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Sonoma County Flood Control & Water Conservation District

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

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WATER POLLUTION INVESTIGATIONS

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REPORT NO. 2

FLOW AND QUALITY CHARACTERISTICS of the RUSSIAN RIVER

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JANUARY 1951

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STON, STATE ENGINEER
EP OF DIVISION

EARL WARREN
GOVERNOR OF CALIFORNIA

C. H. PURCELL
DIRECTOR

STATE OF CALIFORNIA
Department of Public Works
SACRAMENTO 5

WATER RESOURCES
WORKS BUILDING

January 15, 1951

Regional Water Pollution Control Board
No. 1 North Coastal Region 707 South
State Street Ukiah, California
Attention: William G. Shackleton, Executive Officer

Gentlemen:

In response to the request of your Board dated June 14, 1950, the Division of Water Resources has made an investigation of the Russian River with reference to flow and quality characteristics thereof. A report on the investigation is made herewith.

The investigation comprised compilation of available hydrological data and analyses of water samples collected at four-hour intervals for a period of five days, from thirteen stations on the Russian River. There are also included in the report data that pertain to municipal water supplies and existing sewage treatment and disposal facilities of the major communities in Russian River basin. The evaluation and interpretation of the laboratory analyses has been reviewed and verbally concurred with by the Bureau of Sanitary Engineering of the State Department of Public Health and Division of Fish and Game. Copies of the report have been sent to Bureau of Sanitary Engineering of the State Department of Public Health, Bureau of Fish Conservation of the Division of Fish and Game, and to the United States Public Health Service for review and comment.

Very truly yours,

/s/ A. D. Edmonston

A. D. Edmonston
State Engineer

ACKNOWLEDGMENT

In its investigation of the pollution problems and of the flow and quality of the Russian River and preparation of a report thereon, the Division of Water Resources has had the benefit of much valuable data compiled by public and private agencies and individuals.

Much of the information presented in the following pages was received from agencies of the United States, including the Corps of Engineers, the Bureau of Reclamation and the Surface Water Resources Division of the Geological Survey.

Among the contributing state agencies were the University of California, Bureau of Sanitary Engineering of the Department of Public Health, and Division of Fish and Game.

Cooperation was received also from Sonoma County Sanitary Engineer; County Engineer, Mendocino County; City Engineer, Healdsburg; Superintendent of Public Works, City of Sebastopol, City Manager, Ukiah, and other agencies and individuals.

The biochemical, bacterial, and mineral analyses reported herein were made in a mobile laboratory by the Pacific Engineering Laboratories of San Francisco, California under service agreement with the Division of Water Resources.

ORGANIZATION

STATE DEPARTMENT OF PUBLIC WORKS

DIVISION OF WATER RESOURCES

C.H. Purcell ---------- Director of Public Works

A.D. Edmonston ---------- State Engineer

P. H. Van Etten ---------- Assistant State Engineer

The investigation was conducted and report prepared under direction of

Harvey 0. Banks ---------- Supervising Hydraulic Engineer

by

Jack H. Lawrence ---------- Associate Soil Technologist

Assisted by

John W. McPartland ---------- Assistant Hydraulic Engineer

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Delbert D. McNealy ---------- Junior Civil Engineer

George J. Brothers ---------- Junior Civil Engineer

T. R. Merryweather, Administrative Assistant

WATER SUPPLY

The investigation herein reported dealt primarily with the flow and quality characteristics of the Russian River during period of field investigation dating from July 5 through July 19, 1950. Principal objective was to determine present condition of the river and to collect data upon which plans may be formulated for abatement, prevention or control of pollution in that stream. Areal extent of the field investigation was limited to the approximately 100 mile stretch of the river lying between Highway 20 Bridge located north of Ukiah and the mouth of the river near Jenner.

Climate

The climate of the Russian River Basin is characteristically mild and agreeable with relatively even temperatures occurring throughout most of the year. Precipitation usually occurs in the form of quiet rains which are generally of several days duration. Flood producing storms may occur with several days of exceptionally heavy rainfall. Snowfall is of infrequent occurrence. Extremes in temperature commonly encountered in the interior valleys of California do not occur because of proximity to the Pacific Ocean and protection afforded by the land form elements sheltering the basin.

