STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

EARL WARREN, Governor

C. H. PURCELL, Director of Public Works

EDWARD HYATT, State Engineer

REPORT ON WATERMASTER SERVICE IN SHASTA RIVER WATERMASTER SERVICE AREA

Siskiyou County, California

1948 Season

Sacramento, California

EDWARD HYATT, STATE ENGINEER
CHIEF OF DIVISION

EARL WARREN
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STATE OF CALIFORNIA
Department of Public Works
SACRAMENTO

ADDRESS REPLY TO
DIVISION OF WATER RESOURCES
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P. O. BOX 1079
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January 18, 1949

Mr. Gordon Zander
Principal Hydraulic Engineer
Sacramento, California

Dear Sir:

Herewith is submitted the annual report covering watermaster service within the Shasta River Watermaster Service Area, Siskiyou County, California, during the 1948 season.

The report presents a general description of the work and a discussion of the results obtained. Records of precipitation, run-off and other pertinent data are included.

Respectfully submitted,

I. C. Jorson
Senior Hydraulic Engineer

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REPORT ON

WATERMASTER SERVICE

ON

SHASTA RIVER AND ITS TRIBUTARIES

SISKIYOU COUNTY, CALIFORNIA

1948 SEASON

INTRODUCTION

The Shasta River Watermaster Service Area was created by order of the Division of Water Resources under date of March 1, 1933, to embrace the water rights on Shasta River and its tributaries in Siskiyou County, California, excepting certain tributaries and springs named in said order, as established by Decree of the Superior Court, Siskiyou County, California, in the Shasta River Proceeding No. 7035, entered on December 30, 1932. Subsequent to creation of the district, the boundaries were changed to exclude the water rights on Willow Creek and its tributaries by order of the Division of Water Resources under date of December 30, 1935.

Watermaster service in the Shasta River Watermaster Service Area was carried on throughout the 1948 season in accordance with the "Distribution of Water" procedure contained in Sections 4000 to 4360, inclusive, of the Water Code. Such service extended over the period from April 1 to September 30. P. E. Stephenson, Watermaster, Shasta River Watermaster Service Area, administered the distribution of water from the streams within the district during the entire period. Merritt Miller acted as Deputy Watermaster in the area from June 15 to September 1.

WATER SUPPLY

Precipitation

Data on precipitation as compiled from records taken at the U. S. Weather Bureau Station at Yreka, are presented in Table 1.

The precipitation occurring at this station during the period from October 1, 1947 to September 30, 1948 was 129 per cent of the 33-year seasonal average. Normally about 80 per cent of the seasonal precipitation occurs during the period from October 1 to April 1. However, only 60 per cent of the total seasonal precipitation occurred during this period of the 1947-48 seasonal year.

The percentage relationship of the 1947-48 precipitation to the 33-year mean is as follows:

Period	Per Cent
October 1, 1947 to September 30, 1948	129
October 1, 1947 to March 31, 1948	100
April 1 to June 30, 1948	180
July 1 to September 30, 1948	300

Snow Surveys

A record of the water content of the snow at Parks Creek, Sweetwater, North Fork of Sacramento and Mount Shasta snow survey courses as measured on or about April 1 of each year is presented in Table 2. The average water content of the snow at the four stations is considered representative of the snow pack on the Shasta River watershed. Normally the relation of the water content of snow on April 1 and the precipitation for the period October 1 to April 1

to their respective long time means are about the same. During the 1947-48 seasons the average water content of snow on April 1 was 17.5 inches or about 60 per cent of the mean for the 12-year period of record and the precipitation at Yreka for the period October 1 to April 1 was about 100 per cent of the mean for the 33-year period of record.

A curve has been developed for forecasting the runoff of Shasta River from the data presented in Table 2 together with the portion of the measured runoff of Shasta River, above the Edson-Foulke Yreka Ditch, which appears to be incidental to the melting snow. From the records it is indicated that the average period during which this runoff will occur is directly related to the water content of the snow pack as shown in the following tabulation.

Water-Content of Snow Inches	Period during which Runoff occurs
Over 50	April 1 to July 31
30 to 40	April 1 to June 30
16 to 26	April 1 to May 31

The above-mentioned curve provides for normal precipitation subsequent to April 1 and therefore, in years of above-normal precipitation after that date the forecast from the curve will be low in the amount of additional runoff resulting from the above-normal precipitation. From the curve the water content of the show on April 1, 1948 indicated that about 3,500 acre-feet of runoff would occur during April and May.

The actual measured runoff incidental to melting snow totaled about 14,000 acre-feet and occurred during the period from April 1 to July 6. The precipitation during the period from April 1 to June 30 was about 180 per cent of normal .

A comparison of the measured runoff of Shasta River above the Edson-Foulke Yreka Ditch with the estimated runoff obtained by applying the average water content of the snow on April 1 to the above mentioned curve is shown in the following tabulation:

Year	Average Water-Content of snow in inches On April 1	Runoff in Acre-Feet	
		Measured	Estimated from Curve
1937	32.3	12,100 **	11,900
1938	55.0	30,200 ***	30,200
1939	17.1	3,000 *	3,300
1940	33.1	12,600 **	12,500
1941	56.8	32,000 ***	31,800
1942	30.2	13,800 **	10,500
1943	25.7	7,100 *	7,600
1944	16.8	3,600 *	3,200
1945	26.7	9,000 **	8,700
1946	33.9	11,600 **	13,000
1947	21.6	4,210 *	5,400
1948	17.5	14,000 *	3,500

* April - May
** April- May - June
*** April - May - June - July

Stream Flow

Stream flow measuring stations equipped with water stage recorders were maintained during the period of watermaster service from about April 8 to September 30 on Shasta River above the Edson-Foulke Yreka Ditch; at Edgewood Bridge and near Montague; on Parks Creek above Edson-Foulke Yreka Ditch and at the 8-foot weir above the Robertson Ranch; and on Little Shasta River above the Harp Ditch. Records of discharge at these stations are presented in Tables 3 to 8, inclusive.

Intermittent measurements were made of the flows of Carrick and Cleland Springs during the season and are recorded in Tables 9 and 10, respectively.

