areas of the county where imported supplies are available the sustained yield method of operating surface reservoirs has been altered. These surface reservoirs are now emptied as soon as is practical in order to reduce evaporation losses to a minimum. This fact is evident from the records of seasonal deliveries of imported water shown in Table 2 of Chapter II. It may be noted that during the periods from 1951 to 1954 and 1957-58, when increased rainfall made available additional water to surface and ground water reservoirs, the volumes of imports were appreciably reduced.

Studies developed for Bulletin No. 78 indicate that the estimated total seasonal water requirement for the coastal portion of the area of investigation will be about 1,117,000 acre-feet by the year 2020. The increase in net water use between the present and year 2020 is anticipated to be the result of development of about 371,800 acres of land considered susceptible of intensive water using development by 2020, but not currently receiving water service. Of this requirement, approximately 993,000 acre-feet must be derived by importing supplies from beyond the area.

CHAPTER V. SUMMARY AND CONCLUSIONS

The results of the 1958 land and water use survey of San Diego County and a portion of Riverside County, comparisons with the 1948 survey results, and conclusions drawn from this study are summarized in this chapter.

Summary

This investigation disclosed that the following land uses and water requirements existed in the area of investigation:

1. A total of 179,800 acres, or about 6 percent, of all lands within the surveyed area, had been developed for urban and suburban, or irrigated agricultural uses by 1958. This is an increase of about 46 percent over similar water-using developments that existed in 1948.

2. The gross urban and suburban area in 1958 was 90,400 acres, an increase of about 38,400 acres or 74 percent over that which existed in 1948. This increase was a direct result of an increase in population in San Diego County from 556,800 in 1950 to 1,033,000 in 1960. In the coastal portion of the study area, the gross urban and suburban area was about 89,500 acres, which equaled about 25 percent of the 352,000 acres considered susceptible of intensive urban development by the year 2020.

3. The gross irrigated agricultural area in 1958 was about 89,400 acres, an increase of 25 percent over the 71,400 acres that existed in 1948. The net irrigated agricultural acreage in the coastal portion of the study area was about 68,700 acres in 1958 and this is about 39 percent of the 178,000 acres which is forecast by the year 2020.

4. The estimated 1958 mean seasonal level of net water use by these water-using developments was about 249,200 acre-feet. This is an

increase of about 62,900 acre-feet, or approximately 34 percent, over the 1948 estimated net water use level.

5. The net water use in the investigational area has exceeded the approximate mean annual net local water supply from about the middle 1930's to the present time. During this period, the deficiency in local supplies was met, in part, by overdraft of the surface water reservoirs and ground water basins. In 1947-48, the deficiency was alleviated by imported water from the Colorado River.

6. The seasonal volume of Colorado River water imported to the investigational area increased from 59,000 acre-feet in 1947-48 to 136,000 acre-feet in 1957-58. This increase was used largely to meet the increased water use in the investigational area.

7. The estimated total seasonal water requirement for the coastal portion of the investigational area by the year 2020 has been estimated to be on the order of 1,117,000 acre-feet. Of this requirement, approximately 993,000 acre-feet must be derived by importing supplies from outside the area of investigation.

Conclusions

Based on the results of this investigation, it is concluded that:

1. Economic and climatic factors have established a rapid rate of growth in population, industry, and agriculture in the area of investigation, and this growth will probably continue in the foreseeable future if adequate water supplies are available.

2. A large increase in the volume of water imported to the area will be required to meet the anticipated growth. This large volume of imports

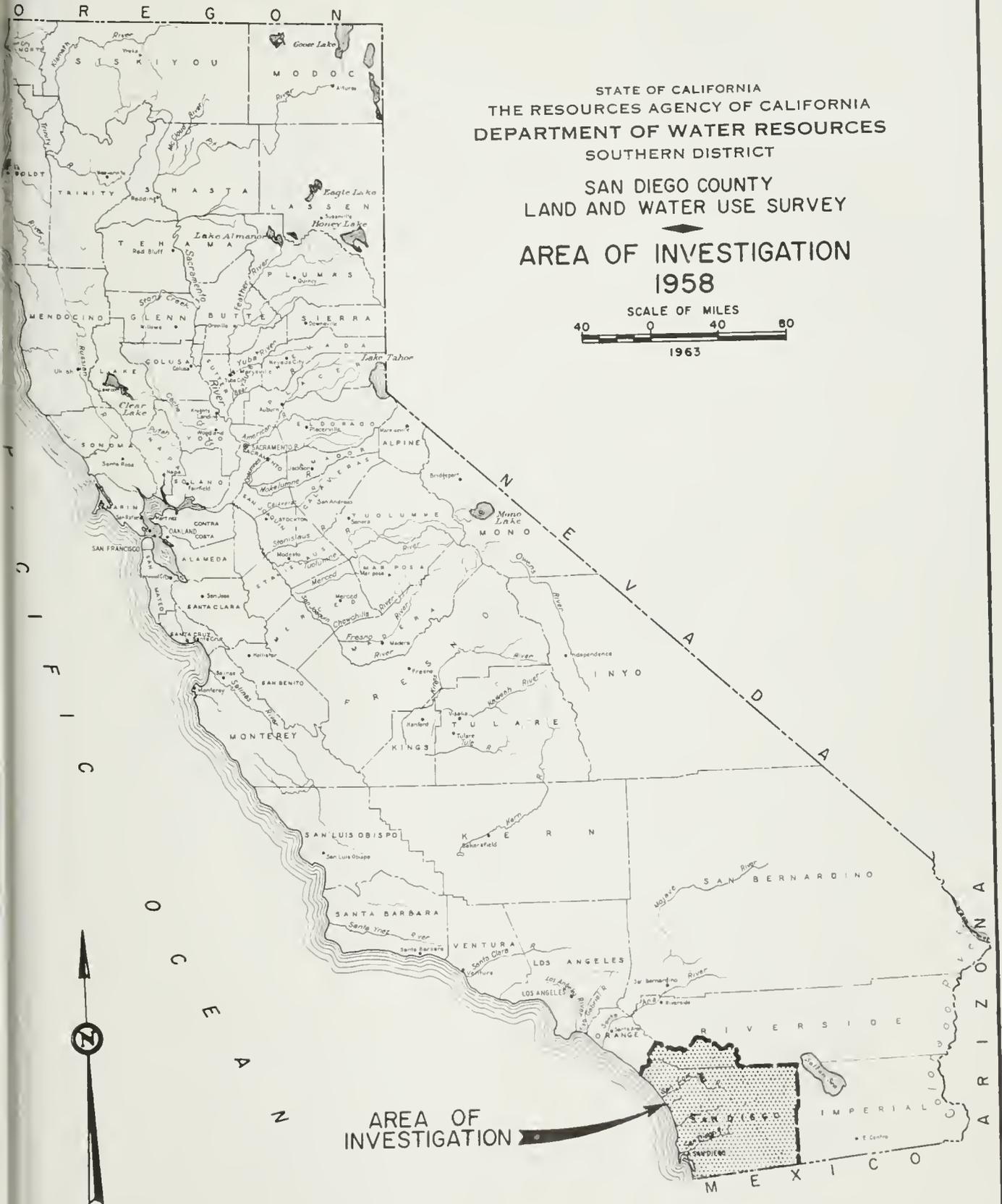
water can be made available only by a program of comprehensive planning and development of water resources.

3. The land uses, water requirements, and growth trends established by this study should be monitored and re-evaluated by future land use surveys in order that the water supplies required to support such growth can be adequately planned and developed.

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SAN DIEGO COUNTY
LAND AND WATER USE SURVEY

