ROGUE RIVER BASIN

STATE WATER RESOURCES BOARD

JANUARY, 1959

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ROGUE RIVER NEAR HELLSGATE CANYON

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STATE OF OREGON
STATE WATER RESOURCES BOARD
270 FINANCE BUILDING
SALEM

January, 1959

To: The President of the Senate and
The Speaker of the House of Representatives
Fiftieth Legislative Assembly
State of Oregon

Gentlemen:

We have the honor of submitting the report of the State Water Resources Board, Rogue River Basin, prepared in compliance with House Joint Resolution 40, Forty-ninth Legislative Assembly, regular session.

We find:

There is sufficient water on an annual yield basis in the Rogue River Basin to meet existing and presently contemplated needs and uses of water except for pollution abatement.

There are serious seasonal and geographical deficiencies from both a quantitative and qualitative standpoint.

Heavy winter runoff causes serious flood damage in the middle and upper portions of the Basin and on major tributaries.

Presently contemplated future needs can be met on most streams of the Basin and flood problems alleviated only if surplus runoff is stored during the winter months and released during the summer and early fall period of peak use.

Statutory restrictions and State Engineer's withdrawals preclude maximum beneficial use of the waters of the system.

Establishment of minimum perennial streamflows are practical and attainment of desired base flows from storage would be in the public interest.

Expansion of the economic base by full utilization of water resources for multiple beneficial use will bring substantial benefits to the state.

We recommend:

1. *Removal or amendment of single or limited-purpose statutory restrictions by Legislative Assembly.*

2. *Rescission or modification of limited-purpose State Engineer's withdrawals of the waters of the Upper Rogue River and tributaries by administrative action.*

3. *Adoption of a program by the State Water Resources Board commensurate with the legislative standards of ORS 536.310.*

Respectfully submitted,

JOHN D. DAVIS, Chairman
ROBERT W. ROOT, Vice-Chairman
BYRON C. BRINTON *ROBERT H. FOLEY*
LASELLE E. COLES
BEN R. LITTLE *KARL W. ONTHANK*

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ROGUE RIVER BASIN STUDY

CHAPTER I THE BASIN

GENERAL

Of the 96,000 square miles of the State of Oregon, 5,100 (5 percent) lying in the southwest corner of the state are drained by the Rogue River and its tributaries. Roughly rectangular in shape, about 110 miles in an east-west direction and 60 miles north and south, the Rogue Basin includes nearly all of Jackson and Josephine Counties, a large part of Curry County, a lesser part of Klamath and Douglas Counties and very small portions of Coos County, all in Oregon; and small segments of Siskiyou and Del Norte Counties in Northern California. Following is a tabulation of the county areas lying within the Basin:

TABLE 1

AREAS OF COUNTIES LYING WITHIN THE ROGUE RIVER BASIN

COUNTY	STATE	AREA WITHIN ROGUE BASIN	
		SQUARE MILES	ACRES
Jackson	Oregon	2,503	1,602,000
Josephine	Oregon	1,645	1,052,000
Curry	Oregon	533	341,000
Klamath	Oregon	217	139,000
Douglas	Oregon	113	72,000
Coos	Oregon	2	1,000
Siskiyou	California	88	56,000
Del Norte	California	59	38,000
	TOTAL	5,160	3,301,000

THE BASIN

More than 2,500 streams, of which 1,200 are named, comprise the Basin's drainage system resulting in highly dissected land forms cut by hundreds of stream valleys, large and small. With nearly 5,100 miles of streams in the Basin, there is an average of about one mile of watercourse, as shown on U.S.G.S. quad sheets, for each square mile of land area. A large percentage of the smaller tributaries are one mile or less in length and flow intermittently. The Basin stream system is shown in Figure 1.

For the purpose of a general discussion, the Basin can be divided into three distinct sections - eastern, central valley, and western, each differing in topography, climate, and degree of development.

The eastern section comprises the Cascade Range and drainage on its western slopes; the central valley section comprises the middle portion of the Basin which includes all of the major blocks of relatively flat valley land; and the western section comprises the mountains along the coast and the coastal region.

An indication of the difference in land ownership in the three sections is given by Table 2 which lists the areas of Federal, State and Public lands in the Basin and summarizes these areas by sub-basins.

EASTERN SECTION

This area starts at the headwaters of the Rogue, which are at elevation 5,200 near renowned Crater Lake, and drains the western slopes of the Cascade Range. Included in this section, which is almost entirely within Jackson County, are (1) about 60 miles of the Rogue main stem, from its headwaters at mile 213 downstream to elevation 1,450, which is near the town of Trail; (2) the Rogue South and Middle Forks, originating at elevation 5,200 and 5,275, respectively, in the Sky Lakes Limited Area, which lies south of Crater Lake along the crest of the Cascade Range; (3) Big Butte Creek whose origin is near elevation 5,000 on the western slope of towering Mt. McLoughlin, elevation 9,495; (4) the upper 26 miles of Little Butte Creek drainage which starts at elevation 5,075 in the lava to the north and south of Brown Mountain, elevation 7,311; and (5) Elk and Trail Creeks which flow from elevation 5,450 and 3,800, respectively, from the divide, to the north, between the Rogue River and Umpqua National Forests.

TABLE 2

FEDERAL, STATE AND PUBLIC LANDS

SUB-BASINS AND MAJOR TRIBUTARIES	TOTAL AREA	FOREST SERVICE AND BLM AREA		PUBLIC DOMAIN AREA		STATE LAND BOARD	
	Sq. Miles	Sq. Mi.	% of Total	Sq. Mi.	% of Total	Sq. Mi.	% of Total
1. UPPER ROGUE	1,250	741	59	11	1.0	1	0.1
B. Butte Creek	253	131	52	1	0.2	*	0.0
Elk Creek	135	71	53	2	1.0	*	0.3
S. Fork Rogue	245	179	73	*	0.2	0	0.0
2. L. BUTTE CR.	374	150	40	12	3	0	0.0
S. Fork Little Butte Creek	138	83	60	2	1	0	0.0
3. BEAR CREEK	341	50	15	6	2	*	0.2
4. APPLEGATE VALLEY	768	383	50	27	4	2	0.3
L. Applegate R.	117	68	58	2	1	*	0.4
Williams Creek	85	37	44	5	6	0	0.0
5. MIDDLE ROGUE	943	310	33	47	5	3	0.3
Evans Creek	218	82	38	5	2	*	0.1
Grave Creek	164	64	39	9	5	*	0.2
Jumpoff Joe Cr.	110	25	23	6	5	*	0.2
Pleasant Cr.	38	12	32	1	2	0	0.0
Wolf Creek	46	18	39	2	3	*	0.2
6. ILLINOIS VALLEY	982	690	70	21	2	5	0.1
Deer Creek	110	47	43	3	3	1	1.0
E. Fk. Illinois	190	103	54	9	5	1	1.0
Sucker Creek	94	67	71	3	3	0	0.0
7. LOWER ROGUE	503	398	79	7	1	1	0.2
TOTAL - ROGUE RIVER BASIN	5,160	2,722	53	131	3	12	0.2

* Less than ½ square mile in area.

Data from U. S. Forest Service, Bureau of Land Management, Geological Survey, and State Land Board.

THE BASIN

Approximately 1,500 square miles (30 percent of the Basin lands), of which only 75 square miles are arable, lie within this section. Here the land surface is rugged and precipitous, a semi-wilderness of swift-flowing streams on steep gradients (Figure 2) coursing through narrow channels cut deeply into pumice or lava. The Rogue flows in a generally southwest direction with an average gradient of 57 feet of drop per mile through this section and most of its tributaries enter from the east after flowing westward on steep gradients from the Cascade Divide. A few tributaries flow from the range on the north to join the Rogue on its western banks.

This is a sparsely-populated area with the largest communities being Shady Cove and Prospect, each having a population of 500 at the time of the 1950 census.

Average annual precipitation ranges from 30 inches at the lower elevations to more than 70 inches, mostly snow, at the highest elevations. Average annual precipitation for the Rogue River Basin is shown in Figure 3.

Temperature averages at the highest elevations vary from highs of 70 degrees Fahrenheit to lows of 17. Averages at the lowest elevations vary from highs of 92 to lows of 32.

The average annual growing season indicated by the Bureau of Reclamation's climatological map is 180 days in the vicinity of Prospect and 200 days along the middle reaches of Elk Creek.

CENTRAL VALLEY

Approximately half of the Basin's area is included in the Central Valley section which takes in most of Josephine County and a large part of Jackson County.

Agricultural lands are found in widely separated, mountain-flanked valleys along the Rogue main stem and in the drainage basins of (1) Bear Creek, which starts at elevation 5,000 in the southeast corner of the Rogue Basin near Soda Mountain, elevation 6,091; (2) Evans Creek, originating at elevation 4,500 near the Basin's north boundary;

(3) Jumpoff Joe and Grave Creeks, also originating at elevation 4,500 to the north but flowing generally to the west; (4) the Applegate River, which makes its start from small lakes lying at elevation 5,500 in California near the Basin's south boundary; and (5) the upper 35 miles of the Illinois River, which also begins to the south in California in the Siskiyou Mountains with headwater elevations at about 5,000 feet.

All of the streams tributary to the Rogue flow on steep gradients in their upper reaches but flatten out considerably as they leave their headwater ranges (Figure 2). It is in these latter stretches that the valleys broaden out and arable lands occur.

Nearly all of the Basin's agricultural lands, consisting of irregular-shaped areas ranging from 1,000 to 46,000 acres in size and all lying below elevation 2,200, are within the valley section. Here the lands consist primarily of intrusive and sedimentary rocks with large areas of alluvium deposits.

Three sides of a rectangle are formed by the Rogue main stem in flowing through the Central Valley by first heading south for 20 miles, then to the west for 35 miles and finally taking a course to the north for an additional 25 miles, to river mile 65 above its mouth.

Ten feet of drop per mile is the average slope of the Rogue through this section as compared to 57 feet per mile through the Eastern Section (Figure 2).

Temperature averages range from winter lows of 32 degrees Fahrenheit to summer highs of 92 in the valleys, and 32 to 75 in the mountains.

A growing season of 220 days is indicated by the Bureau of Reclamation's climatological map as the average for the valley lands.

Precipitation varies widely with annual averages of about 20 inches in the valleys located in the eastern portion of the section to as high as 60 inches in the valleys of the Illinois River and Grave Creek located in the western portion of the section (Figure 3).

Medford, Grants Pass, and Ashland, the major population centers

of the Rogue Basin, are located in the central valley area. Medford, with a 1958 certified population of 24,300, is the largest city in the Basin followed by Grants Pass, 1958 certified population 9,900, and Ashland with a 1958 certified population of 8,800.

WESTERN SECTION

Containing about one-fifth of the Basin area, the western section is a mountainous, semi-wilderness region encompassing the lower 65 miles of the Rogue River and the winding canyon country of the lower 45 miles of the Illinois River. Both the Rogue and Illinois cut their way in narrow, steep-walled canyons with the Rogue traveling in a generally southwest direction to its exodus into the Pacific and the Illinois moving to the northwest to join the Rogue at mile 27.

Agricultural lands are limited due to topography and geology and comprise a negligible amount of the land area in this section.

Although the average slopes of the Rogue and the Illinois Rivers are much milder here (9 and 23 feet per mile, respectively) than in the headwater areas, the lands are extremely precipitous, consisting for the most part of massive, thickly-bedded sandstone.

Rainfall averages are high, ranging from 60 inches annually on the east to an estimated 120 inches at the highest elevations and decreasing again to approximately 90 inches along the coast.

Average temperature highs and lows range from 75 to 32 degrees Fahrenheit in the mountains and 67 to 40 along the coast.

The average annual growing season at Gold Beach is indicated by the Bureau of Reclamation's climatological map to be 280 days.

Nearly all of the population in this area is concentrated in the coastal town of Gold Beach, 1958 certified population 1,950, at the mouth of the Rogue. There are a few very small communities located along the Rogue; none on the lower stretches of the Illinois.