Intermittent measurements were made at Big Springs to determine the water available for the Big Springs Irrigation District.

A summary comparing the seasonal runoff of various streams and springs in Shasta Valley for the 1948 season with that of previous seasons is presented in Table 19 of this report.

DISTRIBUTION OF WATER

Distribution for the 1948 season followed the practices initiated during the past seasons with little modification. As a necessary adjunct to distribution, fourteen water-stage recorders were installed and operated during the season at critical points on streams and diversion conduits. These recorders were in addition to those mentioned heretofore and were located as follows:

Beaughan Creek below Long-Bell Mill Pond (2' Parshall Flume)

M.W.C.D. Parks Creek Canal at Head

Boles Creek below Enos Ditch

Carrick Creek at Carrick Ditch

Carrick Creek at Highway

Lake Dwinnell Reservoir in Outlet Tower

Soule Ditch at Head (4' weir)

Dennis Ditch at Head (4' weir)

Jones # 1 and # 2 Take-outs (4' weirs)

McKee Take-out (4' weir)

M.W.C.D. Shasta River Canal - McKee Check (9' weir)

M.W.C.D. Shasta River Canal - Four Corners Road (10' weir)

M.W.C.D. Shasta River Canal - Little Shasta Road (12' weir)

Big Springs Lake at B.S.I.D. Pumping Station

The resulting distribution in each of the several sections, into which the stream system naturally divides, from the standpoint of water supply follows:

Shasta River above Confluence of Boles Creek

The water supply available to this area is the summation of the flow of Shasta River above the Edson-Foulke Yreka Ditch, as set forth in Table 3, plus the combined discharge of the Dow Eddy Creek Ditch and the Hammond Scott Ditch diverting from Eddy Creek. During the 1948 season this supply was sufficient to satisfy all irrigation demands until about July 10. Subsequent to that date there was insufficient water to meet the demands of the Edson-Foulke Yreka Ditch and those ditches diverting from Eddy Creek. A summary of the distribution for the 1948 season is set forth in the following tabulation:

Month	Average Available Water Supply Cu. Ft. Per. Sec.	Distribution in Per Cent of Priority Allotments		
		Hammond-Scott	Foulke, et al.	Dow
April	58	100	100	100
May	67	100	100	100
June	129	100	100	100
July	37	80	85	50
Aug.	13	50	38	0
Sept.	11	23	34	0

Shasta River Below Junction of Boles Creek and Boles Creek

During the 1948 season 100 per cent of allotments were available for all priorities including storage rights of Montague Water Conservation District until about July 25. Subsequent to this date the water was distributed on an equal and correlative basis among water right owners

down to and including the Mills Ranch. Under this arrangement an average of 100 per cent of allotments was delivered prior to August 9. During the period from August 9 to August 27, an average of about 75 per cent of allotments was delivered to all ditches except the Alexander Ditch which received 0.40 cubic foot per second for stock-watering purposes only. Subsequent to August 27 and until the end of the irrigation season 100 per cent of allotments were available.

Shasta River Below Lake Dwinnell Reservoir

Watermaster service on this section of the stream system involves the operation of the Montague Water Conservation District's Lake Dwinnell Reservoir during the irrigation season. The watermaster, in cooperation with the District, exercises control over deliveries from the reservoir to the District and to the water right owners below the reservoir. The latter group receives water from the reservoir in lieu of their natural flow rights.

Deliveries to the water right owners below the reservoir are made in accordance with the respective agreements between the District and the several water right owners. In general each agreement sets forth the total acre-feet to which the water right owner is entitled and provides that delivery from the reservoir shall be made upon demand of the water user. The watermaster receives and complies with all requests for such service and regulates the discharge from the reservoir and the various diversion ditches. Regulation of deliveries to the District is also handled by the watermaster; firstly, to avoid draining the reservoir through excessive delivery to the District before the "in lieu rights" are satisfied; and, secondly, to eliminate the confusion that would result under dual regulation.

Deliveries to the District commenced on May 11 and continued to about September 20. All demands of "in lieu rights" were satisfied and about 10,200 acre-feet remained in storage on October 1.

Summaries of the operation of the reservoir during the 1948 season are set forth in the following tabulation:

Operation of Lake Dwinnell Reservoir During 1948 Season

Date	Storage: On Hand Acre-Ft.	Storage: Draft Acre-Ft.	Inflow to Reservoir Acre-Ft	Total Draft Acre-Ft	Measured Release Acre-Ft.	Seepage and Evaporation Loss from Reservoir Acre-Feet
April 1	14,400					
May 1	16,400	+ 4,000	6,020	2,020	220	1,800
June 1	22,000	+ 5,600	9,420	3,820	760	3,060
July 1	26,000	+ 4,000	9,440	5,440	1,230	4,210
Aug. 1	17,900	- 8,100	800	8,900	3,590	5,310
Sept. 1	12,800	- 5,100	0	5,100	3,210	1,890
Oct. 1	10,200	- 2,600	0	2,600	2,120	480
Totals		- 2,200	25,680	27,880	11,130	16,750

Deliveries to Prior Right Owners Below Reservoir - During 1948

Name of Water Right Owner	Allotment as per Agreement Acre-Feet	Amount Delivered From Lake Dwinnell Reservoir for 1948 Season: Acre-Feet	Per Cent of Allt
Leland Root	198	198	100
John Soule	692	511 *	74
Fred Dennis; K.K. Waters and Emily S. Waters	696	386 *	55
McKee Company	1,200	1,005	84
Orrin Brown and Estate of Fred Rebling	596	0 *	0

* Leakage from reservoir provided additional water sufficient to supply full irrigation demands.

Summaries of Deliveries from Lake Dwinnell Reservoir for 1948 Season

Month	Measured Release Acre-Feet	Deliveries in Acre-Feet		
		Prior Rights	M.W.C.D.	Wastage
April	220	157	63	0
May	760	173	587	0
June	1,230	350	880	0
July	3,590	482	3,108	0
August	3,210	493	2,717	0
September	2,120	445	1,675	0
Totals	11,130	2,100	9,030	0

Additional data pertaining to Lake Dwinnell Reservoir are contained in Tables 11, 12, 13, 14, and 15.