Temperature — Climatological data are published by the United States weather Bureau from recording stations located at Potter Valley powerhouse, Ukiah, Cloverdale, Healdsburg, Graton and Santa Rosa. Mean annual tempera-tures at these stations vary from 56.8 degrees Fahrenheit at Graton to 59.6 degrees at Cloverdale. January is the coldest month and July the warmest with means averaging 46.4 degrees Fahrenheit and 69.7 degrees respectively. Maximum temperatures range from 105 to 112 degrees Fahrenheit and minimum temperatures range from 15 to 20 degrees. Length of frost free growing season varies from

about 200 days at Potter Valley to about 270 days at Cloverdale.

Precipitation — The mean annual precipitation in the Russian River Valley for the 50-year period 1897 to 1947, varied from 35.28 inches at Ukiah to 38.94 inches at Healdsburg. Greater amounts of rainfall are experienced with increasing altitude on either side of the basin. A seasonal precipitation of about 80 inches occurs in the vicinity of Cazadero and Mount St. Helena, A maximum seasonal rainfall of 72.55 inches occurred at Healdsburg during the 1940-41 rainfall year. The minimum annual rainfall recorded for the area, 15.75 inches, occurred at Cloverdale during the 1923-24 rainfall year. Rainfall data in the Russian River area at Ukiah, Cloverdale and Healdsburg are summarized in Table 1.

Stream Systems

The main channel of the Russian River makes its first appearance on the floor of the drainage basin in Redwood Valley about 13 miles north of Ukiah. The Russian River and its East Fork join about two miles north of Ukiah in Ukiah Valley which is about 6 miles long. From Ukiah Valley the river flows for about 10 miles in a steep winding gorge before emerging into the small Hopland Valley near Hopland. After leaving Hopland Valley the river flows about 25 miles through rough non-agricultural bad lands to emerge in Alexander Valley where it follows a relatively straight southerly course of about seven miles over the flood plain of that valley. Upon leaving Alexander Valley the river turns west and for a distance of about 15 miles meanders through highlands comprising the Fitch Mountain area near Healdsburg. Six miles south of Healdsburg near Mirabel Park the river turns sharply to the west and courses through the picturesque gorge of the Coast range to the ocean at Jenner.

Principal tributaries of the Russian River are Dry Creek and Mark West Creek. Dry Creek and its principal tributary, Warm Springs Creek, drain

an area of approximately 220 square miles. Mark West Creek and its principal tributaries, Windsor, Santa Rosa, and Laguna de Santa Rosa, drain an area of about 290 square miles. Laguna de Santa Rosa and the lower end of Mark West Creek are subject to inundation by backwater from the Russian River. Neither Dry Creek nor Mark West Creek has sustained flow during the dry summer months.

Smaller tributaries of the Russian River include its East Fork, Forsyth Creek, Feliz Creek, Pieta Creek, Big Sulphur Creek, Green Valley Creek and Austin Creek. Locations of the tributaries are shown in detail on the accompanying map showing the drainage basin of the Russian River.

Stream Gaging Stations

First recorded stream flow measurements in the Russian River Basin were made by the United States Geological Survey during the period 1911-13 at gaging stations on the Russian River near Ukiah and near Geyserville and on the East Fork of the Russian River. Measurements at these stations were discontinued until 1939 when a more comprehensive stream gaging program was inaugurated by the U. S. Corps of Engineers, San Francisco District. Most of these stations were discontinued by the Corps of Engineers at the end of the 1939-40 water year but others of these were transferred to the United States Geological Survey for maintenance and operation under cooperative agreement. Runoff records of the Russian River and its principal tributaries that have been published by the United States Geological Survey for the 1939-49 water years form the principal basis for the ensuing discussion of stream flow characteristics. Data pertaining to location and other characteristics of the gaging stations are presented in Table 2.

Discharge and Runoff Characteristics of Russian River

Stream flow records indicate that about 95 per cent of the average annual runoff at Guerneville occurs during the months of November through April. Natural runoff during July through October is practically zero, and

most of the streams tributary to Russian River are dry during the greater part of the time. Practically the entire summer flow of Russian River consists of water inserted from Eel River basin.

Annual mean (October 1 to September 30) natural runoff of the Russian River at Guerneville (exclusive of imported water from South Eel River) is estimated by the Division of Water Resources to be l,400,000 acre-feet. This estimate is for the period dating from the 1894-l895 water year to 1946-1947, inclusive. Minimum annual runoff for the period, estimated at 166,000 acre-feet, occurred in l923-24. Runoff in 1937-38, estimated at 4,200,000 acre-feet, was the maximum for the period.