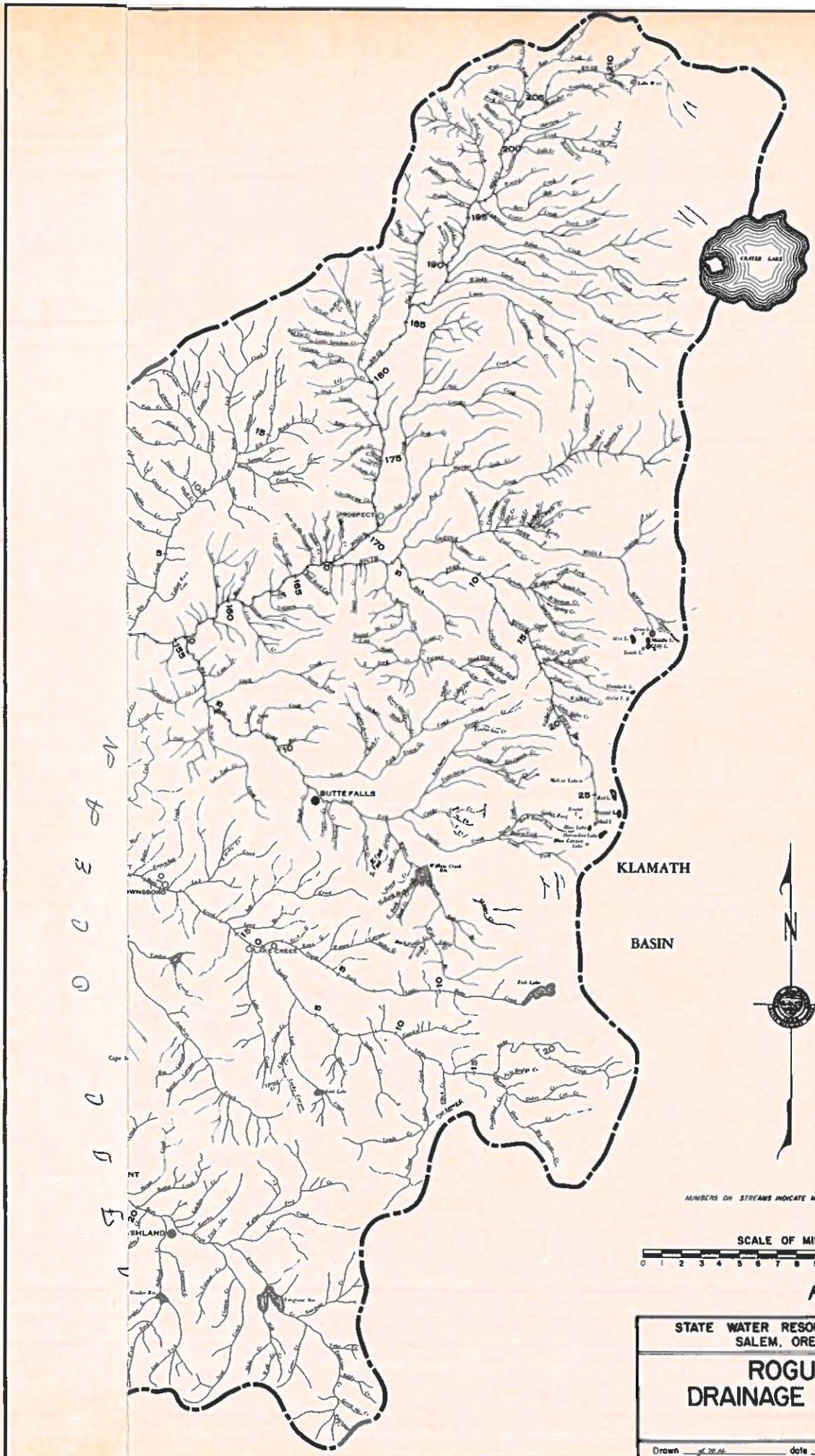

FIGURE 1

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN

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Redrawn	date	
Approved	date	

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

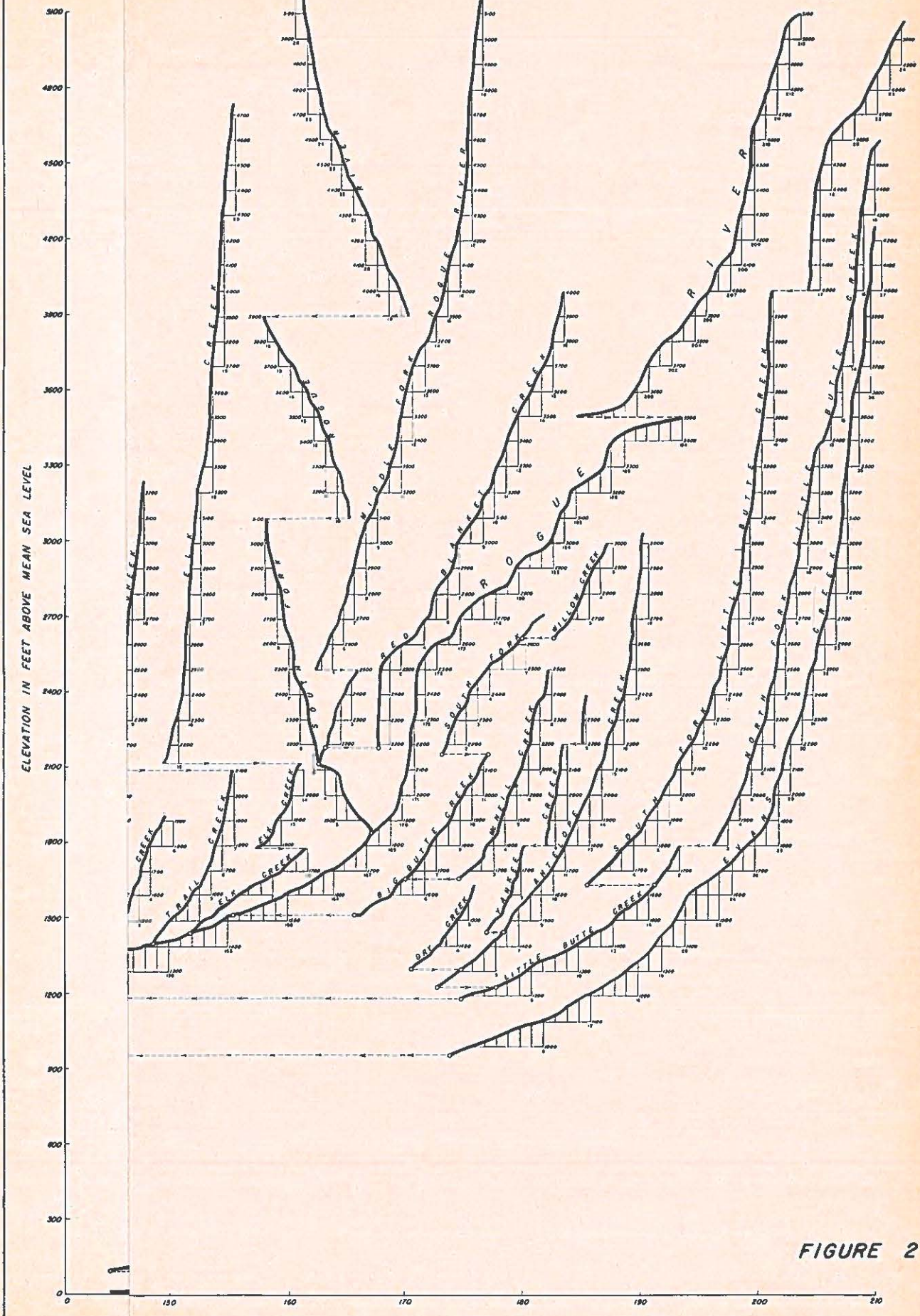

FIGURE 2

STATE WATER RESOURCES BOARD OF OREGON 1958
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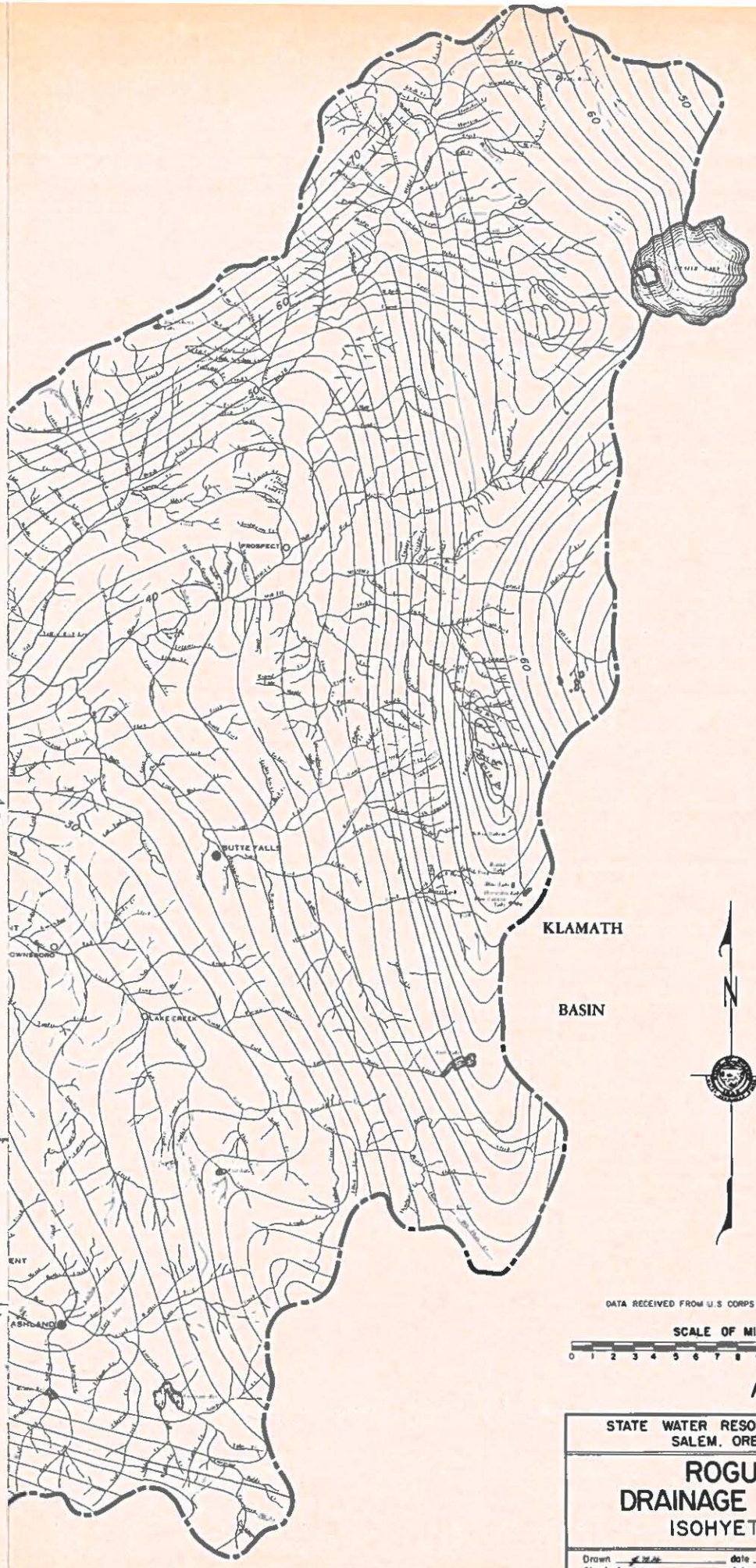

FIGURE 3

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN
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CHAPTER II WATER AND THE BASIN ECONOMY

THE GENERAL ECONOMY

Presently the economy of the Rogue Basin is based upon the natural assets of timber, agriculture, offshore commercial fishing, minerals, and recreation. Following is a brief summary of those assets:

Timber

Approximately 2,500,000 acres of land in the Basin, more than 75 percent of the total area, is timbered and nearly 95 percent of that is classed as commercial, which are lands available for and capable of producing marketable timber.

Douglas fir, the predominant wood species in the Rogue Basin, constitutes about 70 percent of the commercial timber volume. Most of the remainder is made up of other softwood species including other firs, Ponderosa and sugar pine, hemlock, and red cedar. Alder, maple, oak, and other hardwood species represent less than two percent of the total timber volume.

Noncommercial forest lands consist of: (1) 50,000 acres of sparsely-stocked, scrubby Oregon white oak, sometimes with a minor composition of madrone, located in the dry, lower foothills next to the valley floor along the Rogue River in Jackson County; (2) 20,000 acres of a varying mixture of alpine fir, Shasta red fir, noble fir, mountain hemlock, and lodgepole pine, all of a short, limby nature, located along the Oregon-California border in Jackson and Josephine Counties; and (3) 150,000 acres of rocky sterile lands in southwestern Josephine County having sparse stands of rough, short Jeffry or Ponderosa pine.

Table 3 lists the area of commercial and noncommercial forest land in Jackson, Josephine, and Curry Counties, as determined by the Forest Service inventory of 1948.

TABLE 3

FOREST LAND AREA BY COUNTIES

FOREST LAND CLASS	AREA IN ACRES		
	JACKSON	JOSEPHINE	CURRY
Commercial	1,457,000	763,000	786,000
Noncommercial	56,000	151,000	59,000
*Reserved:			
Commercial	6,000	48,000	76,000
Noncommercial	Negligible	8,000	51,000
TOTAL	1,519,000	970,000	972,000

* Reserved forest land includes public land managed as limited areas for recreation; municipal land managed as watersheds; and state parks.

Timber is by far the major industry in the Basin although its rapid growth from 1945 to 1955 has been followed by a decline in Jackson and Josephine Counties indicating a need for stabilization of the industry. Stabilization requires placing log production on a sustained-yield basis using good logging practices and management, and developing means of utilizing the components which are presently left as waste. This latter item is necessary to achieve maximum utilization of the resource by providing more man hours of employment per board foot of harvested timber.

That market conditions have affected the log production rate is indicated by the 1957 timber cut in the Rogue River National Forest which was a little over 101,000,000 board feet as compared to the allowable cut, based on outdated inventories, of 117,000,000 board feet. Present-day sustained-yield figures have not been developed because the rapidly changing economy has invalidated criteria used in the past. Log production since 1925 in Jackson, Josephine, and Curry Counties is shown in Figure 4, which illustrates the increasing utilization of this natural resource.

An analysis of covered employment in the lumber industry from 1936 through 1956 reveals the increasing importance of the industry to the economy of southwestern Oregon. In this period, Jackson County has risen from 18th to 6th place in ranking among the numbers of covered employees in the lumber industry in all the counties in the state, and Josephine County from 25th to 9th. Covered employment for all categories for the years 1948-57 is shown in Figures 5-8 for Jackson County and Figures 9-12 for Josephine County.

The peak year of log production, 1955, found 38 percent of the total covered employment in Jackson County engaged in the lumber and wood products industry, 52 percent in Josephine County, and 80 percent in Curry County. Such large dependence upon a fluctuating type of industry does not constitute economic stability, and many communities dependent upon the lumber industry experience considerable unemployment during periods of unfavorable weather or poor market conditions.

Transportation was one reason for the relatively late start in the exploitation of the Basin's timber resource because many areas, once thought inaccessible, had to wait for the advent of modern machinery and road building methods before they could be developed. Many undeveloped areas remain, particularly in the western section.

Agricultural Lands

Agriculture was the primary industry in the Rogue Basin prior to 1940 but now ranks far behind the timber industry. Population growth since 1940 can be attributed primarily to the great demand for lumber during and following World War II which resulted in a fivefold expansion of that industry by 1955. The U. S. Agricultural census indicates that increased crop production in the past 20 years has resulted from more intensive use achieved by subdivision of existing acreage with little additional land being put into production. The number of farms increased steadily up to the year 1945 followed by a decrease in land use for farming. An increase in numbers from 1,913 to 5,093 farms (Agricultural Census data) took place in the 45-year period, 1900 to 1945. However, the 1950 Agricultural Census fixes the number of farms at 4,453 although this does not include many small rural home tracts.

WATER AND THE BASIN ECONOMY

Less than nine percent of the total Basin area makes up the agricultural base and one-half of this is dry pastureland. Seventy-five percent of the farms produce cattle or dairy products and approximately two-thirds of the farms are irrigated, with less than one-quarter of the total irrigable lands in the Basin receiving an adequate supply of irrigation water.

Table 4 lists the agricultural land use in the Rogue Basin as of 1950.

TABLE 4

AGRICULTURAL LAND USE IN THE ROGUE RIVER BASIN

1950

USE	AREA	
	ACRES	PERCENT OF TOTAL BASIN LANDS
Irrigated Cropland	71,000	2
Dry Cropland	65,000	2
Dry Pastureland	160,000	5
TOTAL	296,000	9

Source: Bureau of Reclamation and Agricultural Census

The Agricultural Census shows that 698 farms were irrigated in 1950, mostly from gravity irrigation systems, at a cost, as defined in the above publication, ranging from $1.65 per acre in the Illinois Valley to $7.37 in the Bear Creek Basin for an average, in the entire Rogue Basin, of $5.36 annually.

The status of irrigation, existing and potential, as determined from publications of the result of surveys by the Bureau of Reclamation is shown in Figure 15.

WATER AND THE BASIN ECONOMY

Physical developments to serve irrigable lands, existing and in various phases of study, are shown in Figure 16.

Minerals

Initially the Basin economy was based upon mining with miners first settling the area shortly after the discovery of gold in California. Mining development was rapid but the peak was passed in its early years and the economy became centered around agriculture while mining started a gradual decline and today follows an up-and-down trend never reaching a very high peak.

In 1954 the Census of Mineral Industries listed 49 mineral industry establishments of which 24 were mining chronium ores, 7 lode gold, 6 placer gold, 2 mercury ores, 1 copper ores, 4 common sand and gravel, and the remainder were unclassified. Federal chrome stockpiling has been stopped and has thus halted production of this mineral.

Other mineral deposits of economic importance existing within the Basin in scattered locations are: silver, platinum, manganese, zinc, iron, molybdenum, antimony, vanadium, nickel, and tungsten. The approximate location of known mineral deposits is shown in Figure 17 along with active mines and mills as listed by the State Department of Geology and Mineral Industries.

Recreation

Recreation, in particular the tourist industry, ranks high in the Basin. Recreational attractions are many and the Rogue is world-famous as a fishing stream. Oregon Caves National Monument and Crater Lake National Park attract many visitors each year. Water recreation is becoming increasingly popular although there is a lack of sufficient lakes and reservoirs to meet the increasing demand.

Recreational activity is concentrated in the Central Valley, eastern section, coastal area, and the lower 27 miles of the Rogue.

Tourist travel on the major highways, Coast Highway, Crater Lake Highway, and U. S. 99, is heavy during the summer months with many

automobiles coming from California on the south and many others from Washington on the north as well as a large percentage of cars occupied by vacationing Oregonians.

Many communities depend primarily upon tourist trade for their economy, and a high standard of quality to meet the pressure of competition has been established by most of the motels and other establishments catering to the tourists.

Fishing continues to be highly popular even in the face of ever-increasing fishing pressure on the streams and is enjoyed as much by the local populace as it is by tourists. Recreation areas in the Basin are shown in Figure 18.

Transportation Facilities

There are transportation links between major population centers in the Basin and other points in Oregon and California but many semi-wilderness areas are not readily accessible and some entirely lack transportation facilities, Figure 19. The western section is isolated from the rest of the Basin and from there it is necessary to travel north to the Umpqua Basin or south into California to find a route which leads eastward and ultimately to the Central Valley section of the Rogue.

Major highways in the Basin are U. S. 99, passing generally north and south through the Central Valley Section; U. S. 101, following the coast; and, U. S. 199 (Redwood Highway), going south from Grants Pass through the western part of the Central Valley Section into California. Regular bus and freight truck schedules are maintained over these routes.

Oregon 62 (Crater Lake Highway) is an important secondary route which links Medford and Crater Lake but regular bus and truck schedules are not available over this road.

The Southern Pacific main line also passes through the Central Valley Section generally following the same route as U. S. 99.

Three airlines serve Medford with connections both to the north and south.

WATER AND THE BASIN ECONOMY

THE ROLE OF WATER

General

Water is essential to nearly all phases of human endeavor and accomplishment. As well as being necessary for the existence of life, nearly everything manufactured or grown and, therefore, practically every occupation is dependent upon water, either directly or indirectly. Herein lies the reason why water is the most important single asset in the economy of the Rogue River Basin and why that importance is increasing with time. Annually the Rogue River discharges 5,661,000 acre-feet of water, on the average, into the Pacific Ocean (Figure 13). Increasing and improving the economy of the Basin depends largely upon the beneficial uses made of that water.

That water already plays an important part in the Basin is illustrated by Figure 20 which shows the location of the point of diversion for each of the 4,300 water rights existing in the Rogue stream system. Each number on the plot represents the use of a given amount of water for a given purpose. These numbers have added meaning when their rights to deplete the waters of the Basin are added up for each stream in the system. This is shown by Figure 14 which graphically portrays the algebraic summation of consumptive rights and total rights of the Basin from the headwaters of the Rogue downstream to its mouth, including the major tributaries. This plot shows that the total of the 4,300 rights is nearly 16,000 cubic feet per second and that consumptive rights total about 6,550 cfs which, if used simultaneously and continuously, represents 4,782,000 acre-feet annually.

The following discussion separates these rights into the ten beneficial uses of water: domestic, municipal, irrigation, power, industrial, mining, recreation, wildlife, fish life and pollution abatement, and the related items of water control - flood control and drainage.

Domestic Use

Adequate supplies of domestic water, aside from that supplied by municipalities, determine the location and expansion of rural populations. Limited or expensive supplies restrict growth while poor quality

water is a deterrent to growth and may also be a public health hazard. Specific examples of these factors, as they occur in the Basin, are discussed in Chapter III, Water Problems.

Domestic water rights total 33 cfs which, if used continuously, is equivalent to 24,090 acre-feet per year. These rights are scattered throughout the Basin and are intended for stock, camps, parks and household uses although many of the earlier rights were for purposes which now would come under the municipal classification.

Municipal Use

To meet ever-increasing demands for water, municipalities must have an adequate source of supply. Establishment of new towns, whatever the reason, requires an adequate supply of available water. Quality is an important factor and sometimes requires large expenditures if treatment is necessary. Industrial needs, in many cases, must be met with municipal supplies.

Municipal rights add up to 331 cfs, 242,000 acre-feet per year, with the City of Medford holding rights for 262 cfs, 191,000 acre-feet per year, and the remainder held by municipalities located in all parts of the Basin. Ninety-five cfs, 69,000 acre-feet per year, of Medford's rights is for use by the Eagle Point Irrigation District to compensate for water diverted by the city from Big Butte Springs. Medford also furnishes the water requirements for the cities of Central Point and Jacksonville and the town of Eagle Point.

Irrigation Use

In the Rogue stream system, where summer flows and summer precipitation are low and many of the smaller tributaries become dry each year, irrigation is of major importance. Agricultural economists have evidence to verify the claim that, based upon optimum conditions, irrigated lands can support up to 27 times as many people as the same area unirrigated, and in addition provide 40 times as much income. There exists considerable potentially-irrigable land in the Basin which could be developed if adequate supplies of irrigation water were available. These lands, along with presently irrigated lands are shown in Figure 15.

Irrigation represents the major consumptive use and is complex and varies with seasons, locality, available water, and changing economy. The rights total 6,123 cfs which, if used simultaneously and continually, represent 1,874,000 acre-feet for the legally-defined irrigation season, May 15 - October 15.

The highest level of irrigation development exists in the Bear Creek Basin and that level is being further increased by virtue of the Talent Project presently under construction in the southeast corner of the Basin.