Beaughan Creek

One measurement was made during the 1948 Season at the 8-foot rectangular weir (Long-Bell Upper Weir) located at the head of Beaughan Creek. The results are given below:

Date	Gage Height in Feet	Discharge in c.f.s
7-23-48	0.38	6.10

This amount of water was sufficient to supply approximately 74 per cent of the total second priority allotments of 8.28 cubic feet per second. Distribution was made in accordance therewith during the 1948 season.

The Long-Bell Lumber Company diverts practically the entire flow of Beaughan Creek, including the downstream users' share of the available water, for use at its sawmill. After such use, the downstream users' share of the water, which is 65 per cent of the measured flow at Long-Bell Upper Weir, must be returned to Beaughan Creek above the 2-foot Parshall Flume

below the Long-Bell Mill Pond. Based upon the above measurement, the amount of water required at said Parshall Flume was 3.96 cubic feet per second. The daily discharge during the 1948 season was in excess of this am ount at all times.

Carrick Creek

There was sufficient water available during the 1948 season to satisfy all irrigation requirements. The results of intermittent measurements of Carrick spring are set forth in Table 9.

Parks Creek

Distribution on Parks Creek for the 1948 Season was in accordance with the practices followed during the past seasons. A summary of the distribution made during the 1948 season is set forth in the following tabulation:

Month	Measured Water Supply c.f.s	Distribution in Per cent of Priority Allotments			
		Duke	Caledonia	Foulke, et al	Robertson
April	36.3	100	100	100	100
May	68.9	100	100	100	100
June	69.9	100	100	100	80
July	13.7	100	100	58	30
August	6.7	100	58	0	20
September	5.3	90	0	0	14

Records of the flow available for the above distribution are set forth in Tables 4 and 5.

The 21st and 24th priority rights of Frank H. Solus at the extreme lower end of Parks Creek received 100 per cent allotments throughout the season.

Big Springs

The water supply of Big Springs averaged about 31 cubic feet per second during April. The supply increased during May and June and an average of about 44 cubic feet per second was available during July, August and September.

The Big Springs Irrigation District was supplied with irrigation water through its pumping plant during the entire 1948 season. Records of discharge of this plant are shown in Table 16.

Clink Bros. operated their pumping plant nearly continuously from about May 10 to the end of the season. The pump was operated at its full capacity of 7.5 cubic feet per second.

Ellis Louie diverted his full allotment of 10 cubic feet per second throughout the season.

Lower Shasta River

The water supply for this section of the stream was in excess of requirements at all times during the 1948 season. All ditches and pumping plants operated with a minimum of regulation during the season.

A record of the flow available to the water users below the Montague Bridge is presented in Table 7. Records of diversion by the Grenada Irrigation District and the Shasta River Water Association are submitted in Tables 17 and 18, respectively. A summary of these data is shown in the following tabulation:

Month	Average Diversion Grenada Irrigation District c.f.s.	Average Diversion Shasta River Water Association c.f.s.	Average Available Water Supply Fioch et.al. c.f.s.
April	26.1	24.9	106.4
May	26.3	16.9	112.6
June	5.7	30.6	103.3
July	32.9	35.7	26.5
August	23.1	29.5	48.9
Sept.	11.8	20.6	70.2

Little Shasta River

Regulation was necessary on this stream beginning about July 7 when the available water supply was only sufficient to satisfy the full requirements of the first five priority classes. Water was available for the higher priority classes during April, May and June.

The flow from Cleland Spring supplied enough supplementary flow to the natural flow of Little Shasta River to provide 100 per cent allotments throughout the season to the first four priority classes.

A summary of the distribution during the 1948 season is set forth in the following tabulation:

Month	Available Water Supply: Cubic Feet Per Second	Available Water Supply: Allotments	Distribution in Per Cent of Priority Allotments: 1	2	3	4	5	6	7
April	61.4	78	100	100	100	100	100	100	100
May	82.6	105	100	100	100	100	100	100	100
June	66.1	84	100	100	100	100	100	50	25
July	25.9	33	100	100	100	100	50	0	0
Aug.	18.1	23	100	100	100	100	20	0	0
Sept.	16.5	21	100	100	100	100	15	0	0

Intermittent measurements of the discharge of Cleland Springs are recorded in Table 10. The following tabulation was compiled from measurements made during the period from 1935 to 1948, inclusive:

CLELAND SPRING

Year	Discharge - Cubic Feet Per Second: Beginning of Season	End of Season	Seasonal Mean
1935	6.81	6.62	6.65
1936	6.50	6.72	6.60
1937	6.50	6.78	6.65
1938	7.10	10.0	7.70
1939	8.77	8.25	8.44
1940	7.84	9.56	8.48
1941	8.39	9.04	8.60
1942	8.20	9.20	8.70
1943	10.50	11.10	10.80
1944	10.20	11.40	10.60
1945	8.8	8.9	9.1
1946	9.0	9.4	9.1
1947	9.1	10.3	9.0
1948	8.7	9.4	8.85

Changes in Ownership

The changes in ownership of lands and water rights which have occurred subsequent to filing "Statement for Shasta River Watermaster Service Area, County of Siskiyou, State of California for 1948 " and which shall be included in the statement for said watermaster service area for 1949 are listed in the following tabulation:

Tract No.	Name of Water Right Owner Appearing in 1948 Statement	Name of Water Right Owner to Appear in 1949 Statement	Amount of water c.f.s.
5-13			
5-30			
5-31	Estate of George M. Haight	Mattie A. Haight	6.04
5-14			
5-28			
5-47	Estate of Kate C. Hart	Raymond E. Hart and Frederic P. Hart	14.79
5-32	H. H. Sullivan	Oliver P. Lane and Lois H. Lane	0.28
5-34	Loren B. Barnes and Mary B. Barnes	Dr. Virgil Simpson	1.75
5-35	Estate of Henry Fiock	Henry Fiock	4.99
5-38	Walter H. Leaverett	Earl B. Fiock	0.30
5-48	Angelo Salvadori	Sedgley D. Nelson	1.10
5-65	Michael Sasso and Myrtle Sasso	Floyd E. Wright and Elva Mae Wright	4.05
5-65	J. Robert Scott	Frances M. Sullivan and Florence Carrol Sullivan	0.95
5-73	Leo C. Samuelson and Harriet N. Samuelson	Martin W. Little and Laura M. Little	1.45
5-76			
5-83	Samuel Clinton Jackson, Henry Jackson and Pearl E. Jackson	Samuel Clinton Jackson	5.77
5-97	Pete Salanti and Gilbert Salanti	Pete Salanti	1.175