AREA OF INVESTIGATION
1958



AREA OF INVESTIGATION



THE
MOUNTAIN
VIEW
OF
THE
CITY
OF
NEW
YORK
FROM
THE
MOUNTAIN
VIEW
HOTEL
IN
1898



— 0 —

HYDROGRAPHIC AREAS AND UNITS

PORTION OF COLORADO DESERT HYDROGRAPHIC AREA

7-2 PORTION OF COACHELLA VALLEY UNIT

7-3 PORTION OF SALTON SEA UNIT

PORTION OF SOUTH COASTAL AREA

9-7 PORTION OF SAN JUAN CAPISTRANO UNIT

9-8 SANTA MARGARITA - SAN LUIS REY UNIT

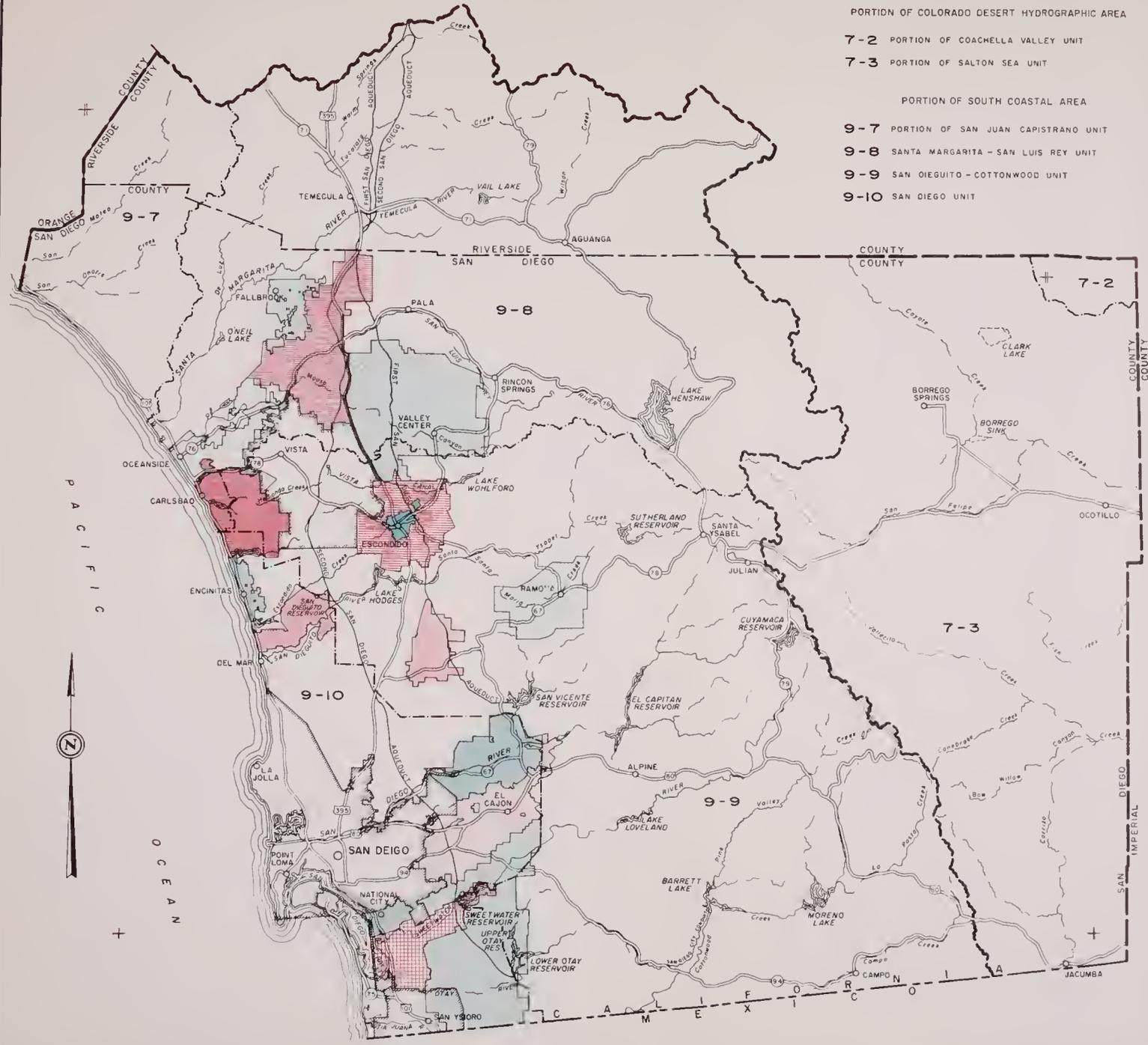
9-9 SAN DIEGUITO - COTTONWOOD UNIT

9-10 SAN DIEGO UNIT

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROGRAPHIC AREA
- - - BOUNDARY OF HYDROGRAPHIC UNIT

- MEMBER AGENCIES OF SAN DIEGO COUNTY WATER AUTHORITY IN 1958
- BUENO COLORADO MUNICIPAL WATER DISTRICT
 - CITY OF SAN DIEGO
 - CITY OF ESCONDIDO
 - CITY OF NATIONAL CITY
 - CITY OF OCEANSIDE
 - HELIX IRRIGATION DISTRICT
 - SAN DIEGUITO IRRIGATION DISTRICT
 - SANTA FE IRRIGATION DISTRICT
 - SOUTH BAY IRRIGATION DISTRICT
 - CARLSBAD MUNICIPAL WATER DISTRICT
 - OTAY MUNICIPAL WATER DISTRICT
 - POWAY MUNICIPAL WATER DISTRICT
 - RAINBOW MUNICIPAL WATER DISTRICT
 - RAMONA MUNICIPAL WATER DISTRICT
 - RINCON DEL DIABLO MUNICIPAL WATER DISTRICT
 - RIO SAN DIEGO MUNICIPAL WATER DISTRICT
 - VALLEY CENTER MUNICIPAL WATER DISTRICT
 - FALLBROOK PUBLIC UTILITY DISTRICT
- 7-3 HYDROGRAPHIC UNIT NUMBERS



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 SOUTHERN DISTRICT

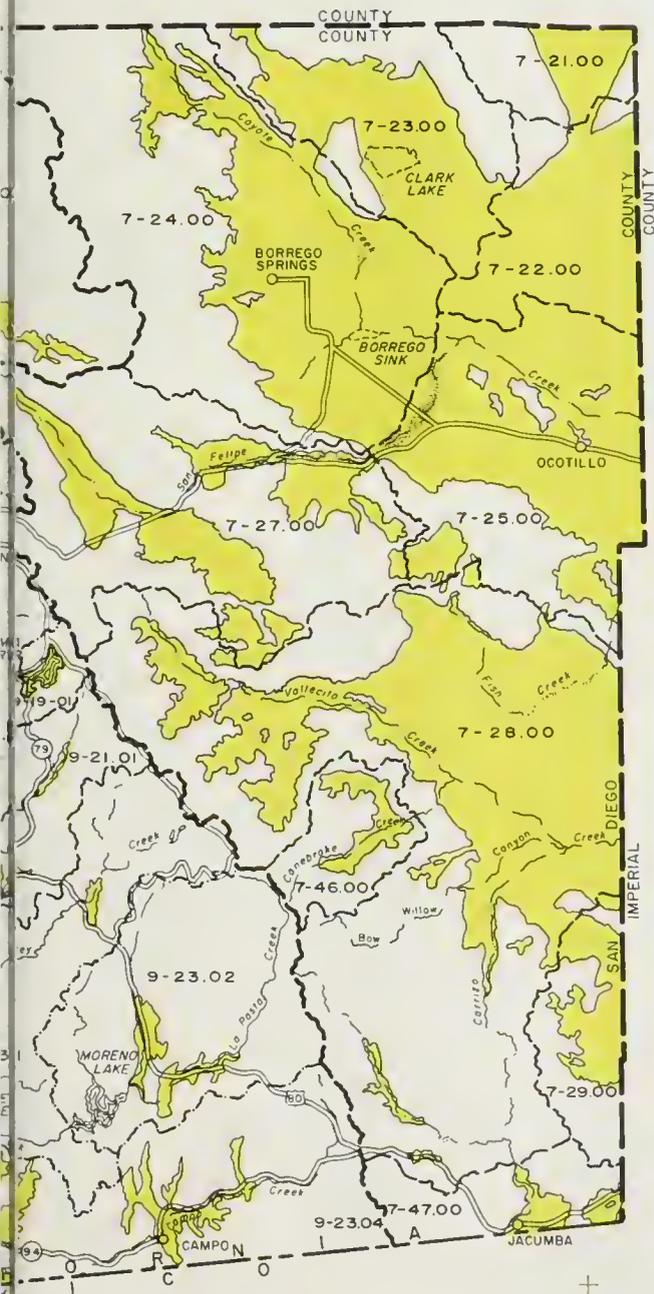
SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

MAJOR WATER AGENCIES
 AND
 HYDROGRAPHIC UNITS

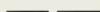
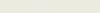
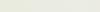
SCALE OF MILES
 0 4 8 12

1963





LEGEND

-  BOUNDARY OF INVESTIGATIONAL AREA
-  BOUNDARY OF HYDROLOGIC REGION
-  BOUNDARY OF HYDROLOGIC UNIT
-  BOUNDARY OF HYDROLOGIC SUBUNIT
- 9-15.07 GROUND WATER BASIN NUMBERS
-  WATER-BEARING SEDIMENTS
-  STREAM GAGING STATION

STATE OF CALIFORNIA
 THE RESOURCES AGENCY OF CALIFORNIA
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

GROUND WATER BASINS AND
 HYDROLOGIC UNITS AND
 SUBUNITS
 1958





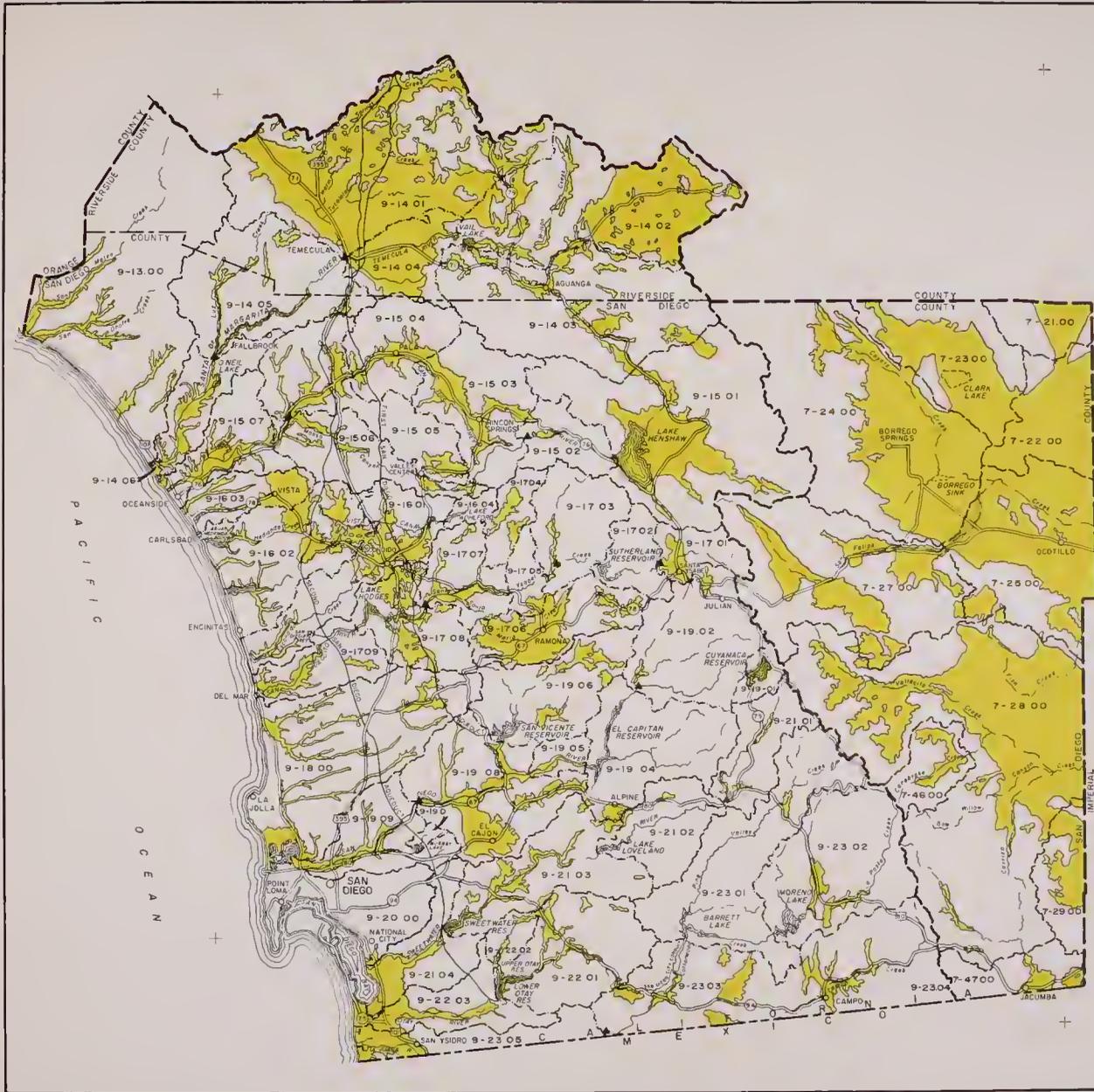
NUMERICAL DESIGNATIONS OF HYDROLOGIC UNITS AND SUBUNITS

PORTION OF COLORADO DESERT REGION

- 7-21.00 Cosonilla Valley
- 7-23.00 West Salton Sea Valley
- 7-23.00 Clark Valley
- 7-24.00 Borrego Valley
- 7-25.00 Ocotillo Valley
- 7-27.00 San Felipe Valley
- 7-28.00 Vallecito-Carrizo Valley
- 7-29.00 Coyote Wells Valley
- 7-46.00 Canabrate Valley
- 7-47.00 Jacumba Valley