Irrigation is practiced to a lesser extent in other areas where agricultural lands exist but in nearly every case the quantity of water is insufficient for adequate irrigation.

Discussion of irrigation districts, developments, and needs appears, in part, in Chapter III, Water Problems; Chapter IV, The Basin Potential; and in detail in Chapter V, Sub-Basin Inventory.

Power Use

Only a small part of the Basin power potential has been developed and this is confined to the upper stretches of the Rogue. Water for this purpose is used nonconsumptively and becomes available for other use at downstream locations. Additional power will be developed as one of the multipurpose phases of the Talent Irrigation Project, presently under construction by the Bureau of Reclamation. Existing developments fall into the low-cost class and several potential sites could also be economically developed if they were included as part of multipurpose projects.

More than 50 percent of the total water rights for power, 5,285 cfs, are in the name of the California-Oregon Power Company and are utilized in its power developments located in the eastern part of the Basin. Other major rights are held by the Ideal Cement Company and the United States. There are several small rights located in various parts of the Basin which apparently have been abandoned but still appear in the records.

The present installed power capacity in the Basin is 50,770 kilowatts of which installations above 1,000 kilowatts plus those under construction are listed in the following table.

TABLE 5

MAJOR HYDRO-ELECTRIC DEVELOPMENTS

NAME	OWNER	STREAM	INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION-KWH
Gold Ray	California-	Rogue River	1,500	11,700,000
Prospect #1	Oregon	Rogue River	3,760	25,000,000
Prospect #2	Power	Rogue River	32,000	275,000,000
Prospect #4	Company	Rogue River	1,000	7,100,000
Prospect #3		South Fork Rogue River	7,200	50,000,000
Eagle Point		Big Butte Creek Canal	2,810	(Completed November, 1957
Green Springs	Bureau of Reclamation	Emigrant Creek	16,000	(Under construction)
Gold Hill	Ideal Cement Co.	Rogue River	2,500	11,000,000
	TOTAL		66,770	

The location of the existing developments listed above and all potential dam and reservoir sites which have been studied and proposed, recommended, or suggested for power and other purposes is shown in Figure 21.

Industrial Use

Industrial rights total less than 67 cfs and are concentrated primarily in the Medford and Grants Pass areas of the Rogue Basin. While the present need is small, mainly for mill ponds and boilers, it nevertheless must be met with both an adequate quantity and acceptable quality of water. One of the first items considered in determining the location of a new industry is the availability of water and this factor is also important in the expansion of existing industries.

Mining Use

Nearly every mining operation requires water, the amount depending upon the specific process involved. There are not many permanent, active mining operations in the Basin, yet the total of mining rights to the use of water, most of which were filed years ago, is 3,995 cfs. These rights are located in every part of the Basin and a large part of them was established during early gold mining operations following the California gold rush. Many rights are for placer operations which have seasonal restrictions as part of the rights. Many developments, and their water rights, are kept active by spasmodic operation and it is assumed that some have been abandoned after depletion of the mineral resource at their location.

Recreation Use

Today's emphasis is becoming more and more on family-type outdoor recreation which to be fully enjoyed usually requires water. Easily accessible water facilities in the Basin are heavily used and in some places overtaxed.

Recreational use of water was not usually, in the past, protected by rights and only one cfs is so reserved specifically for this purpose. Water for drinking, cooking and other purposes at camps and parks is not normally classified as recreational usage.

Lakes and reservoirs within the Basin are small in size, as shown in Table 6, totaling only four square miles. Adjacent bodies of water such as Crater Lake and Howard Prairie Reservoir, under construction, brings the total surface area of lakes and reservoirs which are readily accessible to the people of the Basin to less than 35 square miles; less than 0.7 percent of the Basin area.

Wildlife Use

The physical pattern of streams, ponds, lakes, and reservoirs in the Basin fixes the habitat available for use by wildlife which in turn determines the species and numbers which inhabit the Basin. The wildlife resource dependent upon water in the Rogue Basin has sufficient

TABLE 6

AREA OF LAKES & RESERVOIRS
(Over 5 acres - existing September, 1958)

	ACRES	SQ. MILES
LOWER ROGUE		
Game Lake	5	
Frog Lake	5	
Lake of the Woods	5	
TOTAL	15	0.02
MIDDLE ROGUE		
Savage Rapids Pool	50	0.08
TOTAL	50	0.08
UPPER ROGUE		
Willow Creek Res.	435	0.68
Medco Pond	60	0.09
Indian Lake Res.	50	0.08
Island Lake	45	0.07
Grass Lake	30	0.05
Red Lake	30	0.05
Middle Lake	25	
Dee Lake	20	
Horseshoe Lake	20	
McKee Basin Lakes	20	
Pear Lake	20	
Lake Alta	15	
Cliff Lake	10	
Blue Lake	10	
Hemlock Lake	10	
North Lake	10	
South Lake	10	
Carey Lake	8	
Beal Lake	5	
Holst Lake	5	
Mud Lake	5	
TOTAL	833	1.30

TABLE 6 (Continued)

	ACRES	SQ. MILES
LITTLE BUTTE CREEK		
Fish Lake	515	0.80
TOTAL	515	0.80
BEAR CREEK		
Emigrant Res.	940	1.47
Reader Res.	20	
TOTAL	960	1.50
ILLINOIS VALLEY		
Esterly Lakes	20	
Tannen Lakes	20	
Bolan Lakes	10	
Bigelow Lakes	5	
Mud Lake (Calif.)	5	
TOTAL	60	0.09
APPLEGATE VALLEY		
Squaw Lakes	90	0.14
Fish Lake	5	
Miller Lake	5	
Kettle Lake	5	
Hinkle Lake	5	
Elk Lake (Calif.)	5	
Elk Lake (Calif.)	5	
Fish Lake (Calif.)	5	
Towhead Lake (Calif.)	5	
TOTAL	130	0.23
TOTAL ROGUE BASIN	2,563	4.01
ADJACENT AREA		
Crater Lake	14,720	23.05
Howard Prairie Res.	2,074	3.24
Lake O'Woods	1,197	1.87

TABLE 6 (Continued)

	ACRES	SQ. MILES
Hyatt Prairie Res.	1,075	1.68
Fourmile Lake	690	1.08
TOTAL ADJACENT AREA	19,756	30.92
GRAND TOTAL ROGUE BASIN & ADJACENT AREA	22,319	34.93

value to require protection. Consideration should be given to features of development projects which might alter the natural habitat of the wildlife. Past practices have not included the reservation of water specifically for wildlife use.

Fish Life Use

The fishery resource is a valuable asset to the Rogue Basin because of its contribution to recreation and to offshore commercial fishing. Anadromous fish spawn in nearly every stream of the tributary system. While the numbers are no longer as large as reported in the early history of the Basin, the Rogue remains as an important fishing stream. As with wildlife, past practices have not protected the fishery resource by specifically reserving water for that purpose but indirect protection has been obtained through requirements for fish ladders and fish screens which must be satisfied before development projects are approved.

The spawning areas and numbers of anadromous fish in the Rogue Basin are indicated in Figures 22-24.

Pollution Abatement

The simplest method of controlling pollutants discharged into a stream is by dilution. However, when the streamflow is not large enough for this purpose or the nature of the pollutant will not lend itself to dilution, other methods become necessary.

The sewage load from areas having a large population concentration,

such as Medford and Grants Pass, requires treatment before it can be discharged into the stream system.

Other types of pollution, such as siltation from gravel and logging operations, require enforcement of standards set by the State Sanitary Authority.

Flood Control

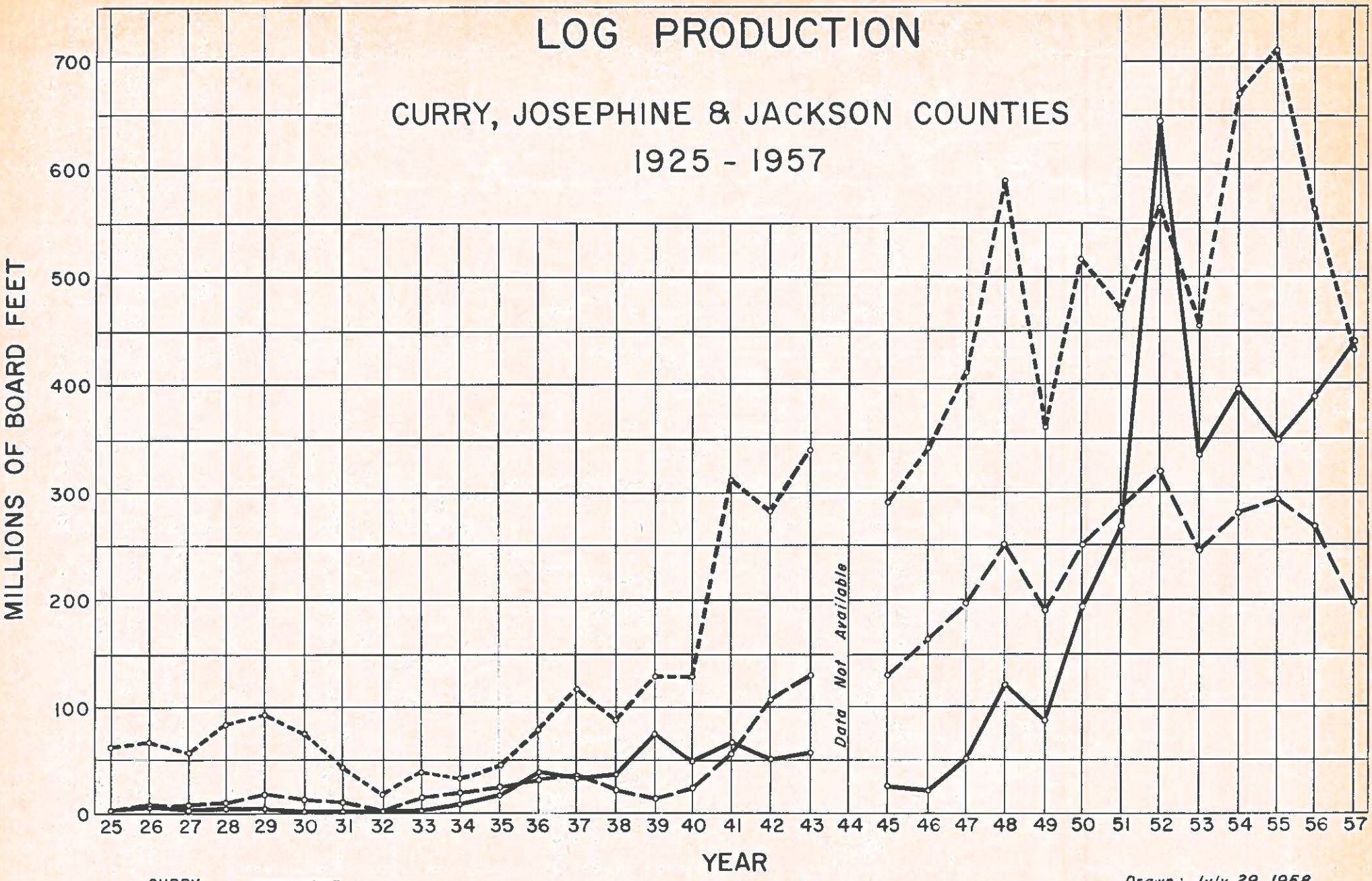
Disastrous, land-inundating types of floods are not uncommon in the Rogue Basin, the last one occurring in 1955, nor are high waters which cause considerable bank erosion damage, as was the case in January, 1958, particularly in the Illinois Valley. The 1955 flood had a peak discharge of 135,000 cfs at Grants Pass which is a flood having a 37-year average recurrence interval frequency at that location. Water stages high enough to cause serious bank erosion damage have frequencies of 2 to 3 years at many points in the Basin.

According to the Corps of Engineers' report of "Floods of December, 1955," damages occurring during that flood in the Rogue Basin amounted to more than $4,000,000 of which 33 percent was direct agricultural damage, 21 percent was direct residential damage, 15 percent was direct commercial damage, and the remainder was other types of damages.

Flood control by means of storage not only protects property but provides water for other uses during low flow periods. Occasionally a structure justified solely by flood control benefits, proves to be as beneficial, in the long run, from items considered intangible at the time of construction.

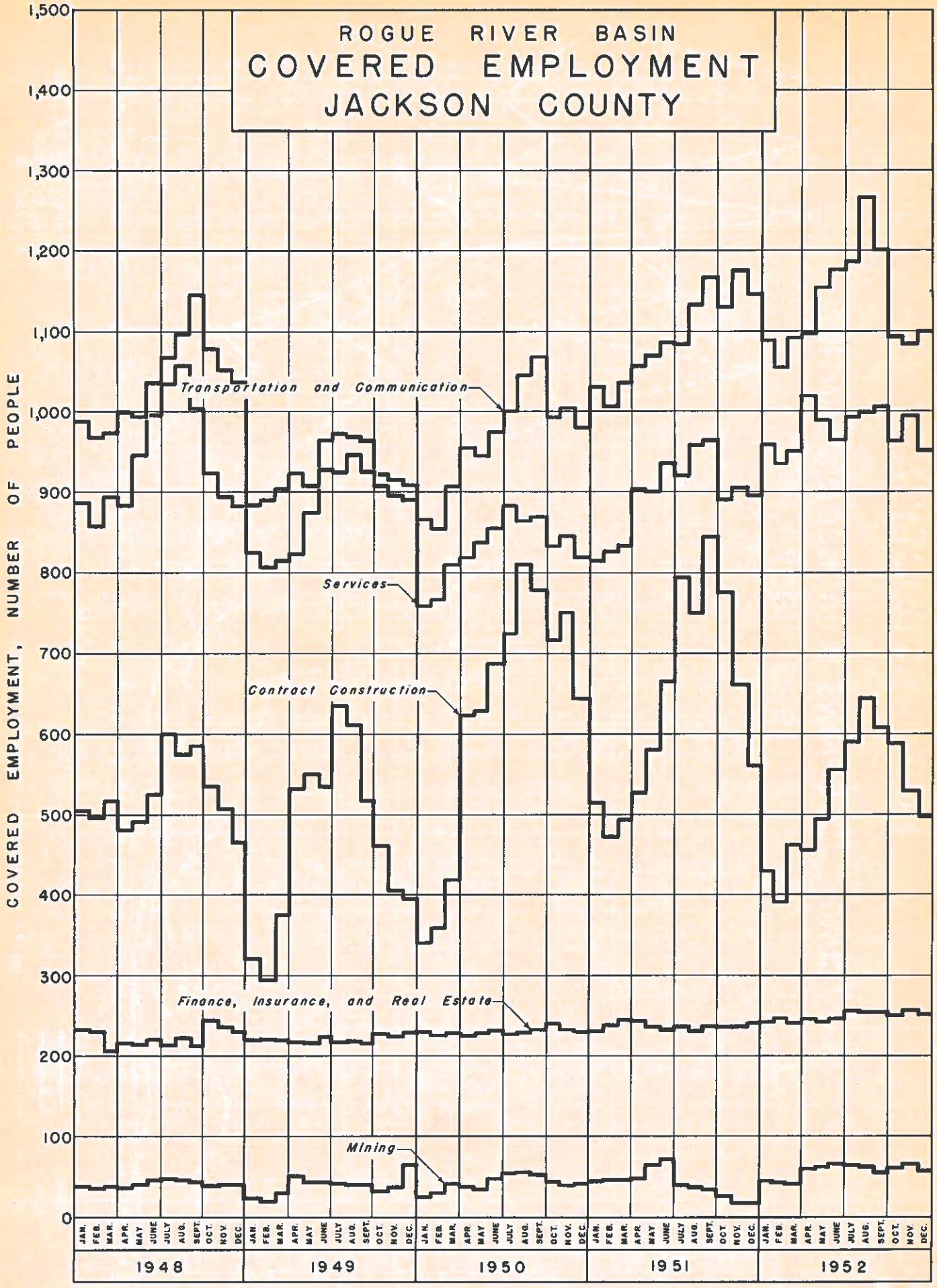
Drainage

Drainage problems exist to some degree in the Basin but are mainly individual farm or local problems rather than area problems. The situations involved are such things as restricted outlets of creeks, the filling in of small drainage ways resulting from construction of subdivisions or other types of land utilization, high water tables resulting from irrigation of higher lands from which subsurface flows build up the water table, inadequate diversion structures and conduits, reduced capacity of water courses from siltation or natural and manmade obstructions.