(Cont'd)

Cont'd

Tract No.	Name of Water Right Owner Appearing in 1948 Statement	Name of Water Right Owner to Appear in 1949 Statement	Amount of Water c.f.s.
5-102	Roxanna Dow	John L. Chechriou	1.80
5-105	William E. Krum, Rita Ruth Krum, Elmer H. Meline and Inez Mary Meline	Elmer H. Meline and Inez Mary Meline	1.69
5-112	James F. Meyers and Hazel M. Meyers	George Vanderbilt and Anita Zaballa Vanderbilt	1.275
5-113			0.70
			1.975

TABLE 1

PRECIPITATION AT YREKA, SISKIYOU COUNTY - ELEVATION 2,625 FEET

Monthly, Seasonal and Average Amount in Inches

1938 - 1948

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Seasonal
1938-39	.82	.80	1.38	2.15	1.23	1.51	.42	.45	.04	.35	.00	2.35	11.50
1939-40	.89	.00	6.12	2.36	5.13	3.52	.69	.32	.56	.09	.00	1.71	21.39
1940-41	1.34	.98	4.13	2.85	2.99	1.51	2.07	1.66	.95	.70	.54	.81	20.53
1941-42	1.01	1.84	8.01	1.88	2.65	.33	1.60	3.96	.30	.00	.13	.47	22.18
1942-43	.34	6.26	5.01	4.22	1.41	1.21	1.07	.66	1.07	.09	.01	.00	21.35
1943-44	2.24	1.17	.85	1.25	1.43	1.44	1.00	.73	.68	.60	.25	.22	11.86
1944-45	.45	2.86	1.15	.96	2.87	1.53	.69	4.06	.07	.13	.05	T	14.82
1945-46	2.06	2.86	4.55	2.25	1.99	1.13	.57	.89	.89	.41	T	.08	17.68
1946-47	1.07	3.15	.76	1.16	.93	1.84	.35	.73	1.13	.26	.85	.00	12.23
1947-48	2.46	.99	.74	5.35	1.36	1.56	2.50	.90	1.33	.29	2.54	.98	21.00
33-Year Mean	1.18	2.43	2.84	2.33	2.31	1.40	1.05	.91	.69	.36	.25	.55	16.32

TABLE 2

Snow Survey Data

1937-1948

Year	Water Content of Snow as of April 1 - Inches				
	Parks Creek Elevation-6,500	Sweetwater Elevation-5,500	Mt. Shasta Elevation-8,000	N. Fk. Sacramento Elevation-6,800	Average
1937	31.8	18.4	43.4	35.5	32.3
1938	33.3	27.0	120.4	39.1	55.0
1939	24.8	10.5	23.3	9.9	17.1
1940	36.3	6.3	67.4	22.2	33.1
1941	54.6	18.8	108.6	45.3	56.8
1942	33.1	12.7	52.7	22.5	30.2
1943	34.2	11.8	41.5	15.4	25.7
1944	18.2	7.7	28.6	12.6	16.8
1945	29.3	10.9	46.7	19.9	26.7
1946	42.8	14.2	53.4	25.4	33.9
1947	29.7	6.1	37.2	13.4	21.6
1948	17.5	5.9	36.2	10.2	17.5
12 Year Mean	32.1	12.5	54.95	24.4	30.6

TABLE 3

DAILY DISCHARGE IN CUBIC FEET PER SECOND
SHASTA RIVER ABOVE EDSON-FOULKE YREKA DITCH
APRIL 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	15	45	60	62	16	8
2	15	40	78	56	16	8
3	15	40	115	46	14	8
4	15	45	168	46	12	8
5	15	47	160	46	12	8
6	15	60	178	40	10	8
7	15	60	160	34	10	8
8	28	44	150	31	9	8
9	28	39	150	29	12	8
10	170	36	215	29	12	7
11	29	26	202	29	13	7
12	29	31	168	29	14	7
13	29	32	152	29	14	7
14	163	32	140	27	13	7
15	139	33	116	25	9	8
16	104	37	113	24	10	8
17	85	46	107	23	10	18
18	60	60	104	23	10	15
19	48	52	104	22	12	12
20	46	36	96	21	10	10
21	52	44	115	21	10	9
22	44	46	108	24	10	9
23	32	66	110	23	12	10
24	29	94	78	23	9	10
25	29	96	76	23	9	10
26	26	104	71	22	9	9
27	24	144	71	19	9	9
28	45	111	71	18	9	9
29	35	81	60	16	9	9
30	39	66	64	16	8	9
31		56		16	8	
Total sec-ft days	1418	1749	3560	892	340	271
Mean sec-ft	47.3	56.4	118.7	28.8	11.0	9.0
Runoff ac-ft	2810	3470	7060	1770	670	540

Total runoff for 183 day period - 16,320 acre-feet.

TABLE 4

DAILY DISCHARGE IN CUBIC FEET PER SECOND
PARKS CREEK ABOVE DUKE NORTH DITCH
APRIL 7 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1		30	71	23	8	5
2	NO	30	95	21	8	5
3		32	115	21	7	5
4	RECORD	47	143	19	7	5
5		54	137	19	7	5
6		70	125	21	7	5
7	14	73	113	17	7	5
8	14	59	107	16	7	5
9	14	50	100	15	7	5
10	14	46	109	14	7	5
11	14	45	106	14	7	5
12	14	54	83	13	7	5
13	14	57	76	13	7	5
14	32	55	67	13	7	5
15	66	52	55	13	7	5
16	75	71	51	12	7	5
17	71	71	45	13	7	5
18	52	61	51	12	7	5
19	51	50	46	12	7	5
20	57	44	49	12	7	5
21	60	50	51	12	7	6
22	50	65	50	11	6	6
23	43	88	45	11	6	6
24	38	109	41	10	6	6
25	33	133	37	10	6	6
26	31	141	30	12	6	6
27	30	130	27	11	6	6
28	30	109	25	10	6	6
29	28	95	23	9	6	6
30	27	83	24	8	5	6
31		83		8	5	
Total sec-ft days	*872	2137	2097	425	207	160
Mean sec-ft	* 36.3	68.9	69.9	13.7	6.68	5.33
Runoff ac-ft	*1730	4240	4160	843	411	317

* 24-day period

Total runoff for 177 day period - 11,700 acre-feet.