Mean monthly discharge of Russian River and its tributaries for l939-40 and other years of record are presented in Table 3. It should be noted that this tabulation refers to actual measured runoff which includes import of water from Eel River basin. There are only limited stream gaging data on the creeks tributary to the Russian River. Runoff in Santa Rosa Creek and Mark West Creek for the six-month period from December 1940 to May 1941, inclusive, amounted to about 99 per cent of the annual total. Flows less than one second-foot continued throughout the rest of the year. In the upper valley reaches the creek beds are normally entirely dry during the summer and fall.

Minimum Discharge Characteristics

As in other parts of California, critical periods of low flow occur during the months of June through October when there is maximum demand for water for irrigation, recreational and other uses. Discharge in the lower reaches of the river, even including import from Eel River, is often less than 100 second-feet at Guerneville during late summer and fall months. Sustained minimum discharge of the Russian River at Hopland, Healdsburg, and

Guerneville during the peak of the recreational season for one, five, ten, twenty and thirty-day periods is presented in Table 4. Minimum runoff usually occurs during July and August. There is minor increase in flow during September and October due largely or in part to a decrease in pumping or diversion of water for irrigation use.

Prior to the time water was imported to the basin, in 1908, the stream was often dry during a large part of the recreation season. Estimates made by the Corps of Engineers of the natural runoff indicate that during the 1922-45 water years there was zero flow at Guerneville for a total of about 540 days. Low water and uncertainty as to sanitary condition of the water has a detrimental effect on business in the resort areas.

Imported Water

Importation of water into the Russian River basin followed construction of a hydro-electric generating plant in the north end of Potter Valley. The water utilized in the operation of this plant is obtained via a trans-mountain tunnel which diverts water from the Van Arsdale reservoir located on the South Eel River. Used water from the plant is discharged through a tail-race into the East Fork of Russian River.

From 1908 until 1922 the amount of imported water was limited to the natural and variable flow of the Eel River at the point of diversion. Since 1922, however, flow in Eel River has been regulated through storage of water in Lake Pillsbury and monthly diversions averaged about 194 second-feet.

Although inflow from this source is now fairly uniform and dependable, it is subject to daily curtailment or to being shut off entirely, depending upon exigencies of power plant operation. Average daily flows of 10 second-feet or less for periods of one to three days are recorded for eleven of the twenty-two years. There was no flow for 5l days, from 9 December 1943 to 28 January 1944, during which latter period the power plant was closed for

repairs. Average monthly diversions from the Eel River, as measured at the Potter Valley powerhouse, are presented in Table 3D.

Ground Water Resources

Ground water has been developed in Russian River Basin for domestic, industrial and municipal purposes and for irrigation of relatively small acreages. Principal development occurs within a few hundred feet from the edges of the river or its tributaries. Wells located near the stream channel are either dug or drilled to depths which seldom exceed 60 feet. Although the wells are apparently adequate to meet normal demands, the shallowness of the water-bearing gravels which they penetrate often makes it necessary in some instances to construct and operate several wells in order to secure a sufficient supply of water.

A reconnaissance of ground water hydrology made in 1944 by the Bureau of Reclamation indicated that there were no important ground water supplies except in the immediate vicinity of the main stream channels. With increasing distances from the river's edge, the coarse high water yielding gravels give way to comparatively low water-yielding alluvial materials. In these areas ground-water development is largely restricted to individual domestic requirements.

Solution to Water Supply Problems

Water supply problems in Russian River basin are principally associated with the conservation, protection and utilization of its water resources and control of floods. The solution of these problems involves construction of reservoirs for storage and regulated release of water to streams during the summer season when there is practically no natural runoff. Augmentation of stream flow during such periods will serve the dual purpose of providing a larger and much needed supply of water for irrigation and other beneficial uses and decreasing pollution hazards that occur in conjunction

with critical low flow conditions.

Investigations relating to conservation and use of water resources of Russian River basin are being made by the California State Division of Water Resources and by several Federal agencies, including the United States Corps of Engineers, United States Bureau of Reclamation and United States Soil Conservation Service. The investigation of the State Division of Water Re-sources include studies of some twenty possible multiple purpose water storage sites on tributaries of the Russian River. These studies are being made in connection with the formulation of state-wide plans to provide for the full conservation, control, protection and utilization of the water resources of California.