Source: Oregon State Dept. of Forestry

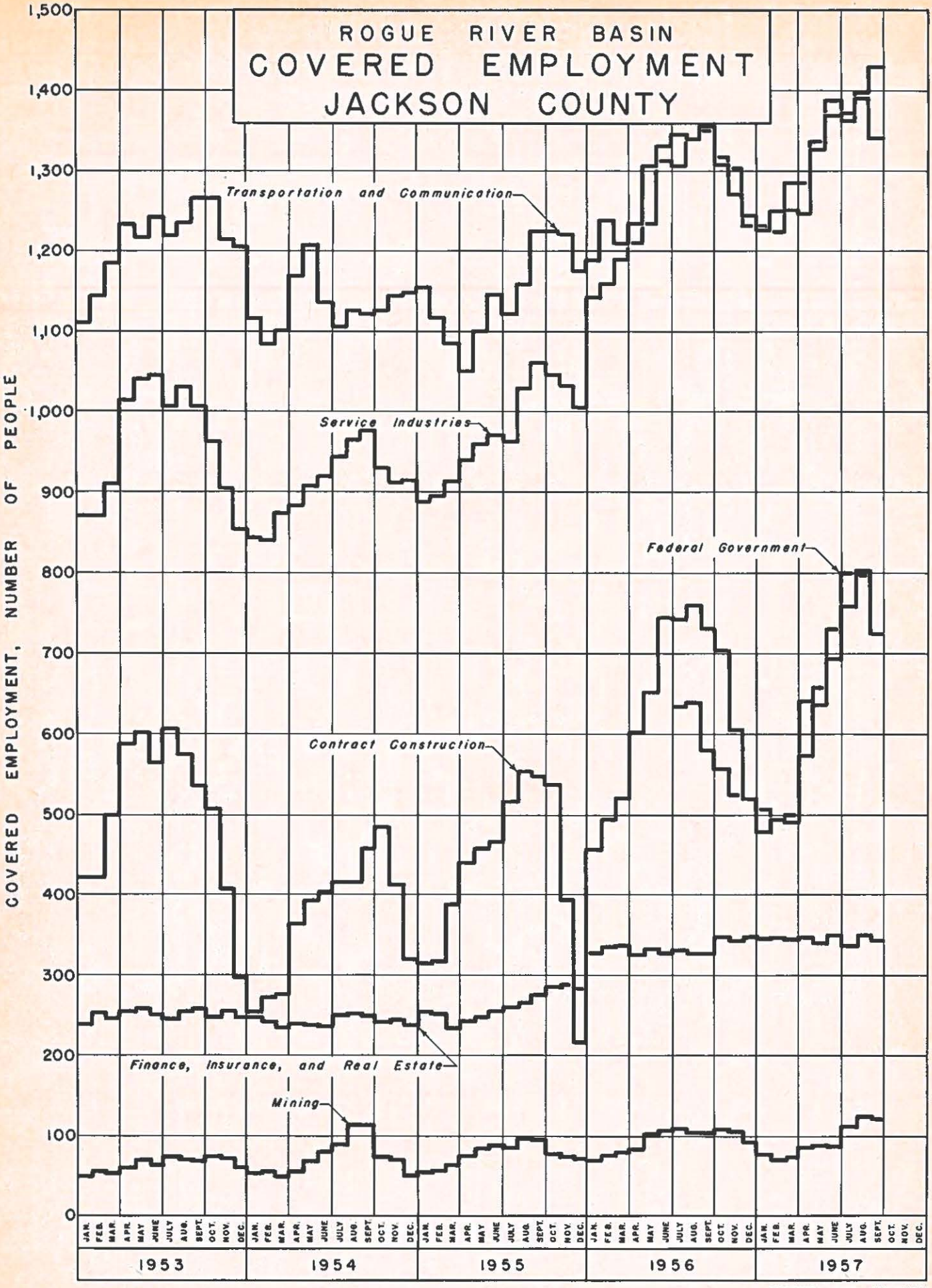
Drawn: July 29, 1958
File No. 15.8
FIGURE 4



Source: Oregon State Unemployment Compensation Commission

DRAWN July 22, 1958
File No. 15.801

FIGURE 5



Source: Oregon State Unemployment Compensation Commission

DRAWN July 23, 1958
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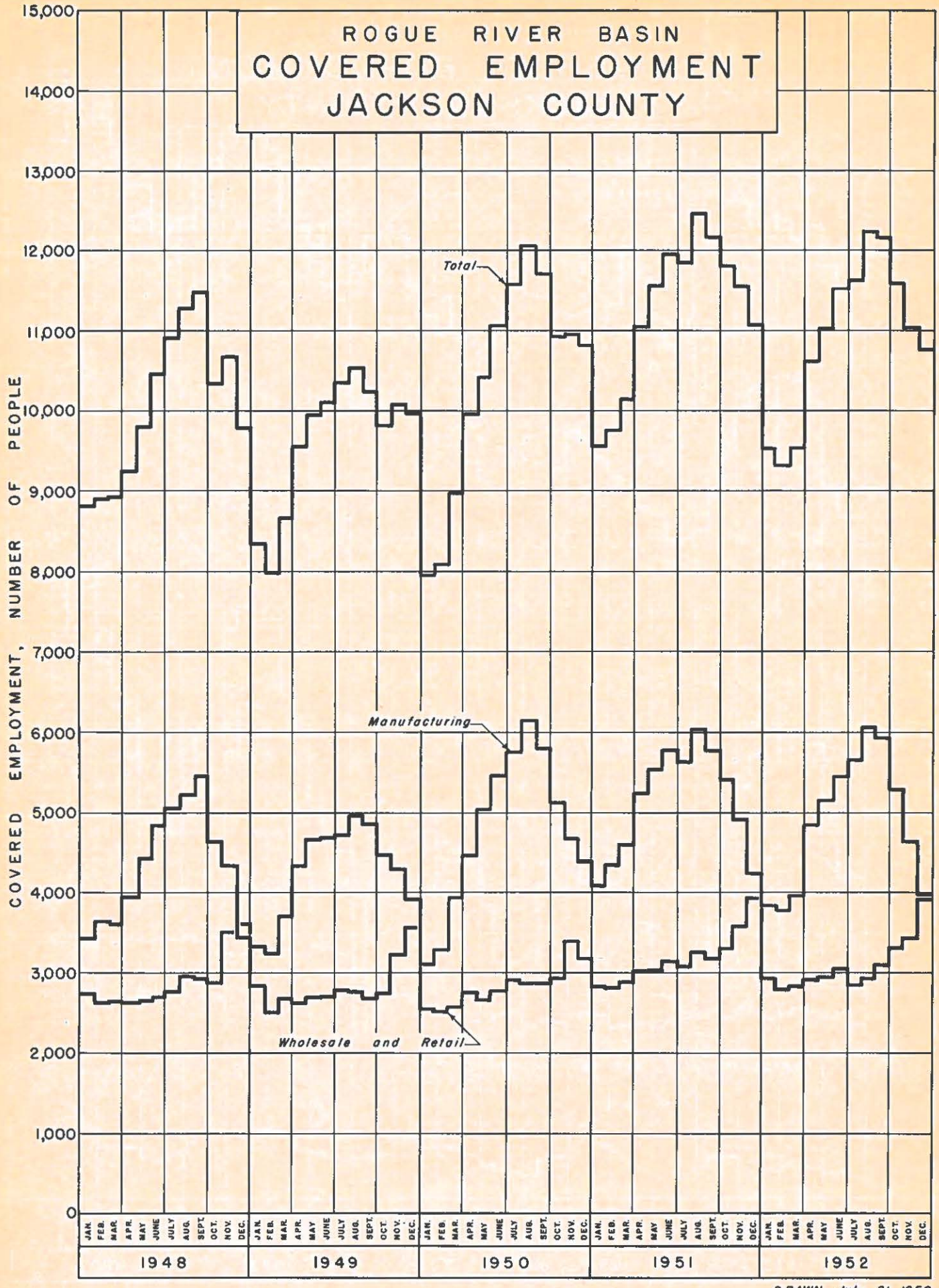
FIGURE 6



Source: Oregon State Unemployment Compensation Commission

DRAWN July 21, 1958
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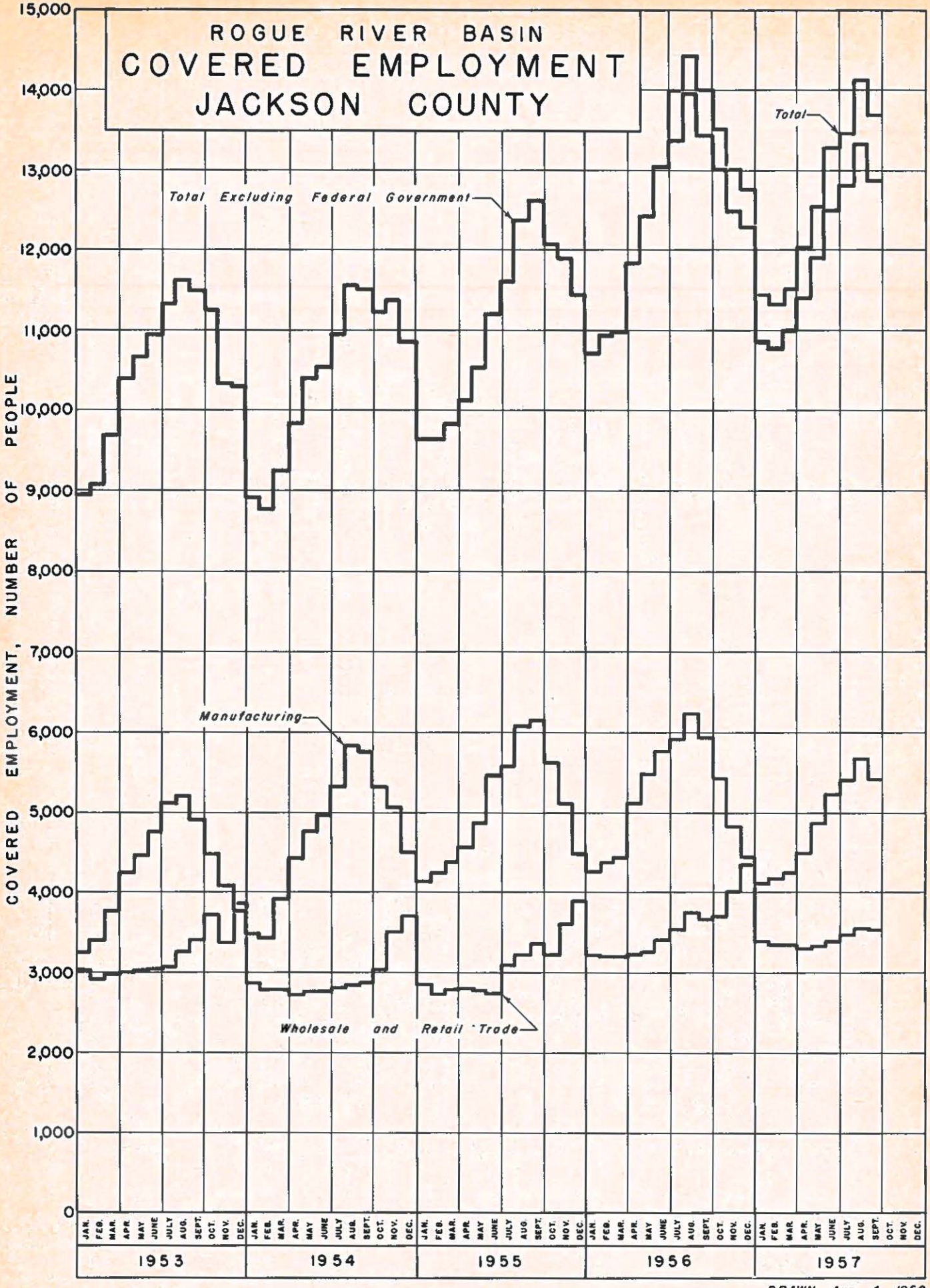
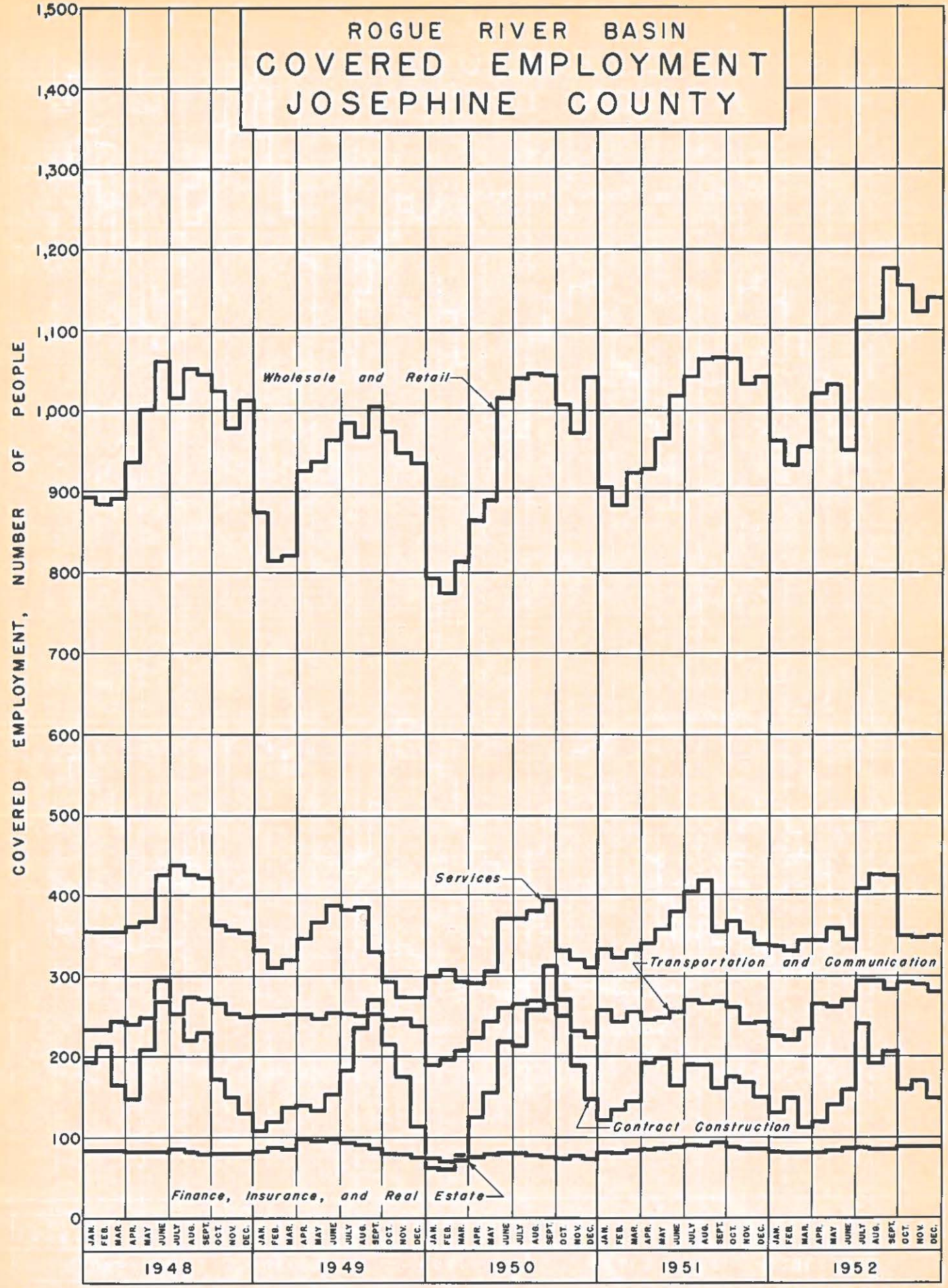
FIGURE 7