PORTION OF SAN DIEGO REGION

- 9-13.00 Arroyo San Onofre Hydrologic Unit
- 9-14.00 Santa Marysita River Hydrologic Unit
 - 9-14.01 Murrieta Creek below Wall Reservoir
 - 9-14.02 Temecula Creek above Wall Reservoir
 - 9-14.03 Lancaster-Columbia Creek above Wall Reservoir
 - 9-14.04 Remainder of Temecula Creek below Wall Reservoir
 - 9-14.05 Santa Marysita River from Dage at Temecula Canyons to De Los Dues Site
 - 9-14.06 Santa Marysita River from De Los Dues Site to Coast
- 9-15.00 San Luis Rey River Hydrologic Unit
 - 9-15.01 San Luis Rey River above Henshaw Dam
 - 9-15.02 San Luis Rey River between Henshaw Dam and Escondido Ditch Intake
 - 9-15.03 San Luis Rey River between Escondido Ditch Intake and Zinkler's Mill near Pala
 - 9-15.04 San Luis Rey River between Stalker's Mill near Pala and Monserate Mountain
 - 9-15.05 San Luis Rey River between Monserate Mountain and Bonnell
 - 9-15.06 San Luis Rey River between Bonnell and Near Bonnell
 - 9-15.07 San Luis Rey River between Near Bonnell and at Oceanaside
- 9-16.00 Carlsbad Hydrologic Unit
 - 9-16.01 Escondido Creek from Lake Wolford to Coast
 - 9-16.02 San Marcos Agua Hedionda, and Encinitas Creeks
 - 9-16.03 Buena Vista Creek
 - 9-16.04 Escondido Creek above Lake Wolford
- 9-17.00 San Dieguito Hydrologic Unit
 - 9-17.01 Santa Ysabel Creek above Santa Ysabel
 - 9-17.02 Santa Ysabel Creek between Santa Ysabel and Sutherland Dam
 - 9-17.03 Santa Ysabel Creek between Sutherland Dam and Pamo Dam Site
 - 9-17.04 Orifito Creek above San Dieguito River
 - 9-17.05 Santa Ysabel Creek between Pamo Dam Site and Head of San Pascual Valley
 - 9-17.06 Santa Maria Creek above Santa Maria Dam Site
 - 9-17.07 San Dieguito River between Head of San Pascual Valley and Bernardo excludng Santa Maria Creek and Orifito Creek
 - 9-17.08 San Dieguito River between Bernardo and Hodges Dam
 - 9-17.09 San Dieguito River between Hodges Dam and the Coast
- 9-18.00 Los Pasaquitos Hydrologic Unit
- 9-19.00 San Diego River Hydrologic Unit
 - 9-19.01 Boulder Creek above Cuyamaca Dam
 - 9-19.02 San Diego River above Diverting Dam excludng Boulder Creek above Cuyamaca Dam
 - 9-19.03 San Diego River between Diverting Dam and El Capitan Dam
 - 9-19.04 San Diego River between El Capitan Dam and Lakeside
 - 9-19.05 San Vicente Creek above San Vicente Dam
 - 9-19.06 Alvarado Canyon above Murray Dam
 - 9-19.07 San Diego River between Lakeside and Gid Mission Dam excludng San Vicente Creek
 - 9-19.08 San Diego River between Old Mission Dam and Gid Town excludng Alvarado Canyon above Murray Dam
- 9-20.00 San Diego Hydrologic Unit
- 9-21.00 Sweetwater River Hydrologic Unit
 - 9-21.01 Sweetwater River above Ivankazo
 - 9-21.02 Sweetwater River between Descanso and Loveland Dam
 - 9-21.03 Sweetwater River between Loveland Dam and Sweetwater Dam
 - 9-21.04 Sweetwater River between Sweetwater Dam and Bay
- 9-22.00 Otay River Hydrologic Unit
 - 9-22.01 Otay River above Lower Otay Dam excludng Proctor Valley
 - 9-22.02 Proctor Valley above Upper Otay Dam
 - 9-22.03 Otay River between Lower Otay Dam and Bay
- 9-23.00 Tia Juana River Hydrologic Unit
 - 9-23.01 Cottonwood Creek above Barrett Dam excludng Cottonwood Creek above Horne Dam
 - 9-23.02 Cottonwood Creek above Horne Dam
 - 9-23.03 Tia Juana River Drainage Area in California excludng Cottonwood Creek above Barrett Dam and Tia Juana Valley Nipase Subunit
 - 9-23.04 Tia Juana Valley
 - 9-23.05 Tia Juana Valley



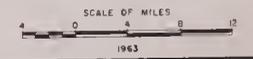
LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC REGION
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF HYDROLOGIC SUBUNIT
- 9-15 07 GROUND WATER BASIN NUMBERS
- Water-bearing sediments (yellow shading)
- ▲ STREAM GAGING STATION

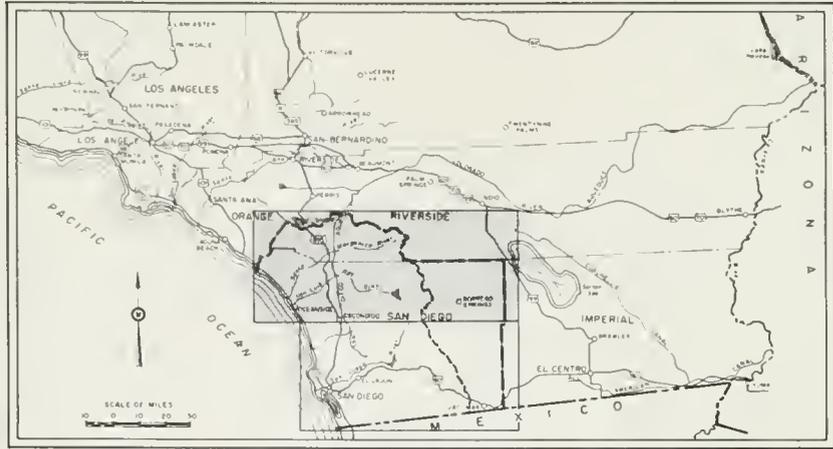
STATE OF CALIFORNIA
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 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

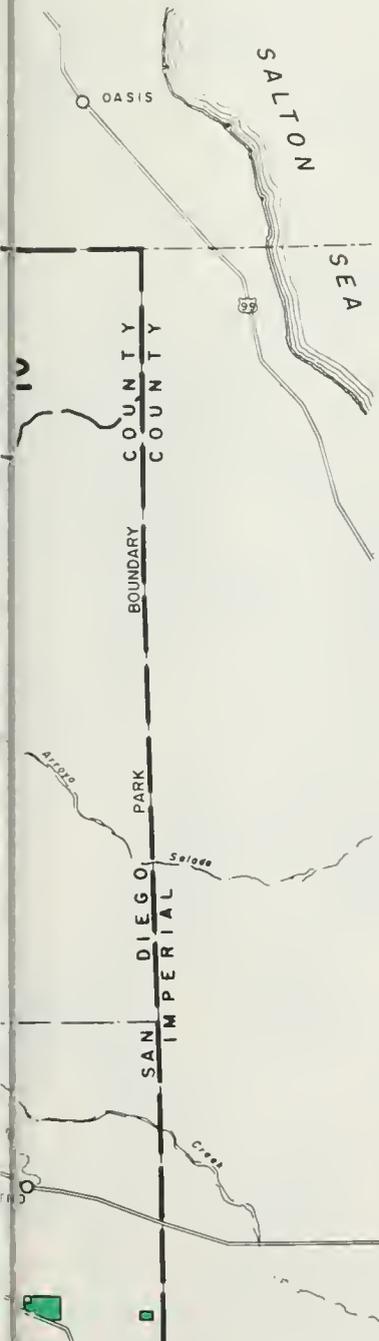
GROUND WATER BASINS AND
 HYDROLOGIC UNITS AND
 SUBUNITS
 1958



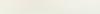
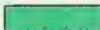
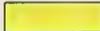




LOCATION MAP

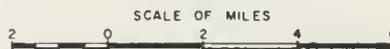


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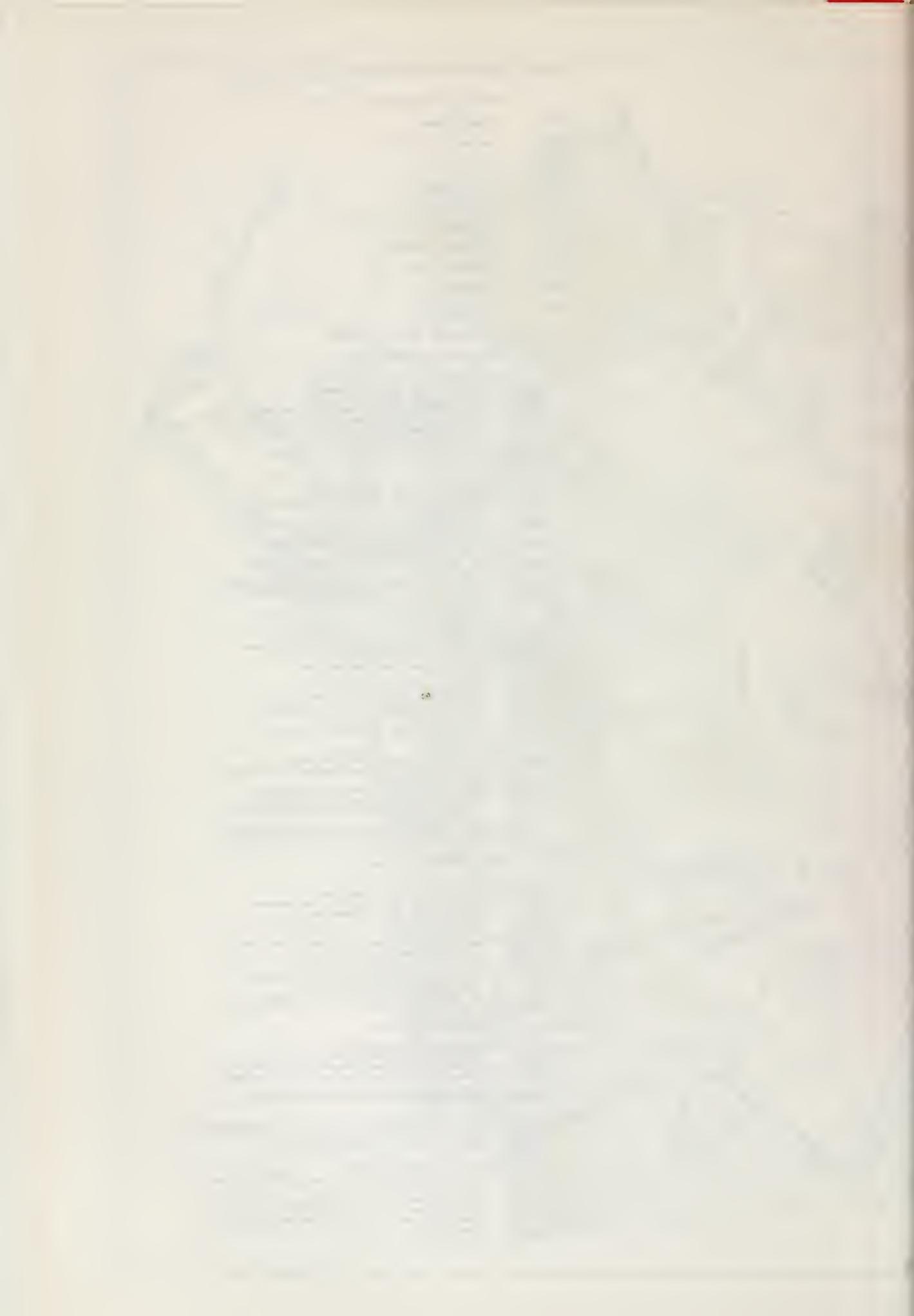
-  BOUNDARY OF INVESTIGATIONAL AREA
-  BOUNDARY OF HYDROGRAPHIC AREA
-  BOUNDARY OF HYDROGRAPHIC UNIT
-  BOUNDARY OF FEDERAL AND STATE LANDS
-  IRRIGATED AGRICULTURE
-  URBAN RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL-MANUFACTURING AND PROCESSING
-  INDUSTRIAL - EXTRACTIVE, STORAGE, AND TRANSPORTATION
-  MILITARY RESERVATIONS
-  HYDROGRAPHIC UNIT NUMBER