The water resources studies of the Corps of Engineers culminated in a Survey Report setting forth recommendation for immediate construction of a multiple purpose reservoir on the East Fork of the river at Coyote Valley and channel stabilization works along the Russian River and the lower reaches of its principal tributaries. These proposed projects were authorized by the Flood Control Act of 1950. The reservoir proposed for immediate construction would have an initial storage capacity of 122,000 acre-feet and an ultimate Cross storage capacity of 199,000 acre-feet. Initial construction of channel stabilization would be primarily in the reach of the Russian River from mile 34.0 to about mile 63.0.

The above authorized projects have as their objective the reduction of flood hazards below the reservoir and local protection to the lands along the river now subject to erosion. The reservoir at Coyote Valley would con-serve water from winter runoff for municipal water supply and other uses during the practically rainless summer months.

The construction and operation of water storage reservoirs in the Russian River basin would also be of material benefit in maintaining water

quality required for recreational and other uses. Local interests concerned with protection of water qualities in the recreational stretches of the river believe from past experience that desirable conditions in this respect can be obtained with a minimum flow of 200 second-feet. The Corps of Engineers has estimated that such flow will be maintained at Guerneville upon completion of the proposed reservoir in Coyote Valley.

SUMMARY

1. Water use along the upper reaches of Russian River above Healdsburg is primarily agricultural although there is considerable use of the river for recreation, including picnicking, swimming and fishing.

2. In the lower reaches of the river below Healdsburg, water use is primarily for recreational purposes. Resort areas and communities of summer homes have been extensively developed. Many people from San Francisco Bay Region and other parts of California spend their vacations in Russian River area.

3. There are minor diversions of water from the river and its tributaries for domestic or municipal purposes. Water for these purposes is pumped principally from shallow wells adjacent to the edge of the river.

4. The available stream flow records show that the natural discharge of Russian River is inadequate during the summer months to support water supply requirements for irrigation and recreational uses. The Corps of Engineers estimates that during the period 1922 to 1945, inclusive, there would have been no natural flow at Guerneville for a total of about 540 days.

5. During the summer months practically the entire flow in Russian River is comprised of water diverted from South Eel River through the Potter Valley powerhouse. Monthly diversion from this source has averaged 197 second-feet since 1922,

6. Even with imports from South Eel River sustained average flow at Guerneville has been as low as 70 second-feet for 30 or more days. Stagnant pools created under these low flow conditions cause hazards in connection with public health, particularly in those pools that are used for swimming.

7. Local interests concerned with the use and protection of recreational uses of Russian River between Mirabel Park and Jenner believe that a minimum summer flow of 200 second-feet in this reach is required to

maintain attractive conditions for swimming, boating or other recreational uses.

8. During the period 1895-1947 runoff of Russian River averaged approximately 1,400,000 acre-feet annually. A large part of this was wasted and could have been stored for release during the summer months.

9. With storage and regulation of runoff, it should be possible to most all local demands on the water supplies of Russian River basin and still maintain a minimum flow of 200 second-feet at all times through those reaches Russian River which are primarily used for recreation. The Corps of Engineers has estimated that a minimum flow of 200 second-feet will be maintained at Guerneville upon completion of the proposed reservoir in Coyote Valley, which has been authorized by Congress. This is only one of several proposed reservoirs.

10. An investigation was made by Division of Water Resources of the quality of water in Russian River during the period July 5 to July 19, 1950. The investigation included collection of water samples from Russian River and analyses of the biochemical, bacterial and chemical quality thereof.

11. The investigation showed that the quality characteristics of water in Russian River during the period of investigation were generally acceptable for all purposes, except that for domestic use some treatment and disinfection would be necessary.

12. Tests for dissolved oxygen and biochemical oxygen demand indicated that there was little or no organic pollution of Russian River from domestic or industrial sewage. Average dissolved oxygen content was above 7 parts per million at all twelve sampling points located on Russian River below the confluence with its East Fork. Average biochemical oxygen demand during the period of investigation ranged from 0.9 parts per million at

Station No. 1 near Ukiah to 2.0 parts per million at Station No. 5 near Asti.

13. Bacterial analyses of water collected from Russian River show conditions in this regard were also normal. Density of coliform organisms ranged from zero to in excess of 1600. Median density was generally below which conforms with that of other unpolluted fresh water streams in California.