Source: Oregon State Unemployment Compensation Commission

DRAWN Aug. 4, 1958
File No. 15.801

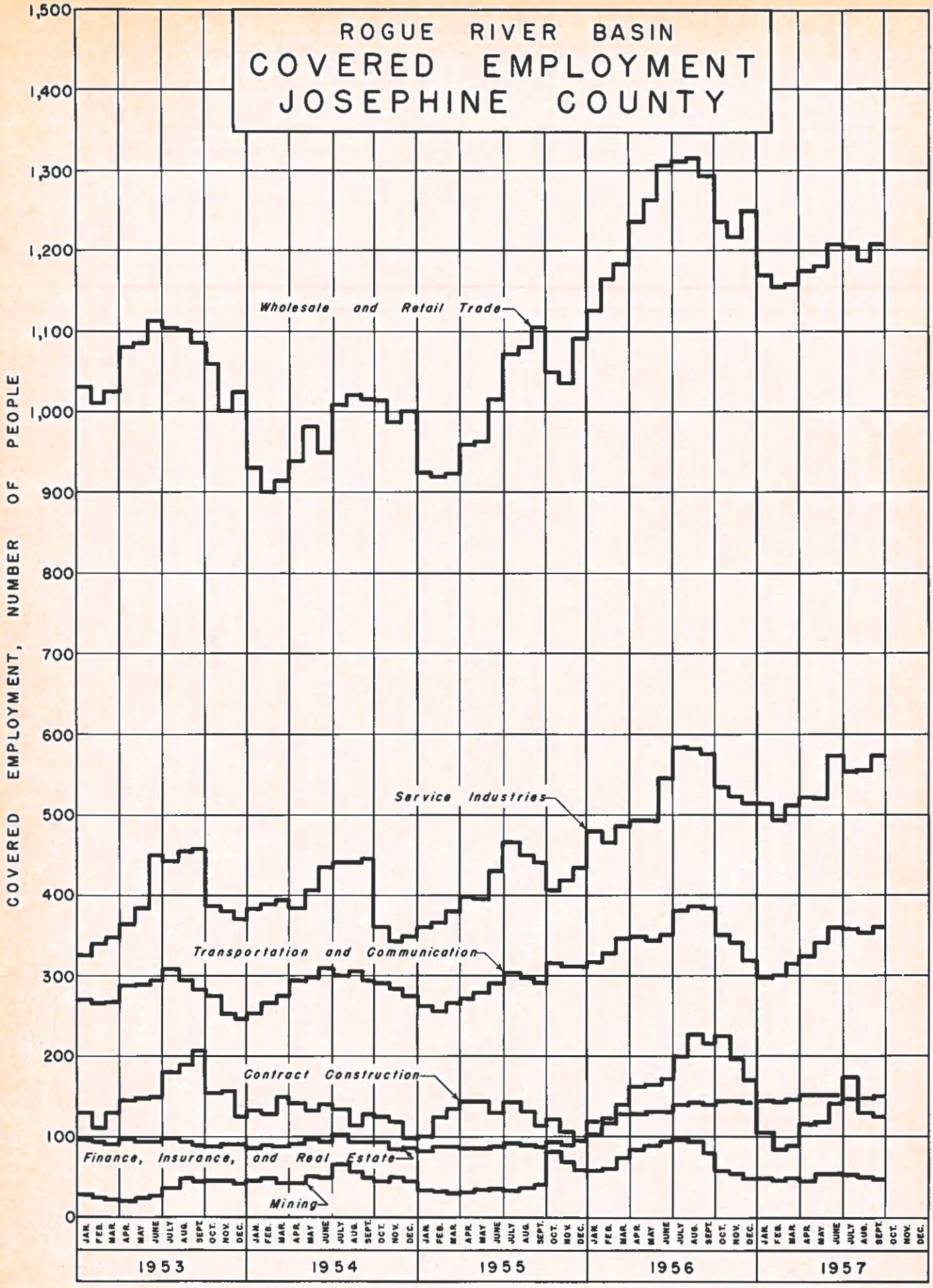
FIGURE 8



Source: Oregon State Unemployment Compensation Commission

DRAWN July 31, 1958
File No. 15.801

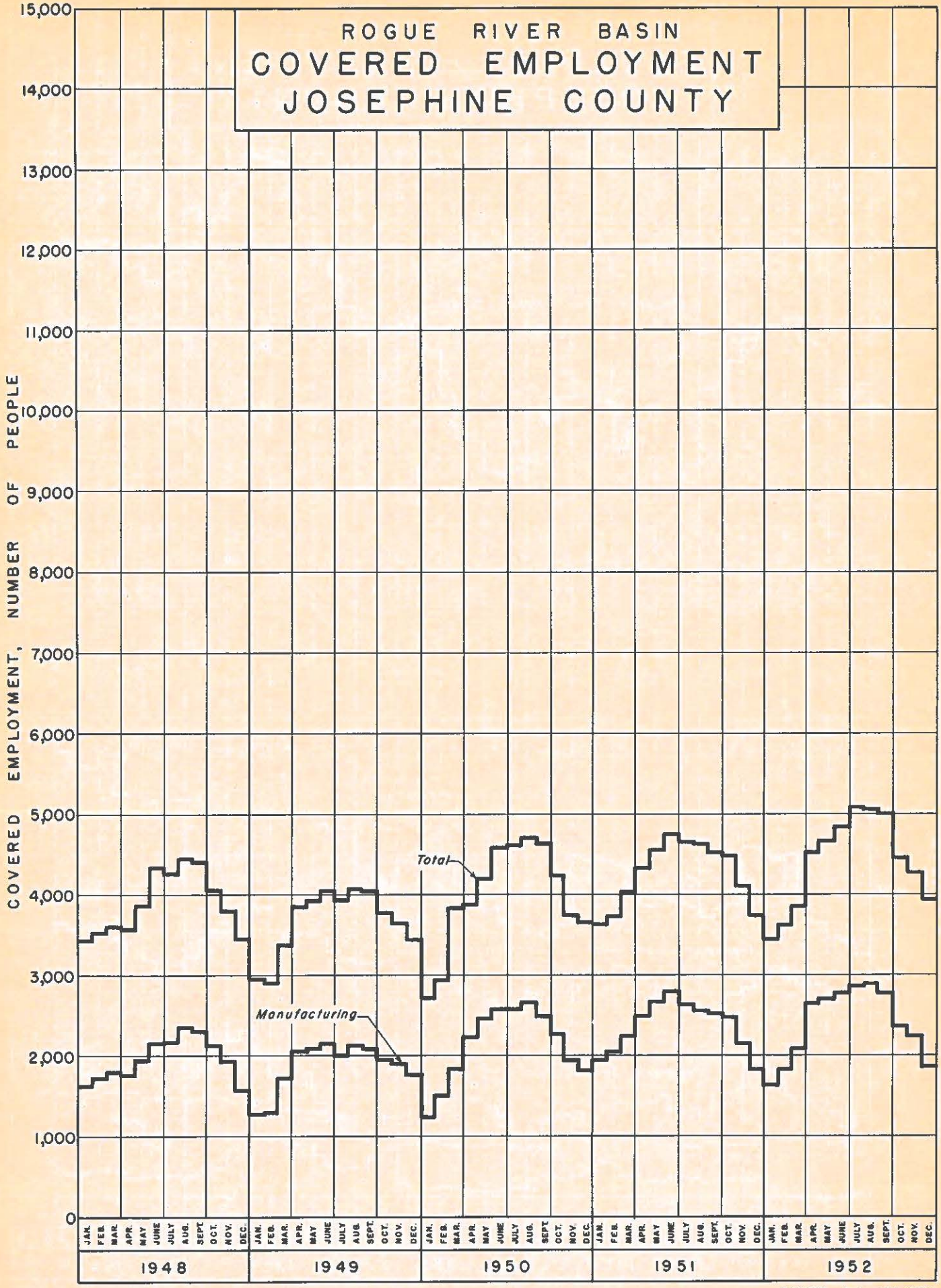
FIGURE 9



Source: Oregon State Unemployment Compensation Commission

DRAWN Aug. 1, 1958
File No. 15.801

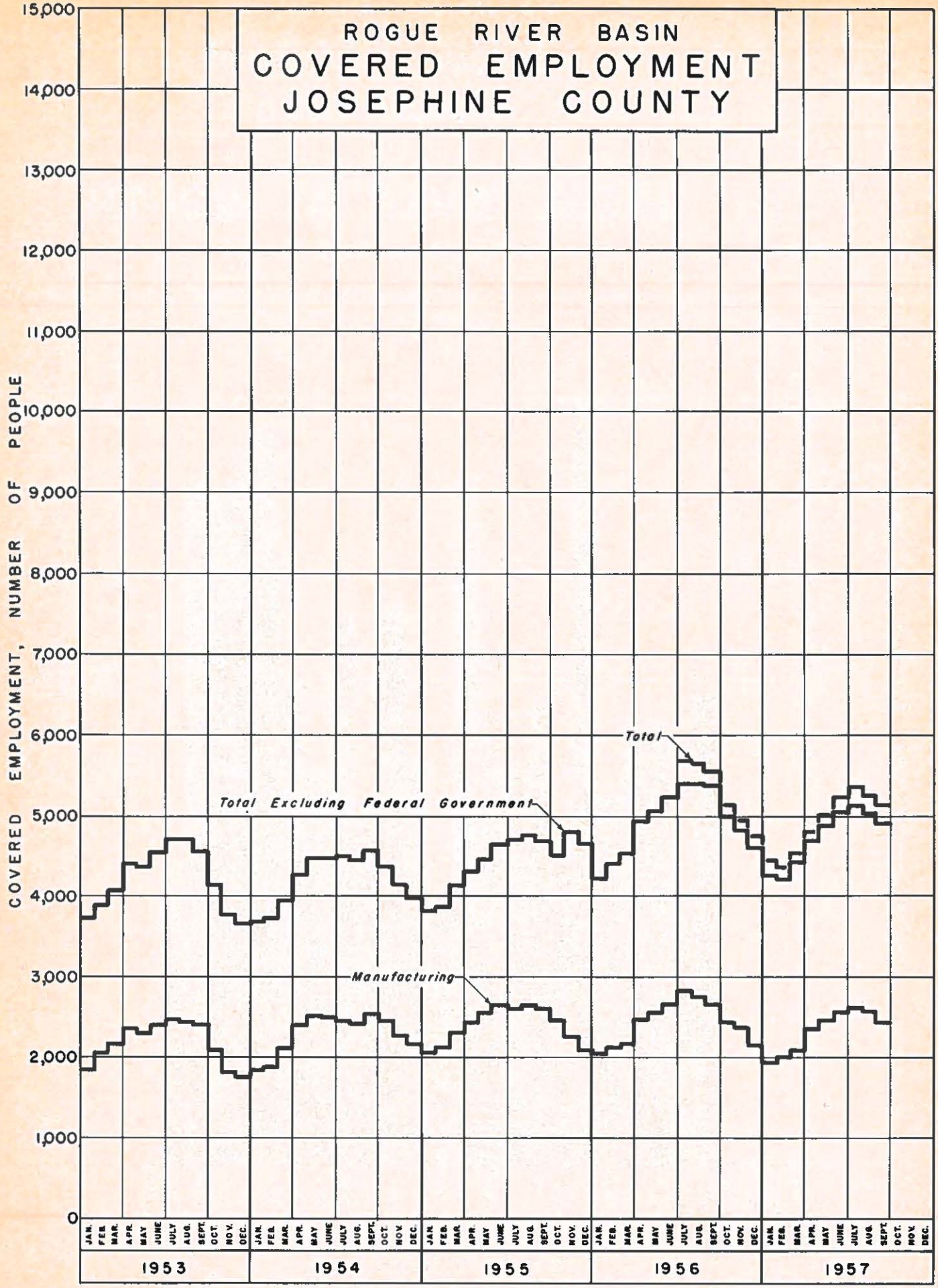
FIGURE 10



Source: Oregon State Unemployment Compensation Commission

DRAWN July 29, 1958
File No. 15.801

FIGURE 11



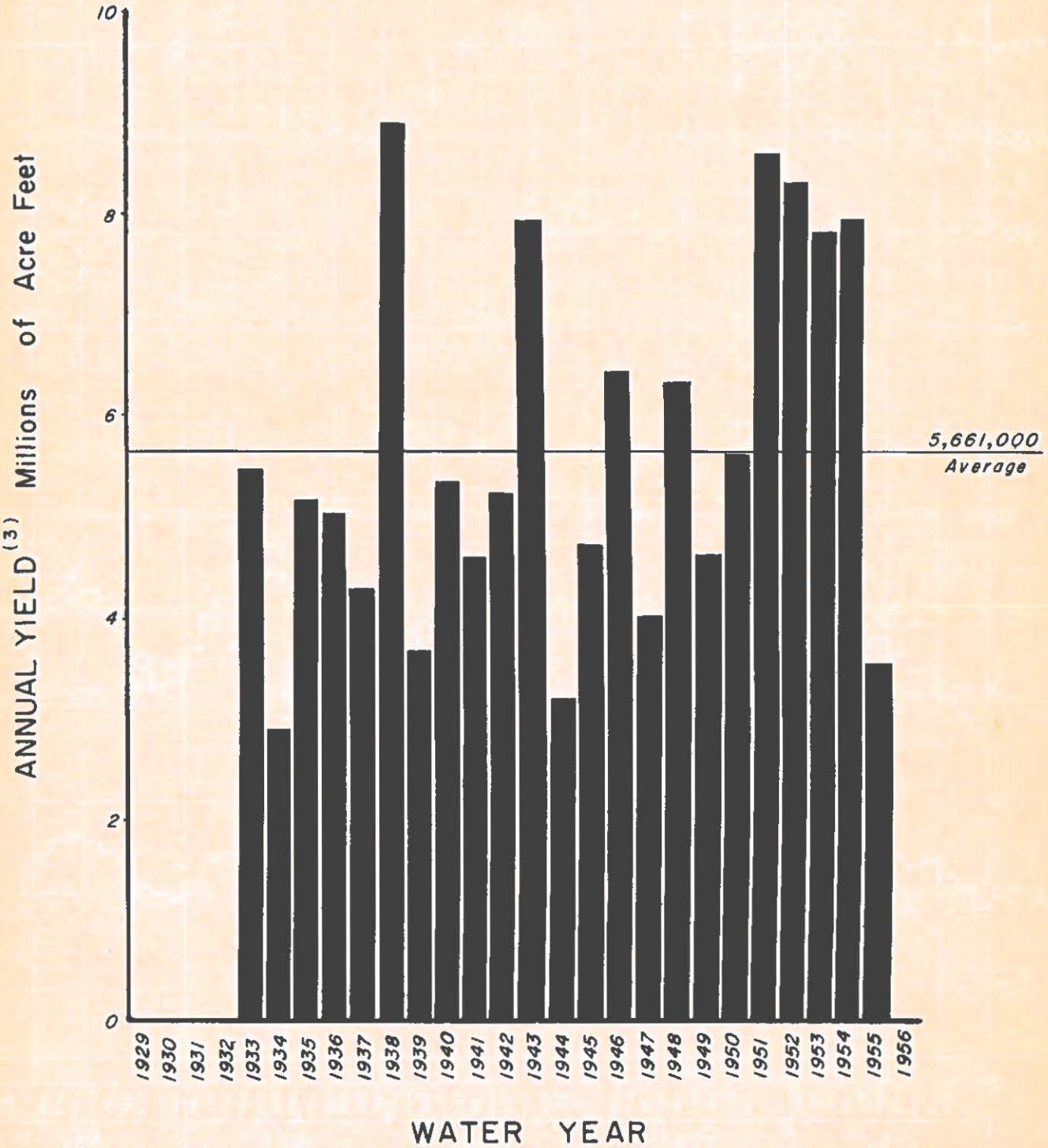
Source: Oregon State Unemployment Compensation Commission

DRAWN July 31, 1958
File No. 15.801

FIGURE 12

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(3)
OF
ROGUE RIVER AT MOUTH

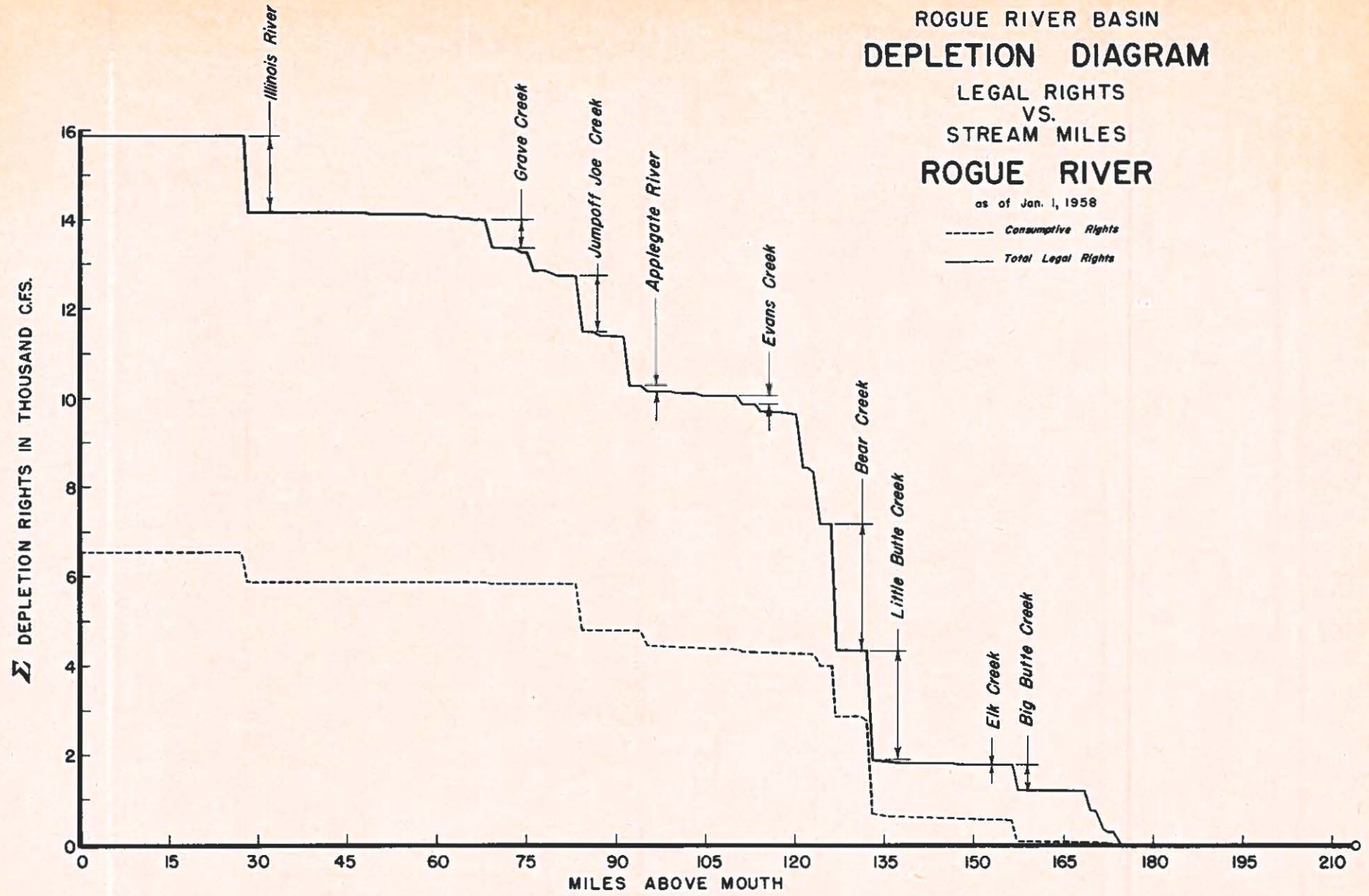
Drainage Area 5080 Sq. Mi.



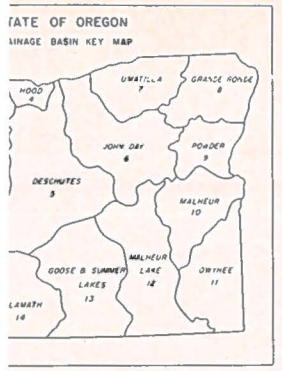
(3) Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.