TABLE 5

DAILY DISCHARGE IN CUBIC FEET PER SECOND
PARKS CREEK AT ROBERTSON WEIR
JUNE 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	SURPLUS	SURPLUS	16	7.6	3.5	3.7
2			16	6.6	3.3	3.3
3			16	7.1	3.1	3.1
4			16	7.1	2.7	3.1
5			16	7.1	2.4	2.7
6			16	7.3	2.2	2.4
7			16.	7.3	2.2	2.2
8			16	5.8	2.1	2.2
9			16	5.0	1.9	2.2
10			16	5.0	3.3	2.1
11			16	5.0	3.1	1.9
12			16	5.0	2.4	1.7
13			14	5.0	2.6	1.9
14			12	5.0	2.6	1.9
15			10.0	5.0	2.7	1.9
16			10.0	5.0	2.7	1.9
17			10.0	4.7	2.9	1.9
18			11.1	3.9	2.9	1.9
19			10.5	3.7	4.1	1.9
20			10.0	3.7	4.3	1.9
21			10.0	3.7	4.1	1.9
22			9.4	3.7	3.9	1.9
23			12.9	3.7	5.0	1.9
24			12.9	3.7	5.0	1.9
25			11.7	3.7	4.7	1.9
26			11.2	3.7	4.5	1.9
27			10.3	3.7	4.3	1.9
28			9.4	3.7	3.9	1.9
29			10.0	3.7	3.7	1.9
30			8.1	3.7	3.3	1.9
31				3.7	3.5	
Total sec-ft days			385.5	152.6	102.9	64.8
Mean sec-ft			12.8	4.9	3.3	2.2
Runoff ac-ft			760	303	204	129

Total runoff for 120 day period - 1,400 acre-feet

TABLE 6

DAILY DISCHARGE IN CUBIC FEET PER SECOND
SHASTA RIVER AT EDGEWOOD BRIDGE
APRIL 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	35	174	145	58	7	11
2	35	130	179	59	5	9
3	35	117	293	50	6	9
4	35	126	293	45	6	9
5	36	135	285	44	5	9
6	35	163	285	42	5	9
7	33	167	285	38	6	8
8	58	130	262	34	6	8
9	58	112	246	30	6	8
10	230	87	280	29	7	9
11	41	84	242	26	8	7
12	52	86	191	25	9	7
13	64	92	191	23	8	6
14	180	87	155	21	8	6
15	247	93	103	15	8	6
16	230	135	95	14	8	6
17	230	148	92	19	7	7
18	142	201	108	17	7	18
19	105	206	99	15	7	17
20	94	155	108	14	8	15
21	103	160	135	14	8	14
22	92	177	123	14	9	14
23	81	212	99	11	12	18
24	70	237	77	11	12	18
25	69	241	71	10	13	19
26	64	283	69	10	13	19
27	68	267	66	9	13	20
28	230	201	64	6	14	20
29	154	137	60	6	12	20
30	130	108	58	6	12	20
31		97		7	11	
Total sec-ft days	3036	4748	4759	722	266	366
Mean sec-ft	101.2	153.2	158.6	23.3	8.58	12.2
Runoff ac-ft	6022	9418	9439	1432	528	726

Total runoff for 183 day period - 27,565 acre-feet

TABLE 7

DAILY DISCHARGE IN CUBIC FEET PER SECOND
SHASTA RIVER NEAR MONTAGUE
APRIL 8 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	NO	260	72	23	22	53
2		225	64	23	28	47
3		194	93	39	47	46
4		172	121	59	52	41
5	RECORD	160	146	56	19	41
6		160	150	50	16	41
7		148	176	43	27	41
8	98	126	150	31	59	41
9	86	126	124	56	56	28
10	94	98	113	50	59	28
11	84	42	100	27	102	25
12	80	38	111	22	111	25
13	86	32	111	23	70	28
14	87	39	102	22	47	29
15	98	24	98	25	28	47
16	121	27	94	23	25	85
17	130	39	82	22	26	110
18	89	89	122	19	32	115
19	74	126	126	16	52	115
20	72	158	160	20	49	115
21	75	148	154	16	50	115
22	84	154	121	13	59	115
23	72	130	107	13	77	115
24	70	87	103	13	67	115
25	84	92	83	15	55	115
26	77	102	64	21	47	115
27	100	105	55	17	44	96
28	146	115	42	15	38	88
29	270	96	30	17	46	67
30	270	90	26	13	55	63
31		90		18	52	
Total sec-ft days	* 2447	3492	3100	820	1517	2105
Mean sec-ft	* 106.4	112.6	103.3	26.5	48.9	70.2
Runoff ac-ft	* 4854	6926	6149	1626	3009	4175

* 23-day period.

Total runoff for 176 day period - 26,740 acre-feet.

TABLE 8

DAILY DISCHARGE IN CUBIC FEET PER SECOND
LITTLE SHASTA RIVER ABOVE HARP DITCH
APRIL 8 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	NO	47	71	29	11	8
2		48	71	29	11	7
3	RECORD	52	89	29	11	7
4		65	102	29	10	7
5		70	89	28	10	7
6		89	80	26	10	7
7		84	80	24	10	7
8	22	64	73	22	10	7
9	22	55	76	21	10	6
10	22	55	72	19	10	6
11	26	55	69	18	10	6
12	28	64	64	17	10	6
13	36	62	60	16	10	6
14	45	63	56	15	9	6
15	72	63	55	14	9	6
16	89	69	50	14	9	6
17	97	71	48	13	9	7
18	71	82	47	13	9	9
19	72	76	48	13	9	8
20	80	86	58	13	8	7
21	86	111	55	13	9	7
22	64	89	45	12	9	8
23	55	82	41	12	8	9
24	47	82	39	12	9	9
25	55	93	33	12	8	8
26	52	95	31	12	8	8
27	49	95	30	12	8	8
28	46	89	30	12	8	7
29	42	82	30	12	8	7
30	33	76	30	12	8	7
31		76		11	8	
Total sec-ft days	*1211	2290	1722	534	286	214
Mean sec-ft	* 52.7	73.9	57.4	17.2	9.2	7.1
Runoff ac-ft	*2400	4540	3420	1060	570	420

* 23-day period

Total runoff for 176 day period - 12,410.