14. All quality characteristics of the river, excepting chemical, relatively uniform throughout the length of the river from near Ukiah to the ocean. There were no significant differences either as between different periods of the day or between the various sampling stations. Tidal water caused a large increase in mineral constituents in the reach of the river below Duncan Mills.

15. Stream flow during the period of investigation approximated normal conditions. Average discharge at Guerneville during the 14-day sampling period was 120 second-feet. This flow compares with an average discharge of 149 second-feet for the same 14-day period of the preceding ten years.

16. During September 1950, a survey was made of sewage treatment and disposal facilities of the major waste producing communities of Russian River basin. No immediate threat of contamination or pollution from the sources investigated is indicated as no wastes are discharged directly to the river, except occasionally during winter months of high flow. It is reported that at such times effluents are chlorinated before disposal into the river.

17. A sanitary survey and report by Charles H. Lee, Consulting Sanitary Engineer, dated February 1944, showed that at that time there was contamination and pollution of the waters of the river from improper disposal of wastes from individual homes along the river. Strict sanitary control is necessary to prevent recurrence of such conditions.

CONCLUSIONS

1. Maintenance of conditions in Russian River basin that will the recreational uses of the area is of importance not only to the region itself but also to the remainder of the State.

2. As regards quality, waters of Russian River are presently acceptable for all beneficial uses except that for domestic use, some treatment and disinfection would be necessary.

3. If this condition of high quality is to be maintained, capacity of the river to receive and dispose of wastes is very limited.

4. As regards discharge, there is need for augmentation of the minimum summer flow if recreational uses as well as other beneficial uses are to be maintained and expanded. Construction and operation of storage reservoirs for control and conservation of winter runoff is required.

TABLE 1

PRECIPITATION RECORDS

RUSSIAN RIVER BASIN

In Inches

Station	Period of record	Mean seasonal rainfall		Maximum		Minimum		Seasonal rainfall 1949-50
		For period of record	50-year mean; 1897-1947	Season	Amount	Season	Amount	
Ukiah	1877-78 to 1949-50	35.44	35.28	1889-90	60.48	1923-24	16.19	29.75
Cloverdale	1893-94 1946-47	38.62	37.66	1940-41	68.90	1923-24	15.75	---
Healdsburg	1877-78 1949-50	39.81	38.94	1940-41	72.55	l884-85	16.35	30.28

Date: Rainfall season from July 1 to June 30.

Source of Information: U. S. Weather Bureau.

Table 2
Stream Gaging Stations
RUSSIAN RIVER BASIN

Station	Location	Type of gage	Drainage area in square miles	Period of record	Years of record	Supervision
Russian River	near Hopland	W.S.R.*	362	12/39 to date	9	U.S.G.S.
Russian River	near Healdsburg	W.S.R.	791	12/39 to date	9	U.S.G.S.
Russian River	at Guerneville	W.W.G.	1,346	12/39 to date	9	U.S.G.S.
Potter Valley Powerhouse Tailrace**	near Potter Valley	W.S.R.***	---	10/22 to date	26	P.G.& E. and U.S.G.S.
East Fork, Russian River	near Calpella	W.S.R.	94.0	11/41 to date	7	U.S.G.S.
Dry Creek	near Cloverdale	W.S.R.	88.3	11/41 to date	7	U.S.G.S.
Dry Creek	near Healdsburg	W.W.G.	131	10/39 to 9/42	2	U.S.G.S.
Mark West Creek	near Windsor	Staff	43	4/40 to 9/41	1	U.S.E.D. and U.S.G.S.
Santa Rosa Creek	at Santa Rosa	Staff	57.1	11/39 to 9/4l	2	U.S.G.S.

* Wire weight gage (W.W.G.) from December 1939 to September 1943
** Import from Van Arsdale Reservoir on Eel River
*** Float type gage maintained by P.G.& E. from October 1922 to October 1923. Water stage recorder gage (W.S.R.) maintained by U. S. Geological Survey from October 1923 to present.