STATE OF CALIFORNIA
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 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY
 PRESENT LAND USE
 1958



1963



HYDROGRAPHIC AREAS AND UNITS

PORTION OF COLORADO DESERT AREA

7-2 PORTION OF COACHELLA VALLEY UNIT

7-3 PORTION OF SALTON SEA UNIT

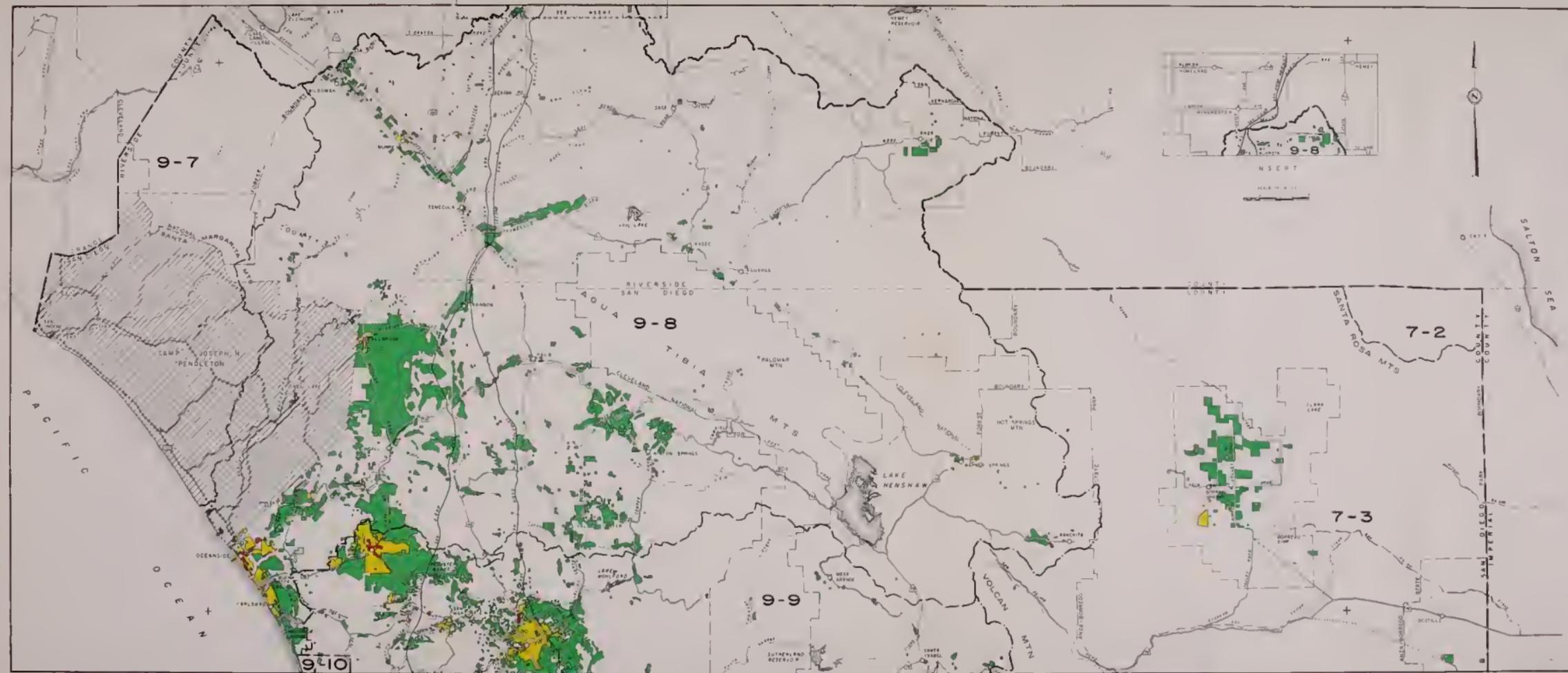
PORTION OF SOUTH COASTAL AREA

9-7 PORTION OF SAN JUAN CAPISTRANO UNIT

9-8 SANTA MARGARITA - SAN LUIS REY UNIT

9-9 SAN DIEGUITO - COTTONWOOD UNIT

9-10 SAN DIEGO UNIT



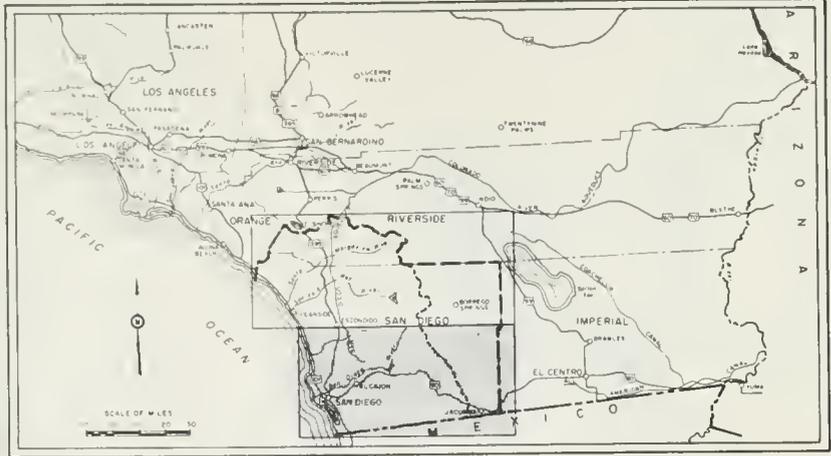
- LEGEND
- BOUNDARY OF INDUSTRIAL AREA
 - BOUNDARY OF HYDROGRAPHIC AREA
 - BOUNDARY OF HYDROGRAPHIC UNIT
 - BOUNDARY OF FEDERAL AND STATE LANDS
 - GREEN: OR GATE VEGETATION
 - YELLOW: URBAN RESIDENTIAL
 - RED: COMMERCIAL
 - BLUE: INDUSTRIAL, WHEAT/TURMS AND PROCESSORS
 - Hatched: INDUSTRIAL, EXTRACTIVE, STORAGE, AND TRANSPORTATION
 - Hatched: MILITARY RESERVATIONS
 - 9-9: HYDROGRAPHIC UNIT NUMBER

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 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY
 PRESENT LAND USE
 1958

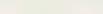
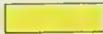
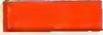
SCALE OF MILES
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LOCATION MAP

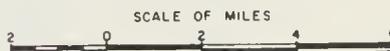
LEGEND

-  BOUNDARY OF INVESTIGATIONAL AREA
-  BOUNDARY OF HYDROGRAPHIC AREA
-  BOUNDARY OF HYDROGRAPHIC UNIT
-  BOUNDARY OF FEDERAL AND STATE LANDS
-  IRRIGATED AGRICULTURE
-  URBAN RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL - MANUFACTURING AND PROCESSING
-  INDUSTRIAL - EXTRACTIVE, STORAGE, AND TRANSPORTATION
-  MIXED INDUSTRIAL, COMMERCIAL, RESIDENTIAL, AND VACANT LANDS DETERMINED BY CITY OF SAN DIEGO (SEE TEXT)
-  MILITARY RESERVATIONS
-  HYDROGRAPHIC UNIT NUMBER