TABLE 9

DAILY DISCHARGE IN CUBIC FEET PER SECOND
CARRICK SPRING
APRIL 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1.						
2				6.9	6.6	
3						
4						
5		6.9				6.5
6	6.9					
7			6.9		6.6	
8				6.6		
9						
10						
11						
12				6.7		
13						
14						
15				6.8	6.4	6.6
16			6.9			
17						
18						
19						
20	6.9			6.7		
21						
22						
23			6.9		6.4	6.6
24						
25				6.6		
26		6.9				
27						
28			7.0			6.6
29				6.6	6.4	
30	6.9					
31						
Total sec-ft days						
Mean sec-ft	6.9	6.9	6.9	6.7	6.5	6.6
Runoff ac-ft	410	420	410	410	400	390

Total runoff for 183 day period - 2,440 acre-feet.

TABLE 10

DAILY DISCHARGE IN CUBIC FEET PER SECOND
CLELAND SPRING
APRIL 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1						
2						
3		8.7				
4			8.7		8.9	
5						
6						
7				8.7		9.3
8						
9	8.7					
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22			8.7			
23						
24		8.7				
25					9.0	
26						
27						
28						9.5
29				8.7		
30			8			
31						
Mean sec-ft	8.7	8.7	8.7	8.7	8.9	9.4
Total ac-ft	520	530	520	530	550	560

Total runoff for 183 day period - 3,210

TABLE 11

DAILY DISCHARGE IN CUBIC FEET PER SECOND
M.W.C.D. PARK CREEK CANAL
APRIL 12 TO JUNE 13, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1		15	25			
2		15	30			
3		15	35			
4		15	60			
5		15	60			
6		15	60			
7		15	50			
8		15	50			
9		15	50			
10		15	35			
11		15	20			
12	5	15	15			
13	7	18	5			
14	10	20				
15	10	20				
16	20	20				
17	20	20				
18	10	18				
19	10	15				
20	5	15				
21	1	15				
22	1	18				
23	1	25				
24	1	35				
25	1	50				
26	1	60				
27	1	60				
28	1	50				
29	5	40				
30	15	25				
31		25				
Total sec-ft days	125	729	495			
Mean sec-ft	6.6	23.5	38.1			
Runoff ac-ft	250	1450	980			

Total runoff for 63 day period - 2,680 acre-feet

TABLE 12

DAILY STORAGE ON HAND IN ACRE-FEET
LAKE DWINNELL RESERVOIR
APRIL 1 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1	12,400	16,400	22,000	26,000	17,900	12,800
2	12,400	16,600	22,400	25,800	17,700	12,600
3	12,400	16,900	23,000	25,600	17,500	12,500
4	12,400	17,200	23,400	25,400	17,300	12,400
5	12,400	17,400	23,800	25,200	17,100	12,200
6	12,400	17,600	24,200	25,000	16,900	12,100
7	12,400	17,800	24,600	24,800	16,700	12,000
8	12,400	18,000	25,000	24,600	16,500	11,800
9	12,600	18,100	25,600	24,400	16,300	11,600
10	13,000	18,200	25,900	24,200	16,100	11,500
11	13,000	18,200	26,100	24,000	15,900	11,300
12	13,000	18,200	26,300	23,800	15,800	11,200
13	13,400	18,200	26,500	23,500	15,600	11,000
14	13,600	18,200	26,900	23,200	15,400	10,900
15	13,800	18,400	26,900	22,900	15,200	10,700
16	14,200	18,500	26,900	22,600	15,000	10,600
17	14,600	18,700	27,000	22,300	14,800	10,500
18	14,800	18,900	27,000	22,000	14,600	10,400
19	15,000	19,000	27,100	21,700	14,500	10,300
20	15,000	19,200	27,100	21,300	14,400	10,200
21	15,100	19,400	27,200	21,000	14,200	10,200
22	15,200	19,600	27,100	20,700	14,000	10,200
23	15,200	19,700	27,000	20,400	13,900	10,200
24	15,300	19,800	26,900	20,100	13,700	10,200
25	15,300	20,000	26,800	19,800	13,600	10,200
26	15,300	20,200	26,700	19,600	13,500	10,200
27	15,300	20,500	26,600	19,300	13,300	10,200
28	15,700	20,700	26,500	19,000	13,200	10,200
29	16,000	21,000	26,300	18,700	13,100	10,200
30	16,200	21,400	26,200	18,400	13,000	10,200
31		21,800		18,100	12,900	

TABLE 13

DAILY RELEASE IN CUBIC FEET PER SECOND
LAKE DWINNELL RESERVOIR
APRIL 21 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1		0	0	56	71	39
2		0	0	59	71	41
3		0	0	61	71	41
4		0	0	61	70	41
5		0	0	66	70	41
6		0	0	71	67	49
7		0	0	68	65	58
8		0	0	66	65	58
9		0	0	66	65	58
10		0	6	66	64	59
11		12	13	66	66	63
12		23	13	66	57	63
13		23	13	57	47	63
14		23	13	12	31	63
15		23	13	16	38	63
16		23	22	20	50	63
17		16	32	40	50	63
18		10	32	60	50	44
19		10	32	60	50	25
20		10	32	61	50	15
21	8	10	32	62	42	6
22	16	10	32	62	35	6
23	16	16	32	62	40	6
24	16	23	32	62	44	6
25	14	23	32	62	44	6
26	12	23	32	64	44	6
27	12	23	42	66	44	6
28	12	23	54	66	44	6
29	6	23	56	66	40	6
30	0	23	56	69	37	6
31		11		71	37	
Total sec-ft days	112	381	621	1810	1619	1070
Runoff ac-ft	220	760	1230	3590	3210	2120

Total for 163 day period - 11,130 acre-feet.