MEAN MONTHLY DISCHARGE OF RUSSIAN RIVER
NEAR HOPLAND

In Second-feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Average for Year	Annual runoff, Acre-feet
1939-40	---	---	209	1,494	3,705	1,774	804	235	113	130	113	149	---	
1940-41	178	179	1,717	3,052	2,833	1,969	1,965	408	246	144	180	206	1,080	782,200
1942-43	139	368	1,398	2,996	977	706	567	336	184	137	143	141	676	489,200
1943-44	162	235	99.4	441	847	1,141	333	270	214	128	145	152	346	251,100
1944-45	166	588	997	552	1,600	1,276	522	316	198	141	154	186	549	397,500
1945-46	220	666	3,649	1,636	734	638	445	226	146	126	132	139	734	531,400
1946-47	168	272	407	249	702	1,181	413	106	91.6	85.6	110	152	326	236,000
1947-48	254	246	236	769	553	1,098	1,705	585	265	79.7	139	195	509	369,600
1948-49	181	190	483	474	1,371	2,386	420	253	59.6	89.9	142	135	512	370,400
Average, period of record	185	331	1,194	1,366	1,658	1,284	819	321	180	121	139	159		428,425

Data from U. S. Geological Survey records

Location of gaging station: In Rancho de Sanol Grant, at highway bridge a quarter of a mile downstream from McNab Creek, 4 miles north of Hopland, and about 17 miles upstream from Sulphur Creek. Drainage area 362 square miles.

MEAN MONTHLY DISCHARGE OF RUSSIAN RIVER
NEAR MENDOCINO

In Second-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Average for Year	Annual runoff, Acre-feet
1939-40	---	---	---	4,527	9,205	4,276	1,925	452	199	149	108	174	---	
1940-41	187	270	5,342	6,962	6,631	4,684	4,823	787	372	195	185	205	2,533	1,834,000
1914-42	208	306	5,615	4,672	7,746	1,392	2,874	957	414	194	132	128	2,019	1,461,000
19142-43	146	478	2,070	6,321	2,071	1,820	982	563	286	150	138	129	1,265	915,800
1943-44	151	243	173	761	2,094	2,525	546	406	274	142	128	127	626	454,700
1944-45	161	945	1,660	989	4,110	2,346	990	457	251	141	137	171	1,009	730,800
1945-46	414	1,319	7,506	2,991	1,335	1,054	783	332	179	115	112	117	1,363	986,800
1946-47	142	486	806	298	1,819	2,441	882	210	171	70.5	82.8	121	620	448,800
1947-48	327	346	357	1,479	716	1,980	4,201	1,232	142	136	138	167	955	693,600
1948-49	182	221	692	735	2,195	6,134	764	358	100	84.5	114	108	971	703,300
Average, period of record	213	513	2,691	2,974	3,792	2,865	1,877	575	266	138	127	145		914, 311

Data from U. S. Geological Survey records

Location of gaging station: In SE 1/4 Sec. 22, T. 9N., R9W., M.D.B.& M., 2 miles east of Healdsburg and 3-1/4 miles upstream from Dry Creek. Drainage area 791 square miles.

MEAN MONTHLY DISCHARGE OF RUSSIAN RIVER
AT GUERNEVILLE

In Second-Feet

Season	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Average for Year	Annual runoff, Acre-feet
1939-40	---	---	393	7,539	14,240	7,681	3,365	621	229	1422	103	161	---	
1940-41	211	305	9,916	13,320	11,320	7,478	8,716	1,136	462	216	184	207	4,421	3,201,000
1941-42	223	337	8,379	7,821	13,300	2,370	4,448	1,301	541	234	158	137	3,210	2,324,000
1942-43	155	666	2,986	10,440	3,255	3,047	1,383	789	347	150*	145*	130*	1,962	1,420,000
1943-44	160	256	226	1,206	4,266	4,215	703	476	300*	138*	122*	122*	1,005	729,900
1944-45	164	1,146	2,564	1,453	7,229	3,559	1,343	588	300*	145*	135*	170*	1,529	1,107,000
1945-46	431	1,757	12,460	4,681	2,054	1,465	1,091	376	192	119	108	123	2,086	1,510,000
1946-47	140	532	1,177	368	2,780	3,791	1,319	257	212	70	82	125	893	646,400
1947-48	408	407	407	2,230	851	2,771	6,847	1,980	507	151	132	174	1,402	1,018,000
1948-49	189	212	838	1,055	3,086	10,430	1,080	421	127	72	115	112	1,477	1,069,000
Average, period of record	231	624	3,935	5,011	6,238	4,681	3,030	795	322	144	128	146		1,447,255

*Estimated by U.S. Geological Survey

Data from U.S. Geological Survey records

Location of gaging station: In NW 1/4 sec. 32, T. 8N., R.10W., M.D.B.& M., at highway bridge in Guerneville, 6-1/2 miles upstream from Austin Creek. Drainage area 1,346 square miles.