Drawn: 11-14-58
File No. 15.220

FIGURE 13



Drawn Oct. 26, 1958
File No. 15.302
FIGURE 14



ROGUE BASIN OUTSIDE OREGON

LEGEND

Present adequately irrigated land

Present irrigated land (supplemental water needed)

Potentially irrigable land

Data from U S Dept of Interior, Bureau of Reclamation

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN

MARIAL
WOLF CREEK
PROSPECT
TRAIL
BUTTE FALLS
AGNESS
GALICE
WINONA
MERLIN
SAMS VALLEY
EAGLE POINT
BROWNSBORO
GRANTS PASS
ROGUE RIVER
GOLD HILL
LAKE CREEK
CENTRAL POINT
MEDFORD
MURPHY
JACKSONVILLE
PROVOLT
SELMA
PHOENIX
TALENT
WILLIAMS
ASHLAND
KERBY
CAVE JUNCTION
TAKILMA
BROOKINGS
OREGON
CALIFORNIA

N

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 IN

FIGURE 15

STATE WATER RESOURCES BOARD
SALEM, OREGON

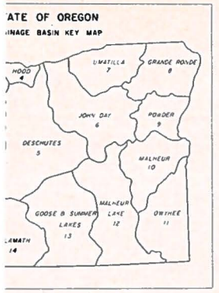
ROGUE DRAINAGE BASIN IRRIGATION LANDS

Drawn	date	File No.	
Checked	date	15	
Revised	date	.1031	
Redrawn IRRIGATION LANDS ADDED	date		
Approved	date		

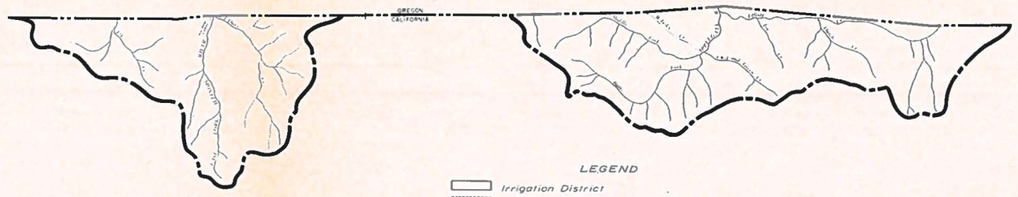
ORIGINAL BASE — State Engineers Stream System Map of Oregon

REVISIONS — Based on U S G S Quadrangle Maps - April 1, 1958

ATE OF OREGON
INAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



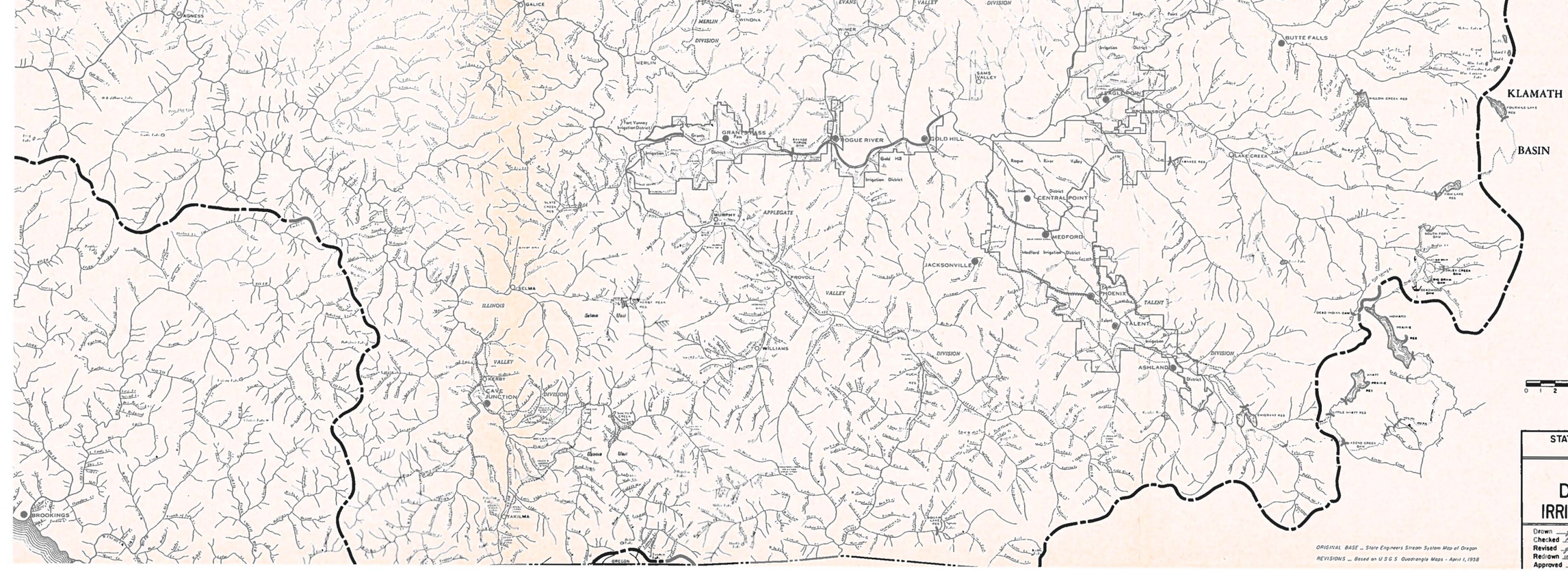
LEGEND

- Irrigation District
- Project Boundary (Bureau of Reclamation)
- Reservoir....Existing or under construction
- Reservoir....Feasibility status
- Reservoir....Investigation status
- Storage dam....Existing or under construction
- Storage dam....Proposed
- Diversion dam....Existing or under construction
- Diversion dam....Proposed
- Canal.....Existing or under construction
- Canal.....Proposed
- Tunnel.....Existing or under construction

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN



SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 161

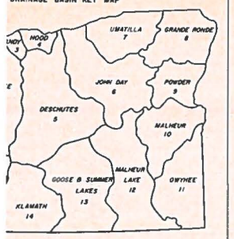
ORIGINAL BASE ... State Engineers Stream System Map of Oregon
REVISIONS ... Based on U S G S Quadrangle Maps - April 1, 1958

STATE WATER RESOURCES BOARD
SALEM, OREGON

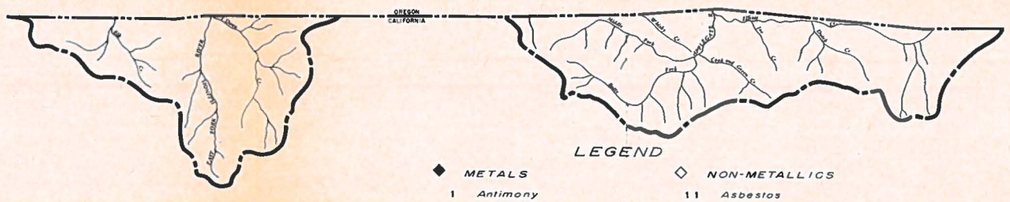
ROGUE DRAINAGE BASIN IRRIGATION DEVELOPMENT

Drawn	date	File No.	15
Checked	date		.704
Revised	date		
Redrawn IRRIGATION DEV'T ADDED	date		
Approved	date		

STATE OF OREGON
DRAINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



LEGEND

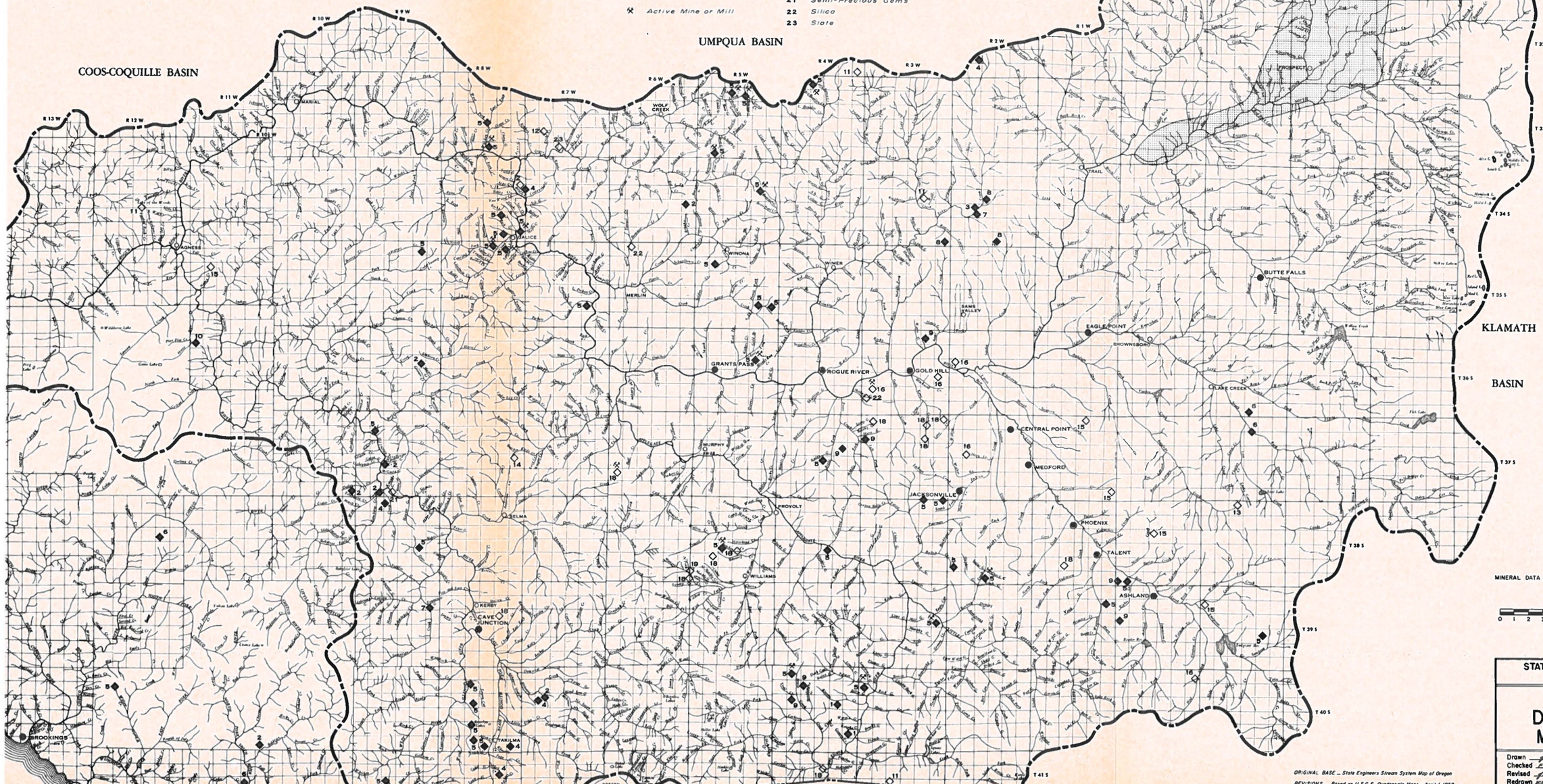
METALS		NON-METALLICS	
1	Antimony	11	Asbestos
2	Chromite	12	Barite
3	Cobalt	13	Bentonite
4	Copper	14	Clay, Brick, & Tile Plants
5	Gold & Silver	15	Coal
6	Manganese	16	Granite
7	Nickel	17	Graphite
8	Quicksilver	18	Limestone
9	Tungsten	19	Marble
10	Vanadium	20	Pumice
		21	Semi-Precious Gems
⚒	Active Mine or Mill	22	Silica
		23	Slate

COOS-COQUILLE BASIN

UMPQUA BASIN

ROGUE RIVER BASIN

KLAMATH BASIN



MINERAL DATA – OREGON DEPT. OF GEOLOGY & MINERAL INDUSTRIES

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 17

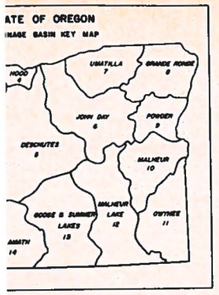
ORIGINAL BASE – State Engineers Stream System Map of Oregon
REVISIONS – Based on U.S.G.S. Quadrangle Maps - April 1, 1958

STATE WATER RESOURCES BOARD
SALEM, OREGON

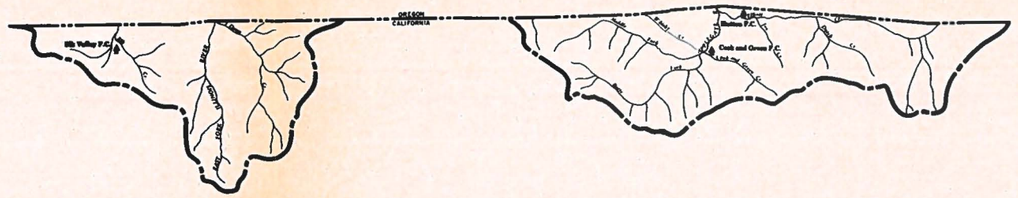
ROGUE DRAINAGE BASIN MINERAL DEPOSITS

Drawn	date		File No.
Checked	date		15
Revised	date		
Redrawn MINERAL DEPOSITS ADDED	date		
Approved	date		

ATE OF OREGON
INAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



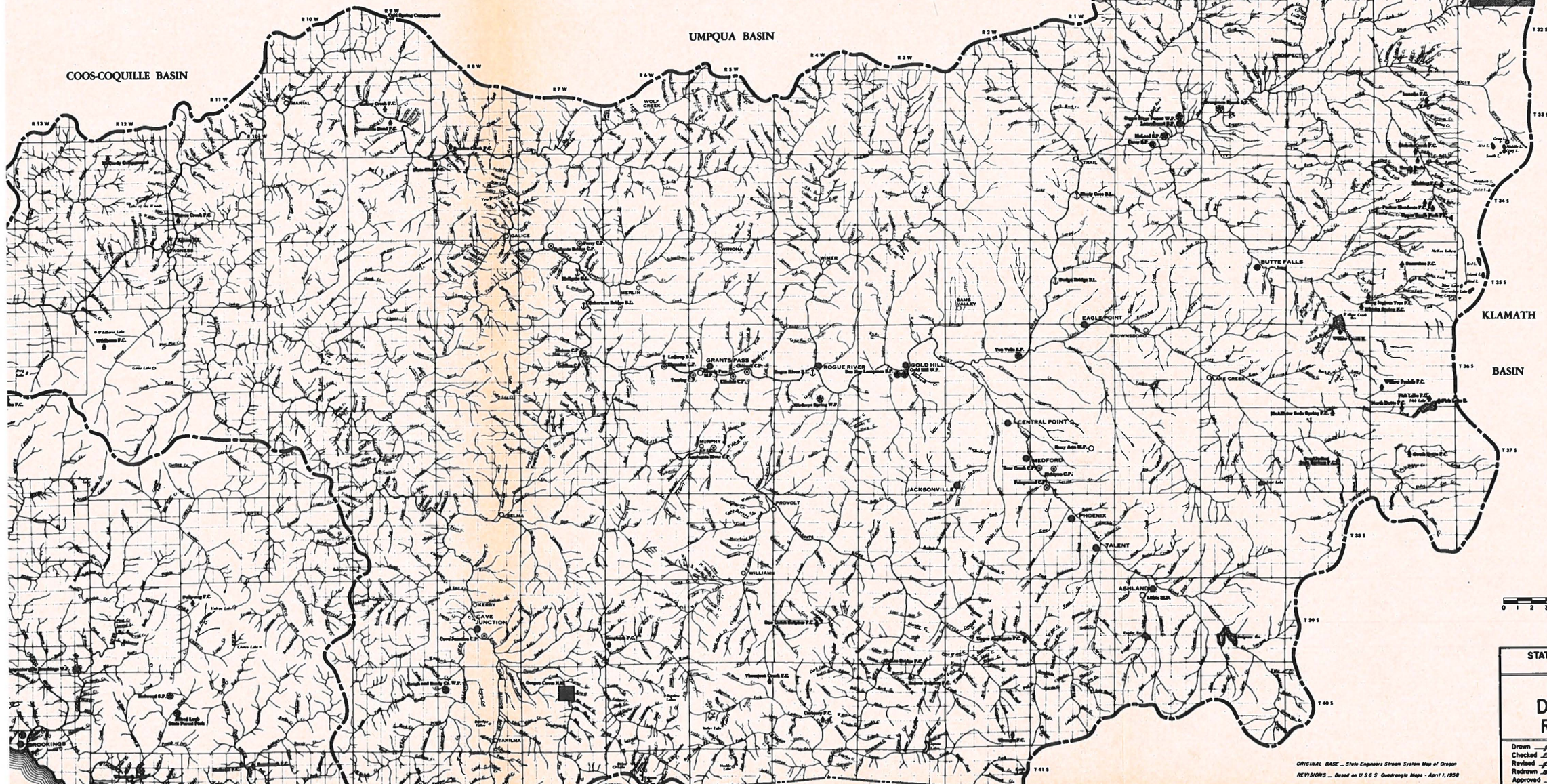
LEGEND

- Forest Camps (F.C)
- Boat Landings (B.L.)
- Resorts (R)
- State Parks (S.P. or W.P.)
- County Parks (C.P.)
- Municipal Parks (M.P.)
- National Parks & Monuments

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN



SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

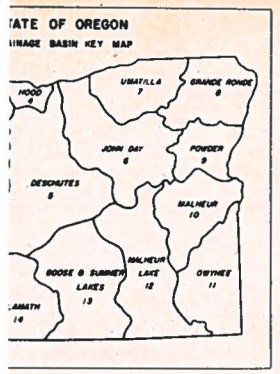
FIGURE 18

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN RECREATION AREAS

Drawn	date	File No.	
Checked	date		15
Revised	date		708
Redrawn RECREATION AREAS ADDED	date		
Approved	date		



ROGUE BASIN OUTSIDE OREGON

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN

LEGEND

- AIRLINE
- RAILROAD
- BOAT ROUTE
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- U S ROUTE NUMBERS
- STATE ROUTE NUMBERS
- AIRPORT WITH FACILITIES
- AIRPORT WITHOUT FACILITIES (Bar indicates runway alignment)

SCALE OF MILES 0 1 2 3 4 5 6 7 8 9 10 15

ORIGINAL BASE — State Engineers Stream System Map of Oregon

REVISIONS — Based on U S G S Quadrangle Maps - April 1, 1958

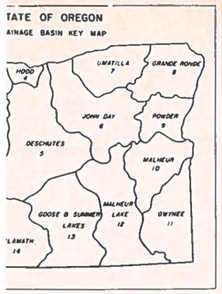
FIGURE 19

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN TRANSPORTATION FACILITIES

Drawn	date	File No.	15
Checked	date		.715
Revised	date		
Addition TRANSPORTATION FACILITIES	date		
Approved	date		

TATE OF OREGON
AINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON

LEGEND

S920 — *A plain number as the application number for a permit to use water under the provisions of the 1909 water code.*

C9900 — *A number preceded by the letter C indicates a vested right to use water as established by adjudication procedures set forth in the 1909 water code.*

R9999 — *A number preceded by the letter R in the application number for a permit to store water under the provisions of the 1909 water code.*

H289 — *A number preceded by the letters HE in the application number for a permit to utilize water for the generation of hydroelectric power under the provisions of the Hydroelectric Act of 1921.*

X98 — *A number preceded by the letter X is an arbitrary number subtending an unclaim water right.*

NOTE *The priority of rights established by the provisions of the 1909 water right code cannot be determined by comparing the relative magnitude of numbers. Numbers as placed on the map indicate the approximate poly-yared locations of diversions for the subsisting rights. For precise definition of location, reference should be made to the files in the State Engineer's office.*
For summary of water rights information, including applications, permit, and certificate numbers; priority date; types of use; and place of use by township, range, and section, refer to State Water Resources Board Farm Engineering No 1, Basin No 15 Rogue River (includes all applications, permits, and certificates for use of water recorded in the State Engineer's office as of Sept 1, 1958.)