STATE OF CALIFORNIA
 THE RESOURCES AGENCY OF CALIFORNIA
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

PRESENT LAND USE
 1958



HYDROGRAPHIC AREAS AND UNITS

PORTION OF COLORADO DESERT AREA

7-2 PORTION OF COACHELLA VALLEY UNIT

7-3 PORTION OF SALTON SEA UNIT

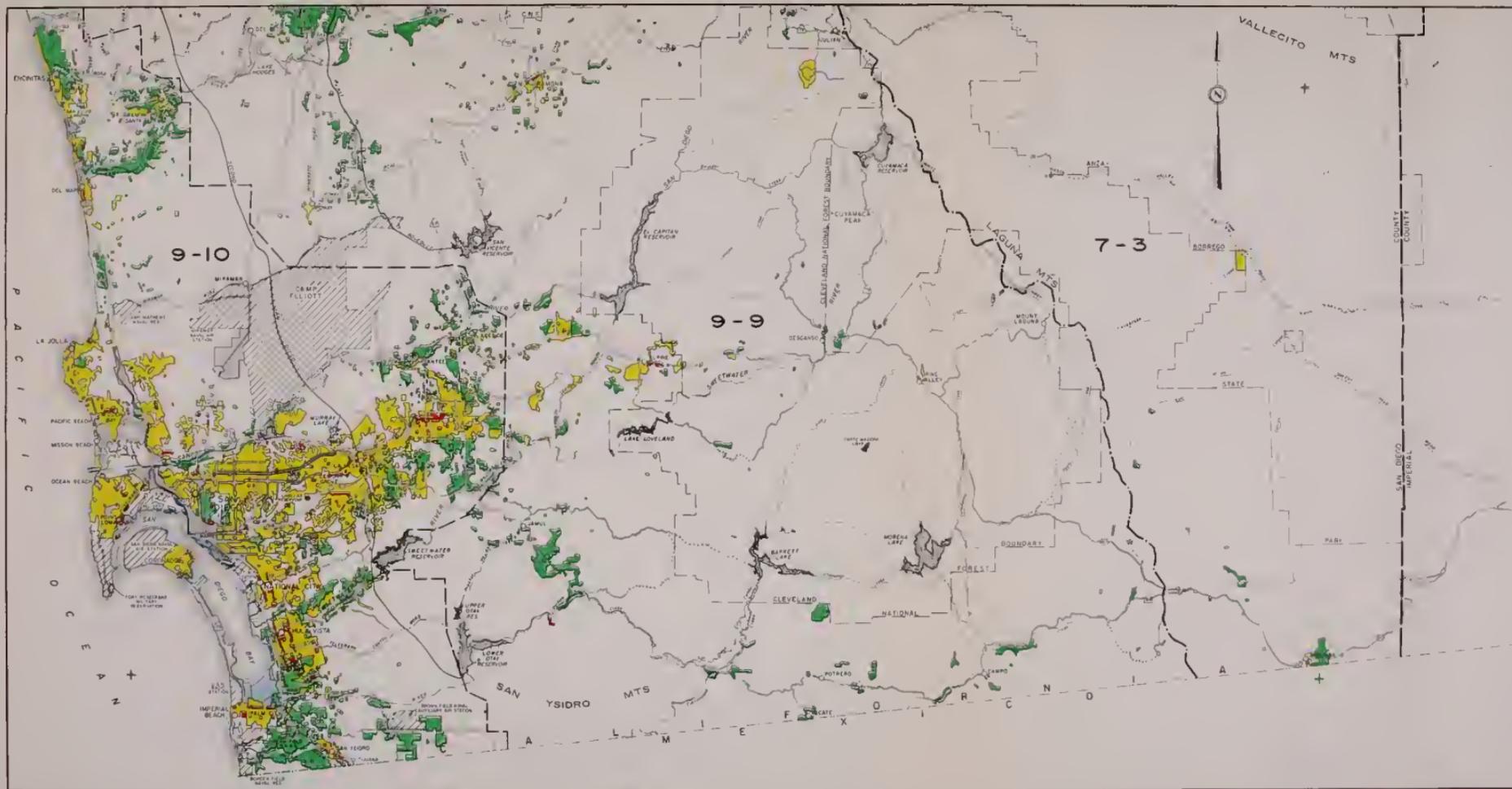
PORTION OF SOUTH COASTAL AREA

9-7 PORTION OF SAN JUAN CAPISTRANO UNIT

9-8 SANTA MARGARITA - SAN LUIS REY UNIT

9-9 SAN DIEGUITO - COTTONWOOD UNIT

9-10 SAN DIEGO UNIT



- LEGEND
- BOUNDARY OF INVESTIGATIONAL AREA
 - BOUNDARY OF HYDROGRAPHIC AREA
 - BOUNDARY OF HYDROGRAPHIC UNIT
 - BOUNDARY OF FEDERAL AND STATE LANDS
 - HAIRY-BERED AGRICULTURE
 - URBAN RESIDENTIAL
 - COMMERCIAL
 - INDUSTRIAL - MANUFACTURING AND PROCESSING
 - INDUSTRIAL - EXTRACTIVE STORAGE, AND TRANSPORTATION
 - MIXED INDUSTRIAL, COMMERCIAL, RESIDENTIAL AND VACANT LANDS DETERMINED BY TITLE OF SAN DIEGO 1956 TESTS
 - WILDERNESS RESERVATIONS
 - 9-9 HYDROGRAPHIC UNIT NUMBER

STATE OF CALIFORNIA
 THE RESOURCES AGENCY OF CALIFORNIA
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

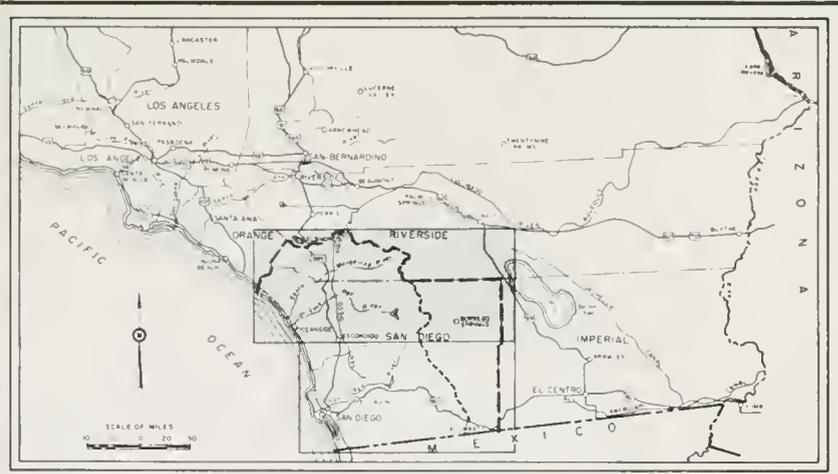
SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

PRESENT LAND USE
 1958

SCALE OF MILES

THE HISTORY OF THE
CITY OF BOSTON

CHAPTER I. THE FOUNDATION OF THE CITY	1
CHAPTER II. THE EARLY SETTLEMENTS	15
CHAPTER III. THE GROWTH OF THE CITY	35
CHAPTER IV. THE REVOLUTIONARY PERIOD	65
CHAPTER V. THE CITY IN THE NINETEENTH CENTURY	100
CHAPTER VI. THE CITY IN THE TWENTIETH CENTURY	135
CHAPTER VII. THE CITY IN THE TWENTY-FIRST CENTURY	170



LOCATION MAP

H

7-2

7-3

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- · - - BOUNDARY OF HYDROGRAPHIC AREA
- BOUNDARY OF HYDROGRAPHIC UNIT
- · - - BOUNDARY OF FEDERAL AND STATE LANDS
- IRRIGATED AGRICULTURAL EXPANSION
- URBAN AND SUBURBAN AREAS EXPANSION
- MILITARY RESERVATIONS
- 9-9** HYDROGRAPHIC UNIT NUMBER

9-7

9-8

9-9

9-10

NOTE: CHANGE IN LAND USE FOR SALTON SEA HYDROGRAPHIC UNIT IS 1950 TO 1958

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SAN DIEGO COUNTY
LAND AND WATER USE SURVEY

CHANGE IN LAND USE
1948 TO 1958



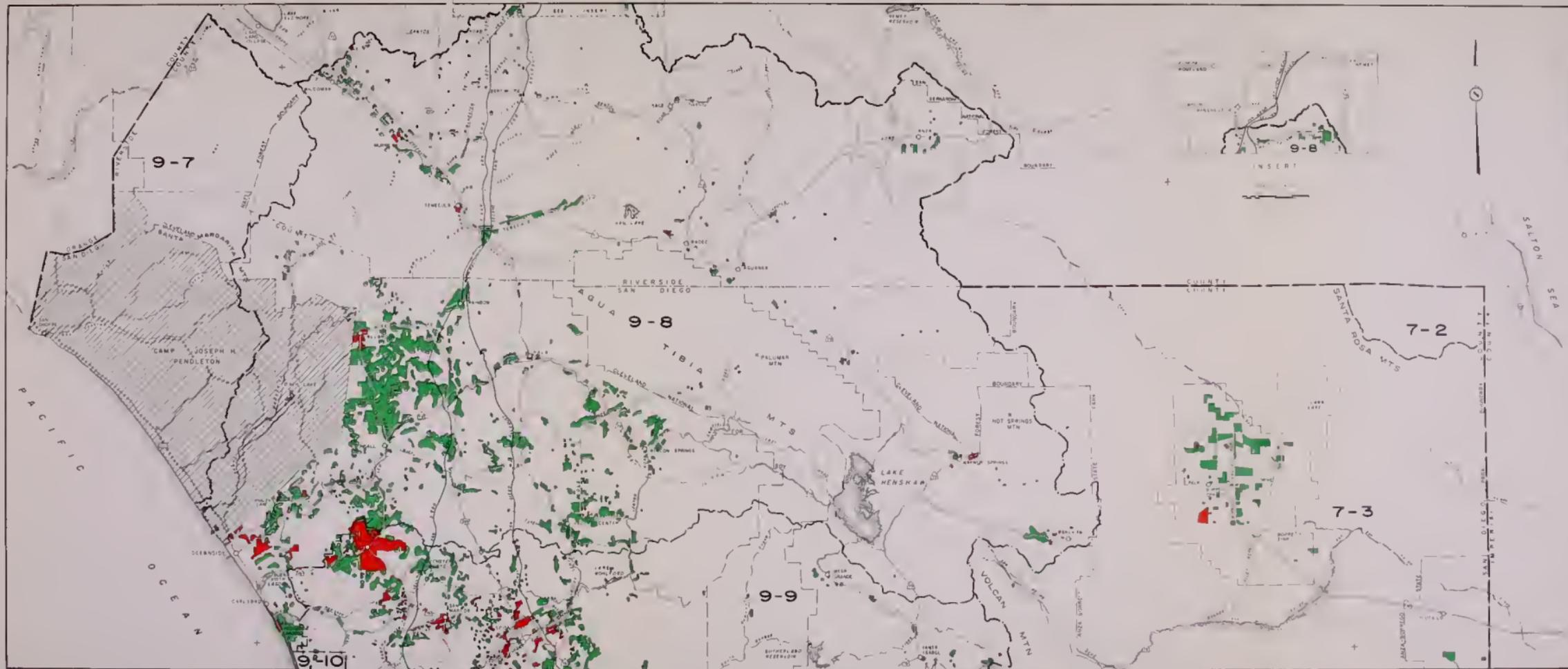
HYDROGRAPHIC AREAS AND UNITS

PORTION OF COLORADO DESERT AREA

- 7-2 PORTION OF COACHELLA VALLEY UNIT
- 7-3 PORTION OF SALTON SEA UNIT

PORTION OF SOUTH COASTAL AREA

- 9-7 PORTION OF SAN JUAN CAPISTRANO UNIT
- 9-8 SANTA MARGARITA - SAN LUIS REY UNIT
- 9-9 SAN DIEGUITO - COTTONWOOD UNIT
- 9-10 SAN DIEGO UNIT



LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROGRAPHIC AREA
- BOUNDARY OF FEDERAL AND STATE LANDS
- BOUNDARY OF FEDERAL AND STATE LANDS
- AGRICULTURAL DEVELOPMENT
- URBAN AND AGRICULTURAL AREAS EXPANSION
- WATERSHED RESERVATIONS
- 9-9 HYDROGRAPHIC UNIT NUMBER