TABLE 14

Summary of Deliveries to Prior Right Owners From
LAKE DWINNELL RESERVOIR
1929 - 1948

Year	Deliveries in Acre-Feet					Deliveries in percent of allotment
	Root	Soule	Dennis et al.	McKee	Brown et al.*	Total	
1929	-	-	-	-	-	-	-
1930	190	485	465	923	-	2060	61
1931	198	473	473	909	-	2050	61
1932	-	-	-	-	-	-	-
1933	198	692	687	1130	101	2210	83
1934	159	692	461	922	159	2390	71
1935	198	609	600	1075	234	2720	80
1936	198	637	527	1195	202	2759	82
1937	198	633	489	1200	120	2690	80
1938	198	-	-	1073	-	1271	38
1939	198	692	687	1138	308	3023	90
1940	198	471	562	1105	0	2336	69
1941	198	561	631	1200	51	2641	76
1942	198	344	618	1200	0	2360	70
1943	198	509	443	1200	0	2350	70
1944	198	692	460	1200	0	2550	76
1945	198	591	387	1050	0	2220	65
1946	198	484	486	1094	0	2262	67
1947	198	692	565	1147	0	2602	77
1948	198	511	386	1005	0	2100	62

1929 - Record of deliveries missing.
1930-1931 - Record of deliveries to Terwilliger missing
1932 - Record of deliveries missing
1938 - Soule, Dennis and Terwilliger had sufficient water from reservoir seepage to supply irrigation demands.
1940 to 1948, inclusive - Reservoir seepage supplied additional water for Soule, Dennis and Terwilliger ranches.

*Accretions to the flow of Shasta River through the Dennis Ranch provide additional water, which is available for diversion by the Terwilliger Ranch, in amounts more than sufficient to make up the shortage in the amounts of water delivered from the reservoir.

TABLE 15

RECORD OF OPERATION OF LAKE DWINNELLL RESERVOIR - 1929 TO 1948

Year	Reservoir Storage on April 1 Ac.Ft.	Inflow Apr.1 to Sept.30 Ac. Ft.	Total Available Water Supply Ac.Ft.	Maximum Storage in Reservoir Ac. Ft.	Maximum Storage in Reservoir Date	Delivery from Reservoir: M.W.C.D. Ac.Ft.	M.W.C.D. Period	Prior Rights Ac.Ft.	Prior Rights Period	Total Ac.Ft.	Storage in Res. When Delivery to MWCD Ceased Ac.Ft.	Seepage and Evaporation Loss Ac. Ft.
1929				4,500		No.Rcrd:		No Rcrd:				
1930				10,500	Mar. 14	5,000	5/5/30-7/4/30	2,060	4/23/30-9/5/30	7,060	2,800	
1931				4,250	April 4	0		2,050	4/1/41-7/25/31	2,050	2,800	
1932	5,500			5,500	Mar. 20	2,000	5/15/32-6/15/32	No Rcrd:		2,000	2,000	
1933	5,200			6,500	May 3	4,750	4/21/33-7/16/33	2,810	4/10/33-9/3/33	7,560	2,200	
1934	4,850			5,000	Apr. 5	1,500	4/10/34-4/23/34	2,390	4/5/34-7/22/34	3,890	2,800	
1935	5,000	4,620	9,620	5,700	May 10	2,700	5/10/34-6/2/35	2,720	4/9/35-8/11/35	5,420	3,000	4,200
1936	5,460	4,720	10,180	6,020	Mar. 3	1,560	4/14/36-5/20/36	2,760	4/14/36-8/11/36	4,320	3,250	5,860
1937	5,940	14,040	19,980	9,800	May 6	7,360	5/5/37-9/15/37	2,690	4/26/37-9/9/37	10,050	0	9,930
1938	31,600	28,440	60,040	32,100	May 3	23910b	5/1/38-9/30/38	1,270	5/1/38-9/30/38	25,180	2,850	32,010
1939	7,350	1,210	8,560	7,350	Apr. 1	2,350	4/9/39-5/5/39	3,020	4/4/39-8/10/39	5,370	3,525	3,190
1940	27,350	18,000	45,350	28,000	Apr. 6	18,570c	4/22/40-9/18/40	2,340	4/17/40-9/30/40	20,900	2,540	22,040
1941	31,680	48,060	79,740	34,400	Apr. 4	36,490d	4/1/41-9/30/41	2,640	5/1/41-9/30/41	39,130	13,600	27,010
1942	25,700	20,600	46,300	29,100	June 6	12,940e	4/13/42-9/30/42	2,360	4/13/42-9/30/42	15,300	10,000	21,000
1943	33,100	12,880	45,980	33,400	Apr. 5	19,770f	4/13/43-9/30/43	2,350	4/15/43-9/30/43	22,120	4,900	18,960
1944	14,200	5,370	19,570	14,200	Apr. 1	9,030	4/17/44-9/30/44	2,550	4/17/44-9/30/44	11,580	90	7,900
1945	17,550	12,450	30,000	18,600	June 11	9,840	4/13/45-9/30/45	2,220	4/13/45-9/30/45	12,060	2,500	15,400
1946	24,400	11,600	36,000	25,100	May 20	11,640	4/2/46-9/30/46	2,260	4/19/46-9/30/46	13,900	5,400	16,600
1947	17,800	3,600	21,400	17,800	Apr. 1	10,660	4/16/47-9/30/47	2,600	4/10/47-9/30/47	13,260	0	8,150
1948	12,400	25,680	38,080	27,200	June 21	9,030	4/21/48-9/30/48	2,100	4/21/48-9/30/48	11,130	10,200	16,750