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 20

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U S G S Quadrangle Maps - April 1, 1958

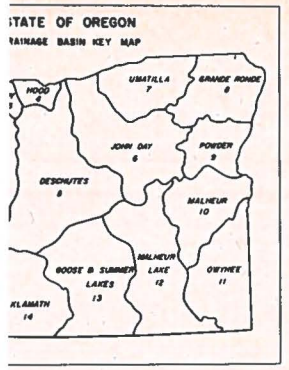
STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN WATER RIGHTS

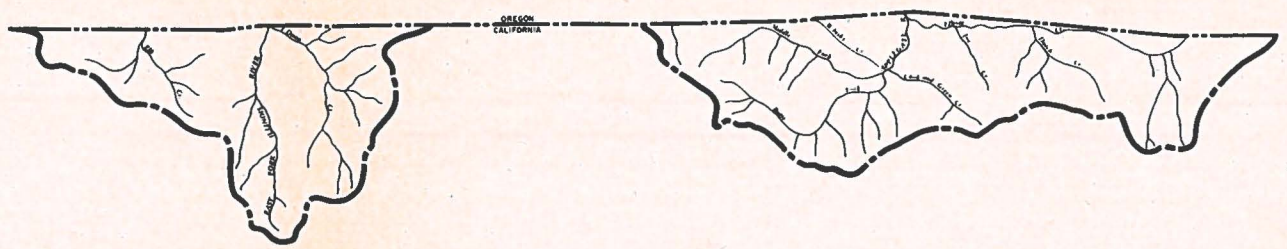
Drawn	G.T.M.	date	8-20-59
Checked	F.P.H.	date	8-20-59
Revised	G.T.M.	date	9-1-59
Redrawn	WATER RIGHTS ADDED	date	1-4
Approved		date	

File No 15 .301

STATE OF OREGON
DRAINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



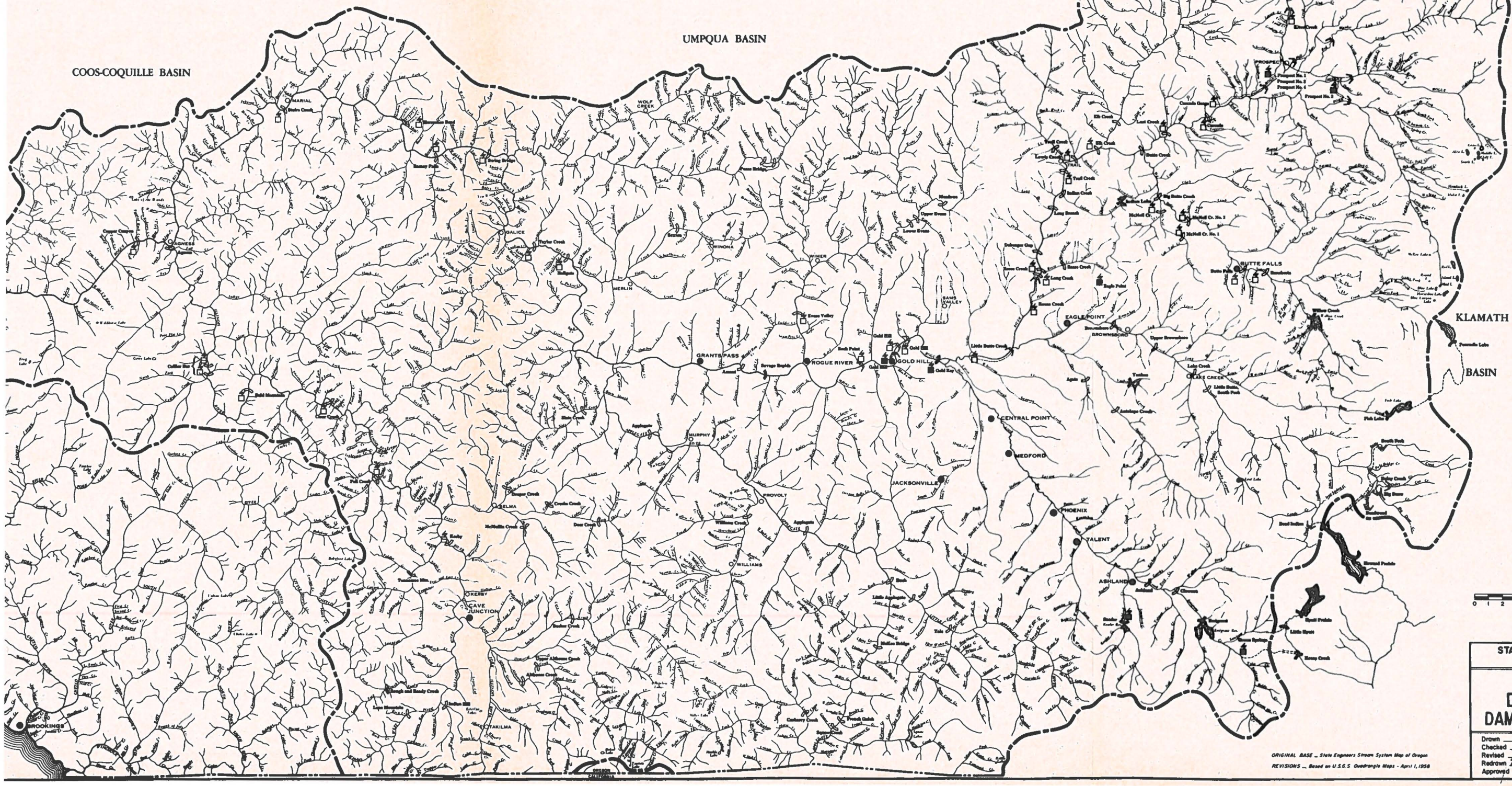
LEGEND

	Existing	Potential
Diversion Dams		
Power Sites		
Storage Sites		

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN


MARIAL
Bolens Creek
Coquille River
Rowland Dam
Bandon
Myrtle Point
Sandy Butte
Sugarloaf Mtn.
Coquille
Powers
Agness
Rogue River
Illahe
Quosatana Creek
Quosatana Camp
Quosatana Peak
Oregon Caves
Cave Junction
Kerby
Grants Pass
Merlin
Galice
Taylor Creek
Galice Creek
Hellgate
Wolf Creek
Wolf Creek Dam
Winchuck River
Brookings
Chetco River
Chetco Peak
Gold Beach
Rogue River Mts.
Siskiyou Mts.
Oregon-California State Line
Applegate
Applegate Dam
Applegate Peak
Williams
Williams Creek
Murphy
Provolt
Selma
Illinois River
Illinois Valley
Deer Creek
Deer Creek Dam
Galice Creek
Galice Creek Camp
Galice Creek Ranger Station
Grave Creek
Grave Creek Mtn.
Grave Creek Hill
Sexton Mtn.
Sexton Pass
Sexton Creek
Sexton Summit
Sexton Mtn. Lookout
Sexton Mtn. Trail
Sexton Mtn. Trail Camp
Sexton Mtn. Trail Shelter
Sexton Mtn. Trail Shelter Camp
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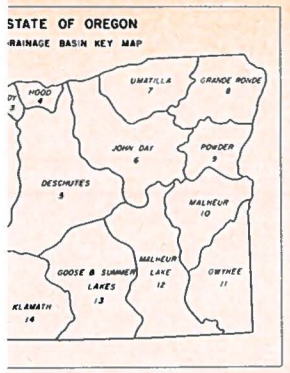
STATE OF OREGON
DRAINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON

FALL CHINOOK
SPRING CHINOOK

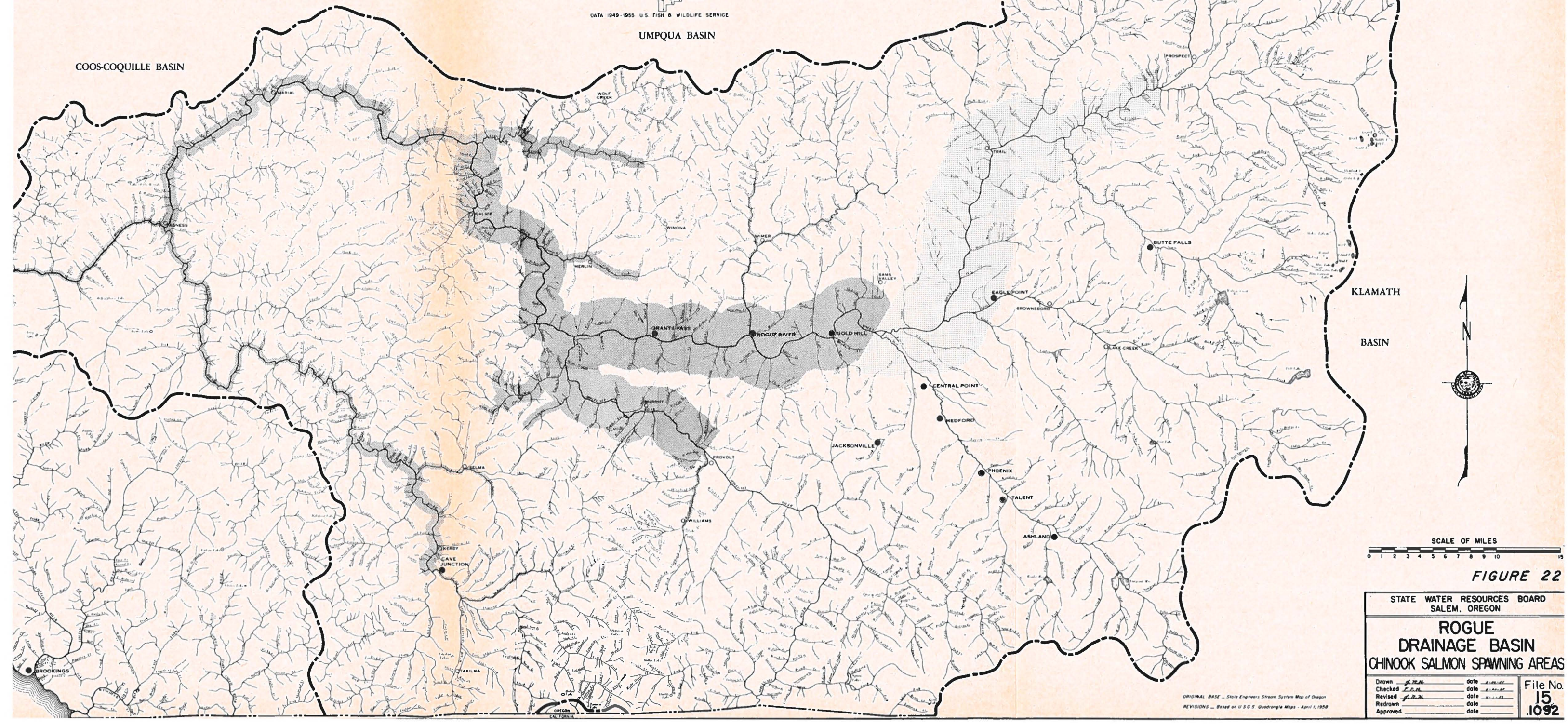
Width of pattern band indicates number of fish per mile

DATA 1949-1955 U.S. FISH & WILDLIFE SERVICE

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN



SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 22

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

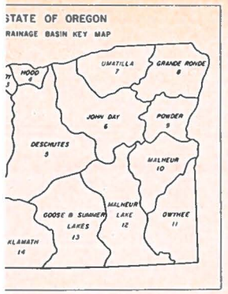
STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN
CHINOOK SALMON SPAWNING AREAS

Drawn	G.M.M.	date	2-10-62
Checked	F.P.H.	date	2-10-62
Revised	G.M.M.	date	3-1-62
Redrawn		date	
Approved		date	

File No. 15 .1092

STATE OF OREGON
DRAINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON

Width of band indicates number of fish per mile

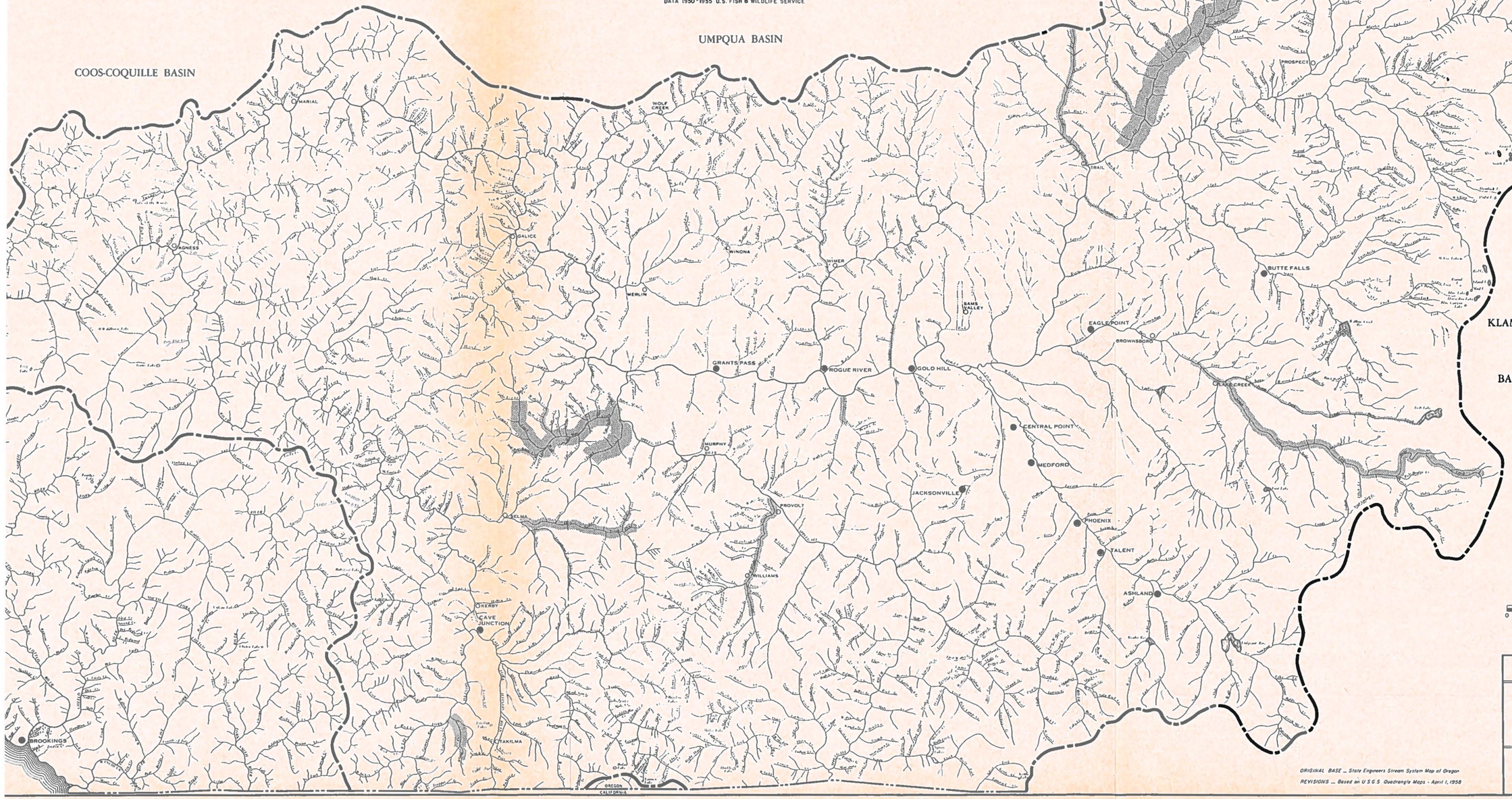
SCALE

DATA 1950-1955 U.S. FISH & WILDLIFE SERVICE

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN



N

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 23

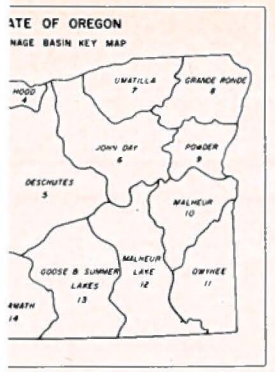
STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN
SILVER SALMON SPAWNING AREAS

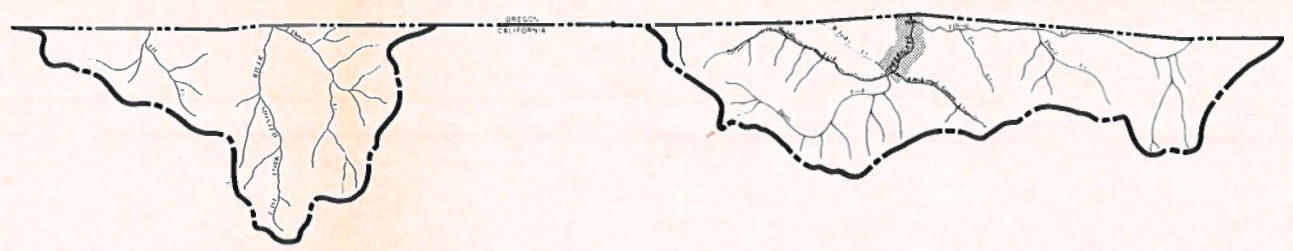
Drawn	date	File No	15 .1092
Checked	date		
Revised	date		
Redrawn	date		
Approved	date		