NOTE: CHANGE IN LAND USE FOR 1948 FOR NEW HYDROGRAPHIC UNIT 9-10 TO 1958

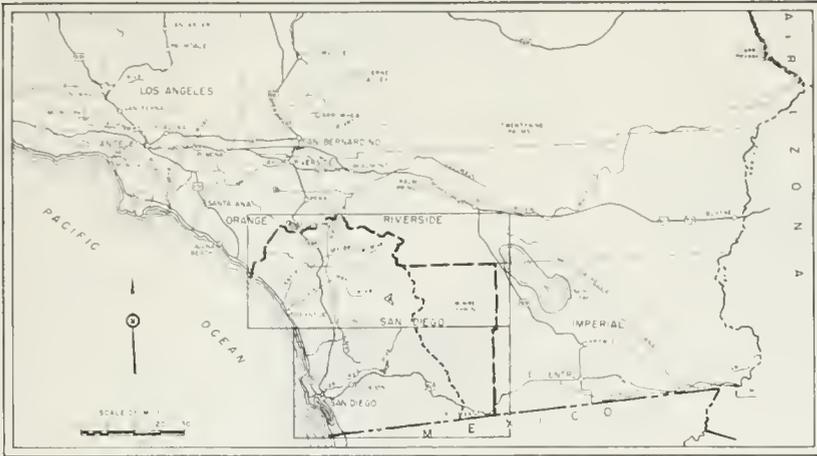
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 THE RESOURCE AGENCY OF CALIFORNIA
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SAN DIEGO COUNTY
 LAND AND WATER USE SURVEY

CHANGE IN LAND USE
 1948 TO 1958

SCALE OF MILES





LOCATION MAP

LEGEND

-  BOUNDARY OF INVESTIGATIONAL AREA
-  BOUNDARY OF HYDROGRAPHIC AREA
-  BOUNDARY OF HYDROGRAPHIC UNIT
-  BOUNDARY OF FEDERAL AND STATE LANDS
-  IRRIGATED AGRICULTURAL EXPANSION
-  URBAN AND SUBURBAN AREAS EXPANSION
-  MIXED INDUSTRIAL, COMMERCIAL, RESIDENTIAL, AND VACANT LANDS DETERMINED BY CITY OF SAN DIEGO (SEE TEXT)
-  MILITARY RESERVATIONS
- 9-9** HYDROGRAPHIC UNIT NUMBER

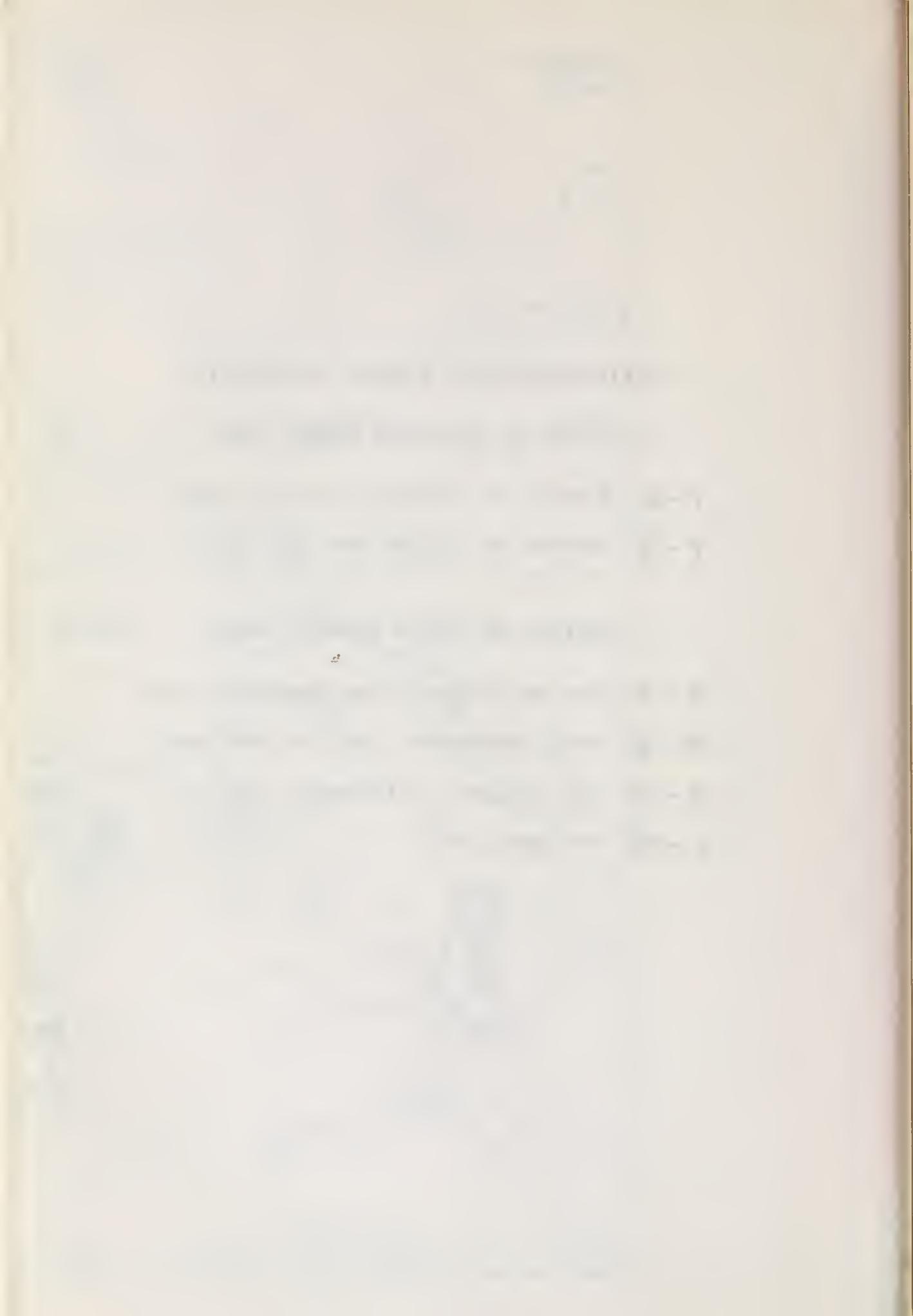
NOTE CHANGE IN LAND USE FOR SALTON SEA
HYDROGRAPHIC UNIT IS 1950 TO 1958

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SAN DIEGO COUNTY
LAND AND WATER USE SURVEY

CHANGE IN LAND USE
1948 TO 1958





APPENDIX A
DEFINITION OF TERMS



APPENDIX A

DEFINITION OF TERMS

Annual - The 12-month period from January 1 of a given year through December 31 of the same year, sometimes termed the "calendar year."

Applied Water - Water delivered to a farmer's headgate, in the case of irrigation use, or to an individual's meter in the case of urban use, or its equivalent. Applied water does not include direct precipitation.

Applied Water Requirement - The applied water needed to provide for all beneficial uses and for irrecoverable losses incidental to such uses. Applied water requirement excludes that portion of the requirement which is provided by precipitation.

Aquifer - A geologic formation or structure sufficiently permeable to yield water to wells or springs.

Average - An arithmetical average relating to a period other than a mean period.

Confined Ground Water - A body of ground water immediately overlain by material sufficiently impervious to sever free hydraulic connection with overlying water, and acted upon by pressure caused by the difference in head between the intake or forebay area and the discharge area of the confined water body.

Consumptive Use of Water - Water consumed by vegetative growth in transpiration and building plant tissue, and water evaporated from adjacent soil, from water surface, and from foliage. It also refers to water similarly consumed and evaporated by urban and nonvegetative types of land use.

Free Ground Water - A body of ground water not immediately overlain by impervious materials.

Ground Water Overdraft - The annual net extraction of water from a ground water basin in excess of safe ground water yield.

Irrigation Efficiency - The ratio of consumptive use of applied irrigation water to the total amount of water applied, expressed as a percentage.

Mean - An arithmetical average relating to a mean period.

Mean Period - A period chosen to represent conditions of water supply and climate over a long series of years. For purposes of the current investigation, the mean precipitation period embraces the 50 seasons from 1897-98 through 1946-47; the mean runoff period, the 53 seasons from 1894-95 through 1946-47.

Net Water Use - Water historically applied, or estimated to have been applied, which is consumptively utilized for beneficial purposes or irrecoverably lost. It does not include that portion of the applied water which is subject to possible reuse.

Present - Land use and water supply conditions prevailing during the 1957-58 season.

Safe Ground Water Yield - The average annual net amount of water that could be beneficially extracted from a ground water basin over an indefinitely long period of years, under a particular set of those physical conditions affecting supply to, and disposal from, the ground water basin, without causing a net lowering of ground water levels during the period.

Seasonal - Any 12-month period other than the calendar year.

Water Utilization - Water utilization includes all employments of water by nature or man, whether consumptive or nonconsumptive, as well as irrecoverable losses of water incidental to such employment, and is synonymous with the term "water use."

Water Requirement - The water needed to provide for all beneficial uses and for all irrecoverable losses incidental to such uses. Water requirement includes the portion supplied from direct precipitation.

APPENDIX B

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS
IN SAN DIEGO COUNTY AND A PORTION OF
SOUTHWESTERN RIVERSIDE COUNTY
IN 1958



LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958

In acres

Category and class of land use	Santa Margarita River Hydrologic Unit									
	Arroyo San Onofre Hydrologic Unit	Murrieta Creek below Vail Reservoir	Temecula Creek above Vail Reservoir	Lancaster-Coahuila Creek above Vail Reservoir	Remainder of Temecula Creek below Vail Reservoir	Margarita River from gage at Temecula Canyon to De Luz Dam site	Santa Margarita River from De Luz Dam site to coast	Santa Margarita River from De Luz Dam site to coast	Santa Margarita River from De Luz Dam site to coast	Santa Margarita River from De Luz Dam site to coast
<u>WATER SERVICE AREA</u>										
Urban and Suburban	0	100	30	30	30	140	220	520	120	20
Residential	0	60	0	0	0	20	30	120	20	0
Commercial	0	40	0	0	0	10	10	20	10	0
Industrial	0	40	0	0	0	40	10	780	10	0
Unsegregated urban and suburban area	0	490	90	90	90	40	10	780	10	0
Subtotals	0	690	120	120	110	80	270	1,440	270	10
Included Nonwater Service Area	0	160	20	20	20	20	100	380	100	0
Gross Urban and Suburban Area	0	810	140	140	130	100	370	1,820	370	10
<u>Irrigated Agriculture</u>										
Alfalfa	0	900	140	140	200	670	0	1,910	0	0
Pasture	0	600	40	40	190	540	0	1,430	0	0
Citrus and subtropical	0	280	0	0	0	0	480	1,790	0	0
Truck crops	0	590	420	420	20	220	0	1,270	0	0
Field crops	0	0	60	60	0	280	0	380	0	0
Deciduous fruits and nuts	0	110	30	30	10	10	0	200	0	0
Small grains	0	50	50	50	0	0	0	100	0	0
Vineyards	0	0	0	0	0	0	0	10	0	0
Subtotals	0	2,530	740	740	420	1,720	480	7,090	480	0
Fallow	0	330	0	0	0	210	30	580	30	0
Included Nonwater Service Area	0	170	120	120	20	90	80	480	80	0
Gross Irrigated Agriculture	0	3,030	860	860	440	2,020	510	8,150	510	0
GROSS WATER SERVICE AREA	0	3,840	1,000	1,000	570	2,120	880	9,970	880	0
<u>NONWATER SERVICE AREA</u>										
Nonirrigated Agriculture	0	53,590	9,800	9,800	4,130	3,060	0	70,780	0	0
Native Vegetation	10	27,740	38,260	38,260	8,250	15,220	0	92,530	0	0
Unclassified	152,310	57,120	51,950	51,950	90,380	8,960	16,040	293,120	16,040	0
GROSS NONWATER SERVICE AREA	152,320	138,450	100,010	100,010	102,760	27,240	16,040	456,430	16,040	0
TOTALS	152,320	142,290	101,010	101,010	103,330	29,360	16,920	466,400	16,920	0