TABLE 16

DAILY DISCHARGE IN CUBIC FEET PER SECOND
BIG SPRINGS IRRIGATION DISTRICT
APRIL 10 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.
1		0	22	25	27	27
2		0	22	25	27	27
3		0	22	25	27	27
4		0	22	25	27	27
5		0	22	25	27	27
6		0	22	26	27	27
7		14	22	26	27	27
8		21	22	26	27	27
9		21	22	26	27	27
10	18	21	6	26	27	27
11						
11	27	18	0	27	27	27
12	27	17	0	27	27	27
13	27	17	0	27	27	27
14	24	20	17	27	27	27
15	21	21	23	27	27	2
16	21	21	23	27	27	0
17	21	21	23	27	27	0
18	21	21	23	27	27	0
19	21	14	16	27	27	0
20	21	0	0	27	27	0
21	21	0	0	27	27	0
22	21	0	0	27	27	0
23	21	0	0	27	27	0
24	21	0	16	27	27	0
25	21	14	24	27	27	0
26	21	22	24	27	27	0
27	21	22	24	27	27	19
28	21	22	24	27	27	27
29	21	22	24	27	27	27
30	7	22	24	27	27	14
31		22		27	27	
Total sec-ft-days	*445	393	489	822	837	467
Mean Msec-ft.	* 21.2	12.7	16.3	26.5	27.0	15.6
Runoff ac-ft	*880	780	970	1630	1660	930

Total [redacted] for 174 day period - 6,850 acre-feet.

* 21-day period.

TABLE 17

DAILY DISCHARGE IN CUBIC FEET PER SECOND
GRENADA IRRIGATION DISTRICT PUMPING PLANT
APRIL 17 TO SEPTEMBER 30, 1948

Day	Apr.	May	June	July	Aug.	Sept.	Oct.
1		0	34	33	36	22	0
2		0	0	33	30	22	0
3		22	0	11	24	22	0
4		34	0	0	38	22	0
5		34	0	0	38	22	0
6		34	0	0	38	22	14
7		34	0	25	38	22	22
8		17	0	33	38	22	22
9		17	0	36	38	22	11
10		17	0	36	17	22	
11		17	0	36	16	22	
12		17	0	36	17	22	
13		17	0	36	0	22	
14		28	0	36	16	22	
15		34	0	36	14	22	
16		34	0	36	13	18	
17	15	34	0	36	14	7	
18	31	34	0	36	18	0	
19	34	34	0	36	17	0	
20	34	34	0	36	18	0	
21	32	34	0	36	17	0	
22	34	0	0	36	22	0	
23	34	34	0	36	22	0	
24	34	28	0	36	22	0	
25	32	31	0	36	22	0	
26	34	34	8	36	22	0	
27	34	27	28	36	22	0	
28	17	34	34	36	22	0	
29	0	34	34	36	22	0	
30	0	34	34	36	22	0	
31		34		36	22		
Total sec-ft-days	*365	816	172	963	715	355	**69
Mean sec-ft	* 26.1	26.3	5.7	31.1	23.1	11.8	** 7.7
Runoff ac-ft	*720	1620	340	1910	1420	700	**140

* 14-day period
** 9-day period.

Total ~~xxxxx~~ for 176 day period - 6,850 acre-feet.

TABLE 18

DAILY DISCHARGE IN CUBIC FEET PER SECOND
SHASTA RIVER WATER ASSOCIATION PUMPING PLANT
APRIL 1 TO OCTOBER 7, 1948

Day	Apr.	May	June	July	Aug.	Sept.	Oct.
1	21	0	35	38	38	26	38
2	16	0	37	35	30	32	38
3	0	0	24	38	29	33	34
4	0	0	0	38	38	38	26
5	0	0	0	38	38	38	26
6	0	0	0	38	38	38	26
7	23	0	0	38	27	38	8
8	38	0	0	38	8	38	
9	38	0	0	0	0	38	
10	38	27	0	13	9	38	
11	38	38	29	32	12	38	
12	38	38	38	38	12	38	
13	38	38	38	38	12	38	
14	38	38	33	38	34	35	
15	38	38	15	38	38	32	
16	38	38	26	38	38	22	
17	38	38	28	38	38	0	
18	38	38	25	38	33	0	
19	38	32	0	38	38	0	
20	34	12	0	38	38	0	
21	23	12	25	38	33	0	
22	28	8	0	38	33	0	
23	38	0	0	38	30	0	
24	38	0	38	38	38	0	
25	38	22	38	38	38	0	
26	33	35	38	38	38	0	
27	0	0	38	38	38	0	
28	0	0	38	38	38	0	
29	0	20	38	38	28	21	
30	0	26	38	38	26	38	
31		26		38	26		
Total sec-ft-days	748	524	619	1106	914	619	*196
Mean sec-ft	24.9	16.9	20.6	35.7	29.5	20.6	* 28.0
Runoff ac-ft	1480	1040	1230	2190	1810	1230	*390

* 7-day period

Total ~~xxxxxff~~ for 190 day period - 9,370 acre-feet.

TABLE 19

SUMMARY OF RUNOFF IN ACRE-FEET
OF STREAMS IN SHASTA VALLEY

APRIL 1 TO SEPTEMBER 30, 1948

Name of Stream	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Shasta River Above Yreka Ditch	7,440	13,600	* 19,100	4,090	14,800	33,300	* 13,800	*** 10,900	6,600	11,000	13,500	6,690	15,580
Parks Creek Above Duke North Ditch	6,560	11,000	* 14,400	4,490	16,000	18,100	* 9,880	*** 8,800	5,670	9,720	10,540	5,770	*** 11,870
Little Shasta River Above Harp Ditch	6,520	5,680	** 6,060	3,270	4,160	4,480	* 5,570	*** 10,500	2,840	6,100	7,080	2,110	*** 12,700
Beaughan Spring	1,860	1,820	1,950	1,810	1,810	2,200	2,140	2,100	2,150	2,450	2,450	2,150	2,214
Big Spring	12,100	12,100	---	12,100	---	---	**** 15,600	14,800	14,500	14,400	14,600	7,690	14,816
Carrick Spring	2,050	2,020	2,110	2,000	2,070	2,700	2,700	2,530	2,450	2,540	2,530	2,510	2,450
Cleland Spring	2,400	2,410	2,790	3,060	3,070	3,170	3,160	3,820	3,840	3,290	3,300	3,270	3,200

* Does not include April Runoff ** May 14 to September 30, inclusive *** April partly estimated
**** Estimated from measurements made during July, August and September.