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1978
(continued)

In acres

Category and class of land use	San Luis Rey River Hydrologic Unit									
	San Luis River between Henshaw Dam and Escondido Ditch Intake:	San Luis River between Escondido Ditch Intake: Pala								
WATER SERVICE AREA										
Urban and Suburban										
Residential	20	a	50	10	500	90	790	1,460		
Commercial	10	0	10	a	20	10	110	160		
Industrial	0	0	0	0	0	0	30	30		
Unsegregated urban and suburban area	140	a	100	30	290	260	220	1,040		
Subtotals	170	a	160	40	810	360	1,150	2,690		
Included Nonwater Service Area	40	10	30	10	220	70	520	900		
Gross Urban and Suburban Area	210	10	190	50	1,030	430	1,670	3,590		
Irrigated Agriculture										
Alfalfa	a	0	300	0	80	70	80	530		
Pasture	60	0	590	450	900	610	280	2,890		
Citrus and subtropical	0	0	2,230	200	7,140	830	1,220	11,620		
Truck crops	0	0	480	190	680	420	1,640	3,410		
Field crops	a	0	0	0	0	0	470	470		
Deciduous fruits and nuts	a	0	90	20	260	270	10	650		
Small grains	0	0	20	20	1,130	70	70	1,310		
Vineyards	0	0	a	0	40	70	20	130		
Subtotals	60	0	3,710	880	10,230	2,340	3,790	21,010		
Fallow	0	0	40	0	320	140	210	710		
Included Nonwater Service Area	10	0	260	240	760	130	200	1,600		
Gross Irrigated Agriculture	70	0	4,010	1,120	11,310	2,610	4,200	23,320		
GROSS WATER SERVICE AREA	280	10	4,200	1,170	12,340	3,040	5,870	26,910		
NONWATER SERVICE AREA										
Nonirrigated Agriculture	22,940	570	1,680	750	1,820	720	310	28,790		
Native Vegetation	6,840	420	4,910	3,760	3,490	2,100	2,420	23,940		
Unclassified	101,390	19,170	41,130	28,990	35,470	30,600	21,790	272,080		
GROSS NONWATER SERVICE AREA	131,170	20,700	47,720	33,500	40,780	33,420	24,520	331,810		
TOTALS	131,450	20,710	51,920	34,670	53,120	36,460	30,390	358,720		

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958
(continued)

In acres

Category and class of land use	Carlsbad Hydrologic Unit				San Diego River Hydrologic Unit			
	Escondido Creek from Lake Wohlford to coast	San Marcos, Agua Hedionde, and Encinitas Creeks	Buena Vista Creek	Escondido Creek above Lake Wohlford	Carlsbad Hydrologic Unit Total	Santa Ysabel Creek above Santa Ysabel Dam	Santa Ysabel Creek between Santa Ysabel and Sutherland Dam	Santa Ysabel Creek between Sutherland and Pamo Dam site
WATER SERVICE AREA								
Urban and Suburban								
Residential	1,940	1,440	2,140	10	5,530	0	0	a
Commercial	160	110	220	a	490	20	0	0
Industrial	40	10	30	0	80	0	0	0
Unsegregated urban and suburban area	500	440	310	20	1,270	30	10	20
Subtotals	2,640	2,000	2,700	30	7,370	50	10	20
Included Nonwater Service Area	1,120	870	1,280	10	3,280	10	a	20
Gross Urban and Suburban	3,760	2,870	3,980	40	10,650	60	10	40
Irrigated Agriculture								
Alfalfa	90	40	0	0	130	10	20	20
Pasture	500	200	60	20	780	a	10	60
Citrus and subtropical	3,570	3,410	2,260	0	9,240	0	0	0
Truck crops	260	2,020	300	0	2,580	0	0	0
Field crops	20	30	a	0	50	0	0	0
Deciduous fruits and nuts	160	330	30	130	650	a	0	0
Small Grains	0	90	0	10	100	0	0	0
Vineyards	260	60	30	0	350	0	0	0
Subtotals	4,860	6,180	2,680	160	13,880	10	30	80
Fallow	100	420	120	0	640	0	0	20
Included Nonwater Service Area	470	460	190	10	1,130	0	a	70
Gross Irrigated Agriculture	5,430	7,060	2,990	170	15,650	10	30	170
GROSS WATER SERVICE AREA	9,190	9,930	6,970	210	26,300	70	40	210
NONWATER SERVICE AREA								
Nonirrigated Agriculture	3,110	6,490	380	0	9,980	2,680	0	400
Native Vegetation	3,810	2,960	2,850	0	9,620	120	0	860
Unclassified	33,810	40,790	9,910	5,200	89,710	12,980	18,460	35,290
GROSS NONWATER SERVICE AREA	40,730	50,240	13,140	5,200	109,310	15,780	18,460	36,550
TOTALS	49,920	60,170	20,110	5,410	135,610	15,850	18,500	36,760

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958
(continued)

In acres

Category and class of land use	San Diego River Hydrologic Unit									
	Boulder Creek above Cuyamaca Dam	San Diego River above Dam ^c	San Diego River between Diverting Dam and El Capitan Dam	San Diego River between El Capitan Lakeside Dam	San Diego River between San Vicente Creek above Murray Dam	Alvarado Canyon above Murray Dam	San Diego River between Lakeside and Old Mission Dam	San Diego River between Old Mission Dam and Old Towne		
WATER SERVICE AREA										
Urban and Suburban	40	110	210	20	0	30	3,750	4,310		
Residential	^a	10	60	0	0	0	370	320		
Commercial	0	0	0	0	0	0	20	200		
Industrial	0	20	20	30	20	0	570	460		
Unsegregated urban and suburban area	40	140	290	50	20	30	4,710	5,290		
Subtotals	30	290	100	10	0	30	2,270	4,790		
Included Nonwater Service Area	70	430	390	60	20	60	6,980	10,080		
Gross Urban and Suburban										
Irrigated Agriculture										
Alfalfa	0	0	0	40	0	0	50	30		
Pasture	0	70	30	200	10	0	890	200		
Citrus and subtropical	0	0	0	0	0	0	1,770	60		
Truck crops	0	^a	10	40	0	0	360	160		
Field crops	0	0	0	10	0	0	0	0		
Deciduous fruits and nuts	0	170	0	0	0	0	70	0		
Small grains	0	0	0	0	0	0	280	0		
Vineyards	0	0	0	0	0	0	40	^a		
Subtotals	0	240	40	290	10	0	3,460	450		
Fallow	0	0	0	10	0	0	190	120		
Included Nonwater Service Area	0	10	^a	20	0	0	380	100		
Gross Irrigated Agriculture	0	250	40	320	10	0	4,030	670		
GROSS WATER SERVICE AREA	70	680	430	380	30	60	11,010	10,750		
NONWATER SERVICE AREA										
Nonirrigated Agriculture										
Native Vegetation	140	270	520	600	2,200	0	7,210	1,720		
Unclassified	7,270	55,620	54,870	6,810	42,720	2,250	44,410	25,940		
GROSS NONWATER SERVICE AREA	7,410	56,350	55,070	7,540	47,730	2,250	54,140	27,770		
TOTALS	7,480	57,030	55,500	7,920	47,760	2,310	65,150	38,520		

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958
(continued)

Category and class of land use	In acres													
	San Diego River Hydrologic Unit		San Diego Hydrologic Unit		Sweetwater River above Descanso		Sweetwater River between Descanso and Loveland Dam		Sweetwater River Hydrologic Unit		Sweetwater River between Sweetwater and Bay		Sweetwater River Hydrologic Unit	
	San Diego River Hydrologic Unit	Total	San Diego Hydrologic Unit	Total	Sweetwater River above Descanso	Total	Sweetwater River between Descanso and Loveland Dam	Total	Sweetwater River between Sweetwater and Bay	Total	Sweetwater River between Sweetwater and Bay	Total	Sweetwater River Hydrologic Unit	Total
WATER SERVICE AREA														
Urban and Suburban	8,470	11,950	70	30	520	4,240	520	310	40	800	4,860	350	40	800
Residential	760	1,180	10	10	20	310	20	40	470	350	310	40	470	350
Commercial	220	410	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	1,120	890	20	40	270	470	270	470	470	270	470	270	470	270
Unsegregated urban and suburban area	10,570	14,430	100	80	810	5,060	810	5,060	5,060	810	5,060	810	5,060	810
Subtotals	7,520	10,660	40	20	590	3,920	590	3,920	3,920	590	3,920	590	3,920	590
Included Nonwater Service Area	18,090	25,090	140	100	1,400	8,980	1,400	8,980	8,980	1,400	8,980	1,400	8,980	1,400
Gross Urban and Suburban	120	0	20	0	80	0	80	0	0	100	0	100	0	100
Irrigated Agriculture	1,400	30	210	90	130	170	130	170	170	600	600	600	600	600
Alfalfa	1,830	20	0	0	800	820	800	820	820	1,160	1,160	1,160	1,160	1,160
Pasture	570	400	0	20	150	990	150	990	990	10	10	10	10	10
Citrus and subtropical	10	0	0	10	0	0	0	0	0	0	0	0	0	0
Truck crops	240	0	0	20	10	30	20	30	30	30	30	30	30	30
Field crops	280	0	0	80	660	10	660	10	10	750	750	750	750	750
Deciduous fruits and nuts	40	0	0	0	0	0	0	0	0	0	0	0	0	0
Small fruits	40	0	0	0	0	0	0	0	0	0	0	0	0	0
Vineyards	4,490	450	230	210	1,840	1,990	1,840	1,990	1,990	4,270	4,270	4,270	4,270	4,270
Subtotals	320	190	40	0	100	610	100	610	610	710	710	710	710	710
Fallow	510	140	40	10	180	590	180	590	590	820	820	820	820	820
Included Nonwater Service Area	5,320	760	270	220	2,120	3,190	2,120	3,190	3,190	5,800	5,800	5,800	5,800	5,800
Gross Irrigated Agriculture	23,410	25,870	410	320	3,520	12,170	3,520	12,170	12,170	16,420	16,420	16,420	16,420	16,420
GROSS WATER SERVICE AREA	6,710	0	50	140	1,810	320	1,810	320	320	2,320	2,320	2,320	2,320	2,320
NONWATER SERVICE AREA	12,660	420	750	400	4,560	1,520	4,560	1,520	1,520	7,230	7,230	7,230	7,230	7,230
Nonirrigated Agriculture	239,890	12,400	27,600	32,480	44,240	16,990	44,240	16,990	16,990	121,310	121,310	121,310	121,310	121,310
Native Vegetation	259,260	12,820	28,400	33,020	50,610	18,830	50,610	18,830	18,830	130,860	130,860	130,860	130,860	130,860
Unclassified	282,670	38,690	28,810	33,340	54,130	31,000	54,130	31,000	31,000	147,280	147,280	147,280	147,280	147,280
GROSS NONWATER SERVICE AREA	282,670	38,690	28,810	33,340	54,130	31,000	54,130	31,000	31,000	147,280	147,280	147,280	147,280	147,280
TOTALS	282,670	38,690	28,810	33,340	54,130	31,000	54,130	31,000	31,000	147,280	147,280	147,280	147,280	147,280

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1958
(continued)

In acres

Category and class of land use	Otay River Hydrologic Unit				Tia Juana River Hydrologic Unit			
	Otay River above Lower Otay Dam	Proctor Valley above Upper Otay Dam	Otay River between Lower Otay Dam and Bay	Otay River Hydrologic Unit Total	Cottonwood Creek above Barrett Dam	Cottonwood Creek above Moreno Dam	Tia Juana River drainage area in California ⁸	
WATER SERVICE AREA								
Urban and Suburban								
Residential	10	0	1,770	1,780	50	10	40	
Commercial	30	^a	180	210	10	0	10	
Industrial	^a	0	30	30	0	0	^a	
Unsegregated urban and suburban area	80	30	440	550	10	10	110	
Subtotals	120	30	2,420	2,570	70	30	160	
Included Nonwater Service Area	30	0	1,500	1,530	100	10	70	
Gross Urban and Suburban	150	30	3,920	4,100	170	40	230	
Irrigated Agriculture								
Alfalfa	0	0	40	40	0	^a	0	
Pasture	160	0	90	250	0	0	650	
Citrus and subtropical	10	20	10	40	0	0	0	
Truck crops	10	0	1,070	1,080	0	0	10	
Field crops	0	0	10	10	0	0	0	
Deciduous fruits and nuts	0	0	0	0	0	0	30	
Small grains	1,450	120	0	1,570	0	0	1,140	
Vineyards	0	0	0	0	0	0	0	
Subtotals	1,630	140	1,220	2,990	0	^a	1,830	
Fallow	10	0	720	730	0	0	0	
Included Nonwater Service Area	80	10	370	460	0	0	140	
Gross Irrigated Agriculture	1,720	150	2,310	4,180	0	^a	1,970	
GROSS WATER SERVICE AREA	1,870	180	6,230	8,280	170	40	2,200	
NONWATER SERVICE AREA								
Nonirrigated Agriculture								
Native Vegetation	2,110	510	330	2,950	0	650	2,930	
Unclassified	2,160	280	2,540	4,980	450	2,930	6,080	
GROSS NONWATER SERVICE AREA	48,830	7,150	38,490	94,470	83,050	69,210	99,020	
TOTALS	53,100	7,940	41,360	102,400	83,500	72,790	108,030	
	54,970	8,120	47,590	110,680	83,670	72,830	110,230	

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN COASTAL SAN DIEGO COUNTY
AND A PORTION OF SOUTHWESTERN RIVERSIDE COUNTY IN 1956
(continued)

Category and class of land use	In acres				Totals
	Tia Juana River Hydrologic Unit				
	Hipass Subunit	Tia Juana Valley	Tia Juana River Hydrologic Unit	Total	
WATER SERVICE AREA					
<u>Urban and Suburban</u>					
Residential	10	470	580	40,840	
Commercial	^a	40	70	3,710	
Industrial	0	10	10	980	
Unsegregated urban and suburban area	<u>10</u>	<u>240</u>	<u>380</u>	<u>8,980</u>	
Subtotals	20	760	1,040	54,510	
<u>Included Nonwater Service Area</u>					
Gross Urban and Suburban Area	<u>10</u>	<u>360</u>	<u>550</u>	<u>35,010</u>	
	30	1,120	1,590	89,520	
<u>Irrigated Agriculture</u>					
Alfalfa	0	300	300	4,530	
Pasture	30	220	900	9,830	
Citrus and subtropical	0	0	0	31,780	
Truck crops	0	1,880	1,890	12,670	
Field crops	0	80	80	1,370	
Deciduous fruits and nuts	^a	0	30	1,560	
Small grains	0	0	1,140	5,810	
Vineyards	<u>0</u>	<u>0</u>	<u>0</u>	<u>760</u>	
Subtotals	30	2,480	4,340	68,710	
Fallow	0	1,700	1,700	6,570	
Included Nonwater Service Area	<u>0</u>	<u>550</u>	<u>690</u>	<u>7,000</u>	
Gross Irrigated Agriculture	<u>30</u>	<u>4,730</u>	<u>6,730</u>	<u>82,280</u>	
GROSS WATER SERVICE AREA	60	5,850	8,320	171,800	
NONWATER SERVICE AREA					
<u>Nonirrigated Agriculture</u>					
Native Vegetation	0	340	3,920	154,290	
	0	2,010	11,470	174,590	
Unclassified	<u>5,690</u>	<u>17,490</u>	<u>274,460</u>	<u>1,809,860</u>	
GROSS NONWATER SERVICE AREA	<u>5,690</u>	<u>19,850</u>	<u>289,850</u>	<u>2,138,740</u>	
TOTALS	5,750	25,700	298,170	2,310,540	

- a. Less than 5 acres.
- b. Excluding Santa Maria Creek and Gujito Creek.
- c. Excluding Boulder Creek above Guymaca Dam.
- d. Excluding San Vicente Creek.
- e. Excluding Alvarado Canyon above Murray Dam.
- f. Excluding Cottonwood Creek above Moreno Dam.
- g. Excluding Cottonwood Creek above Barrett Dam and Tia Juana Valley.

APPENDIX C

LIST OF DISTRICTS, AREAS, AND UNITS
FOR WHICH INDIVIDUAL TABULATIONS
OF 1958 LAND USES ARE AVAILABLE

APPENDIX C

LIST OF DISTRICTS, AREAS, AND UNITS FOR WHICH INDIVIDUAL TABULATIONS OF 1958 LAND USES ARE AVAILABLE

Utilizing machine techniques that were developed for processing data from this survey, individual tabulations of 1958 land uses can be obtained for most of the political and hydrologic subdivisions within the area of investigation. However, reasonable limitations do not permit all of these individual tabulations to be published in this report.

For those requiring more detailed information, this appendix lists all districts, areas, and units for which 1958 land uses can be individually determined and tabulated by machine methods using data available in Department of Water Resources files. It should be noted that data were based on 1958 conditions, including boundaries, and have not been modified to reflect subsequent changes.

COUNTY WATER DISTRICTS

Pomerado County Water District

San Marcos County Water District

Tia Juana Valley County Water District

INDIAN RESERVATIONS

Barona

Campo

Capitan Grande

Coahuila

Cuyapaipe

Inaja

INDIAN RESERVATIONS (continued)

La Jolla
La Posta
Los Coyotes
Manzanita
Mission
Morongo
Pala
Pauma
Pechanga
Rincon
San Pasqual
Sequan
Viejas
Yuima
Cosmit
San Ysabel
Mesa Grande
Ramona

IRRIGATION DISTRICTS

Helix Irrigation District
Lakeside Irrigation District
Ramona Irrigation District
Rancho Santa Fe Irrigation District
San Dieguito Irrigation District
Santa Fe Irrigation District

IRRIGATION DISTRICTS (continued)

San Ysidro Irrigation District
South Bay Irrigation District
Spring Valley Irrigation District
Vista Irrigation District

MUNICIPALITIES

Carlsbad
Chula Vista
Coronado
El Cajon
Encinitas
Escondido
Imperial Beach
La Mesa
National City
Oceanside
San Diego

MUNICIPAL WATER DISTRICTS

Bueno Colorado Municipal Water District
Carlsbad Municipal Water District
Otay Municipal Water District
Poway Municipal Water District
Rainbow Municipal Water District
Ramona Municipal Water District
Rincon Del Diablo Municipal Water District
Rio San Diego Municipal Water District

MUNICIPAL WATER DISTRICTS (continued)

Valley Center Municipal Water District

Olivenhain Municipal Water District

San Luis Rey Municipal Water District

NATIONAL FORESTS, WILD AREAS

Cleveland National Forest

Aqua Tibia Wilderness Area

PARKS

State Parks

Carlsbad State Park

Cuyamaca Rancho State Park

Montgomery Memorial State Park

Palomar Mountain State Park

Silver Strand State Park

Anza Borrego State Park

Torrey Pines Beach

County Parks

Flinn Springs County Park

City Parks

Balboa

Mission Bay

Presidio

Soledad

Soledad Terrace

Torrey Pines

PUBLIC UTILITY DISTRICTS

Fallbrook Public Utility District

Heber Public Utility District

Crest Public Utility District

SANITARY DISTRICTS

Del Mar Sanitary District

Fallbrook Sanitary District

Soledad Sanitary District

Imperial Beach Sanitary District

Encinitas Sanitary District

Green Acres Sanitary District

SANITATION DISTRICTS

Julian Sanitation District

Lakeside Sanitation District

Palm City Sanitation District

Ramona Sanitation District

Rancho Del Campo Sanitation District

Randho Santa Fe Sanitation District

San Ysidro Sanitation District

Solana Beach Sanitation District

Spring Valley Sanitation District

Vista Sanitation District

La Mesa Park Sanitation District

Rolando Sanitation District

Cardiff Sanitation District

Poway Sanitation District

SANITATION DISTRICTS

Fletcher Hill Sanitation District

Alpine Sanitation District

WATER DISTRICTS

Belfort Heights Water District

Bonsall Heights Water District

Los Posas Water District

Moosa Water District

Orchard Water District

Alpine Highlands Water District