ORIGINAL BASE ... State Engineers Stream System Map of Oregon
REVISIONS ... Based on U S G S Quadrangle Maps - April 1, 1958

ATE OF OREGON
NAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



Width of band indicates number of fish per mile

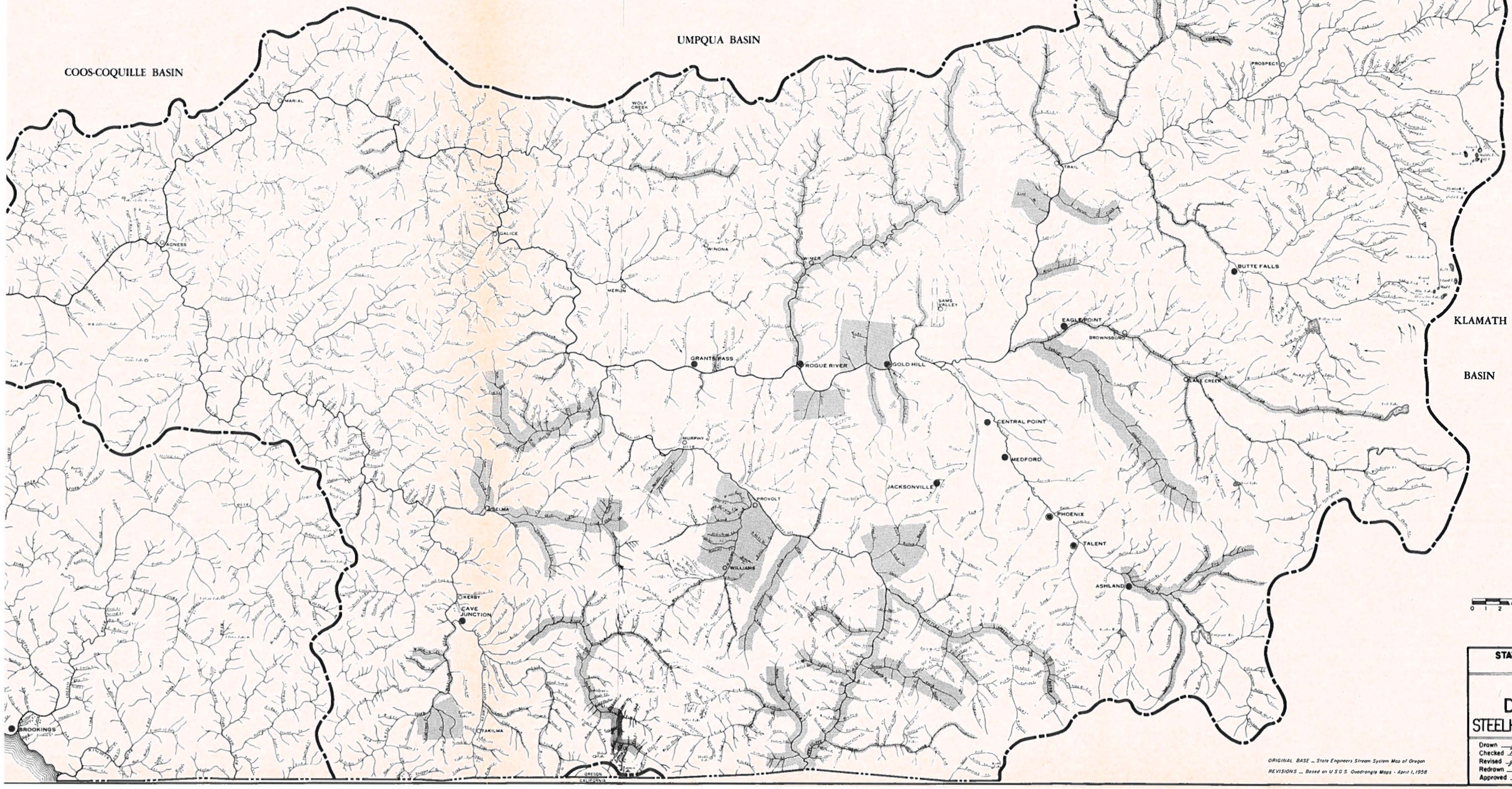
SCALE

DATA 1950 - 1954 U.S. FISH & WILDLIFE SERVICE

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN



SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

ORIGINAL BASE ... State Engineers Stream System Map of Oregon
REVISIONS ... Based on U.S.G.S. Quadrangle Maps - April 1, 1958

FIGURE 24

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN
STEELHEAD TROUT SPAWNING AREAS

Drawn	date	File No.	
Checked	date	15	
Revised	date	.1092	
Redrawn	date		
Approved	date		

CHAPTER III WATER PROBLEMS

QUANTITY

There is sufficient volume of water in the Rogue Basin on an annual basis to meet present demands and contemplated future needs. Yet a problem of quantity exists, as it does in nearly every western Oregon stream basin, which is having the water where it is needed when it is needed. Stream runoff in the Basin follows a pattern of high flows in the winter, with occasional floods, and low flows in late summer and fall (Figure 25). Many smaller streams become completely dry in the late summer and remain that way until the winter rains begin. Even some of the major tributaries drop to extremely low flows each fall. For example, the mean monthly flow of the Illinois River at its mouth is 157 cubic feet per second for August and 134 cfs for September as compared to an average of 6,315 cfs for January. Critical flow and yield conditions throughout the Basin are summarized in Tables 7 and 8. The location of stream gaging stations is shown in Figure 29.

Domestic

Ground water is the major source of domestic supplies in the Basin. It is estimated that 90 percent of the 20,000 people in Josephine County served by domestic supplies utilize wells. There are approximately 5,800 wells in Josephine County of which 40 percent are shallow wells which experience some shortage of supply during the dry season of each year.

Underground water provides the requirements of rural homes in Jackson County with the exception of water districts close to Medford and along the route of the aqueducts from Big Butte Springs. In Jackson County the quantity of water is unsatisfactory for at least 50 percent of the existing wells according to the Jackson County Water Resources Committee. A few areas have sufficient underground water to supply a high density of population but in most places the quantity will not supply over one person per two acres.

In the Gold Beach area the only dependable source of domestic supply is the Rogue main stem itself.

Municipal

The quantity of water available for municipal use seems to be

TABLE 7

MINIMUM FLOW WATER YEARS SUMMARY

LOCATION	YEAR	MIN. FLOW CFS	DATA SOURCE
Applegate R. nr. Applegate	1951	7	USGS WSP 1218
Applegate R. nr. Ruch	1929	7	USGS WSP 694
Applegate R. nr. Wilderville	1939	14	USGS WSP 884
Big Butte Cr. nr. McLeod	1955	54	USGS WSP 1398
E. Fk. Illinois R. nr. Takilma	1944	5.2	State Engineer
Elk Cr. nr. Trail	1946	0.9	USGS WSP 1064
Evans Cr. at Bybee Springs	1926	4	USGS WSP 634
Grave Cr. at Pease Br. nr. Placer	1946	0.3	USGS WSP 1064
Grave Creek nr. Placer	1934	0	State Engineer
Illinois R. at Kerby	1934	19	USGS WSP 769
Jumpoff Joe Cr. nr. Merlin	1934	0	State Engineer
	1942	0	State Engineer
Middle Fk. Rogue R. nr. Prospect	1931	72	USGS WSP 724
Red Blanket Cr. nr. Prospect	1931	34	USGS WSP 724
	1932	34	USGS WSP 739
Rogue R. above Prospect	1932	200	USGS WSP 739
Rogue R. at Dodge Bridge	1940	830	USGS WSP 904
Rogue R. at Grants Pass	1940	794	USGS WSP 904
Rogue R. at Raygold	1931	616	USGS WSP 724
Rogue R. below S. Fk. nr. Prospect	1934	493	USGS WSP 769
Slate Cr. at Wonder	1946	0.6	USGS WSP 1064
South Fork Rogue nr. Prospect	1931	35	USGS WSP 724
Sucker Cr. nr. Holland	1947	19	USGS WSP 1094
West Fork Illinois River above O'Brien	1945	2.1	State Engineer

TABLE 8

MINIMUM YIELD WATER YEARS SUMMARY

LOCATION	YEAR	MIN. YIELD AC-FT	DATA SOURCE
Applegate R. nr. Applegate	1944	139,600	USGS WSP 1014
Applegate R. nr. Ruch	1931	104,000	USGS WSP 724
Applegate River nr. Wilderville	1944	195,200	USGS WSP 1014
Bear Cr. at Medford	1931	8,690	USGS WSP 724
Big Butte Cr. nr. McLeod	1955	142,700	USGS WSP 1398
East Fork Illinois River nr. Takilma	1944	62,350	State Engineer
Elk Cr. nr. Trail	1947	97,450	USGS WSP 1094
Evans Cr. at Bybee Springs	1926	41,900	USGS WSP 634
Grave Cr. nr. Placer	1934	23,790	State Engineer
Illinois R. at Kerby	1931	390,800	USGS WSP 724
Jumpoff Joe Cr. nr. Merlin	1934	12,110	State Engineer
Middle Fork Rogue River nr. Prospect	1931	79,700	USGS WSP 724
Red Blanket Cr. nr. Prospect	1931	43,300	USGS WSP 724
Rogue R. above Prospect	1931	298,000	USGS WSP 724
Rogue R. at Dodge Bridge	1941	1,235,000	USGS WSP 934
Rogue R. at Grants Pass	1941	1,612,000	USGS WSP 934
Rogue R. at Raygold	1931	839,000	USGS WSP 724
Rogue River below South Fork nr. Prospect	1931	673,000	USGS WSP 724
Slate Cr. at Wonder	1947	34,010	USGS WSP 1094
South Fork Rogue River nr. Prospect	1931	55,500	USGS WSP 724
Sucker Cr. nr. Holland	1955	62,450	USGS Gage 7114
West Fork Illinois River above O'Brien	1944	86,190	State Engineer

sufficient at present and most communities feel they can meet their foreseeable future demand without any great difficulty unless they are required to supply large industrial developments.

Medford, the major municipal water user in the Basin, has Big Butte Springs as its source of supply and holds exclusive rights to the waters of Big Butte Creek subject only to rights existing prior to 1925. Twenty-five million gallons per day (38.7 cfs) is the capacity of the springs which was more than sufficient to meet the maximum daily demand that occurred in 1956 of nineteen million gallons. In anticipation of future needs, including possible industrial supplies, the City of Medford holds a water right for 100 cfs on the main stem of the Rogue at approximately mile 133.

Grants Pass, the second largest water user, holds a right for 12 cfs (7.75 million gallons per day) from the Rogue and has applied for an additional 10 cfs (6.46 million gallons per day) to meet anticipated future needs. Peak usage, which occurs in July, now runs about 11 cfs (7.11 million gallons per day) for that city.

Many smaller communities are served by wells and most of these feel that future needs can be met with additional wells while the remainder contemplate going to the Rogue main stem.

Ashland is the only town utilizing storage as part of its municipal supply and plans on additional storage as the demand requires. Present storage for the city is located on Ashland Creek and the water is also used for power production.

Irrigation

Adequate quantities of water for irrigation have always been a problem in the Basin and continue to be a major problem. Low stream flows in summer, coupled with dry weather, make irrigation essential if production from agricultural lands is to be anywhere near the possible potential. (As an example of summer rainfall, the average annual precipitation in the Medford area is about 18 inches and less than 30 percent of this amount occurs during the irrigation season, May 15 - October 15.) To achieve this end, low flows must be augmented either

by storage or by diversion from major streams. This was recognized early in the history of the Basin development but costly structures could not be financed by many individuals, which led to the formation of irrigation districts. Today irrigation districts or community and individual developments exist in nearly every valley section of the Basin and the greatest concentration occurs in the Bear Creek Basin and along the Rogue in the Grants Pass area.

Figure 16 showed all existing irrigation developments in the Basin and possible future developments presently in various phases of study by the Bureau of Reclamation.

Adequately irrigated agricultural lands in the Basin represent only a small fraction of the total potentially irrigable area. Much land classified as "irrigated" is receiving only from 25 to 75 percent of the fully supply and would benefit substantially from additional irrigation water. Many dry land farms finding it difficult to prosper would become highly productive if irrigation water were made available to them.

An example of the economic importance to Jackson County of full irrigation development is the following, taken from the Agricultural Subcommittee Report of the Jackson County Water Resources Committee:

a. *Gross crop value for irrigated lands under present water supply conditions*	$10,789,000
b. *Gross crop value for irrigated lands with Talent Division completed*	$12,890,000
c. *Gross crop value from all irrigable lands if fully developed*	$31,970,000

Data from Josephine County indicates that in the ten-year period from 1945 to 1955 the acreage of farm land had dwindled to such an extent that less existed at the end of that period than the area farmed in 1920. According to the Bureau of Reclamation surveys, practically no land in Josephine County receives a full supply of water and there is considerable acreage of potentially irrigable land which probably will not be developed until water is available. Recommendation of the Sucker Creek storage project in the Illinois Valley has been made by

the Bureau of Reclamation and it has also published a feasibility report concerning the Sexton Project in the Jumpoff Joe Creek Basin.

The agricultural potential of the Curry County portion of the Rogue Basin is negligible with not more than 500 acres of land involved, most of which is located near the towns of Illahe and Agness, which both lack transportation ties with market areas.

While additional supplies of irrigation water is of major importance, beneficial use dictates that more efficient use be made of presently available water. This requires enforcement of the laws governing regulation and measurement of diverted water. To achieve this end, a manyfold increase in the regulatory staff of the State Engineer is necessary since at present there are only two watermasters in the Basin and they have more than 4,300 water rights to control. This means that each watermaster has roughly 2,500 square miles of area under his jurisdiction and more than 1,200 streams totaling over 2,500 miles in length to patrol. Being faced with such a tremendous task, the best each man can presently do is visit the trouble spots during periods of shortage and attempt to distribute the water on a rotation basis. This gives rise to water waste in many areas unless such wastes are brought to the attention of the watermaster by someone familiar with the local conditions.

To illustrate the problem, Mr. A. C. L. Jetley, Registered Engineer, assisted by Mr. George W. Thrasher, Watermaster of Josephine County, measured the flow in nine main ditches diverting water from Sucker Creek on August 8, 1957. The legal right to divert totaled 33.3 cfs for the nine ditches while the measured total was 51.7 cfs - more than 155 percent of the allowable diversion. In every ditch the flow was greater than that allowed; in some more than twice the allowable diversion.

If this condition were repeated all along the stream, a point would be reached where downstream rights would no longer be satisfied. Also, streamflows below the lowest diversions would become too low to adequately support fish and wildlife or meet pollution abatement needs. In addition, new developments would be approached with hesitancy because of the apparent lack of sufficient water to support such developments. Finally, to intelligently establish the beneficial uses for the

waters of a given stream it is necessary to know exactly what water is available and how the water is being used.

Power

Low flows are particularly important to consider in power production, especially in the type of installations found in the Rogue Basin. Quantities of flow limit the capacity of installations and fix the potential of the Basin. Power production from installations not having storage to augment low flows is dependent upon the discharge characteristics of the stream system involved. Low flow extremes reduce the output from existing Rogue Basin installations while high flows are bypassed due to the limited capacity of the installations. Presently the firm power production of the Rogue River and its tributaries is 56,770 KW with an additional 16,000 KW from the Green Springs power project of the Talent Division to be added in the near future (Table 5).

Industrial

There are, at present, no problems of quantity for industrial use. The municipalities of Medford and Grants Pass supply approximately 15 percent of their total usage to industry, largely for log ponds and steam boilers. Other industrial supplies are obtained by diversions from small streams and from wells. This situation would undoubtedly change if there were more industrial diversity in the Basin. According to the California State Chamber of Commerce, industrial water use in cities of 30,000 or more is between 25 to 30 percent of the total water consumed.

Mining

Actual mining use of water in the Basin is slight with the available supply more than adequate. The major use of water for mining is in sand and gravel operations with intermittent mining for gold occurring on the Rogue and its tributaries during high water periods. Development of nickel ores in the Rogue Basin is being considered. The Ideal Cement Company is contemplating a possible expansion of its operations which would involve the construction of a new plant at Marble Mountain. Both of these operations would require additional water but the quantity would not be large.

WATER PROBLEMS - QUANTITY

Recreation

Problems of sufficient water quantity for recreational purposes consist primarily of developing satisfactory sites and facilities for the pursuing of water-type recreational activities. The only lake-type areas readily available in the Basin are listed in Chapter II, Table 6. These areas are heavily used and dangerous conditions occasionally arise from the conflict between the various types of water sports such as boating, swimming and water skiing.

Completion of the Talent Project will add Howard Prairie Reservoir to the Basin for recreational use as well as providing a substantial increase in area at Emigrant Reservoir by virtue of a new dam which will enlarge the reservoir.

The rivers and streams themselves are too swift and dangerous for the pursuit of water-type recreation, including boating. According to the Josephine County Water Resources Committee, of the 2,000 boats existing in Josephine County, no more than 25 are used on the river.

Wildlife

According to the State Game Commission, development of areas in the Rogue Basin has restricted the numbers of the more wilderness types of wildlife but has improved the habitat of other forms, resulting in population increases.

The deer population is taking a rapid climb due to the increase in area of habitat resulting from logging operations.

Waterfowl and upland game are found in areas having irrigation ponds and reservoirs and extensive areas of irrigated land. The population of upland game would probably increase substantially if the amount of land irrigated and the numbers of reservoirs in the Basin were to increase to any measurable degree since each 100 acres of suitable habitat will support a breeding population of 4 pheasants and 20 quail.

The population of fur-bearing animals remains fairly constant and trapping is limited because of the low fur prices.

Since the existence of wildlife is dependent upon the availability of habitat, significant changes in the population of wildlife probably will not occur unless there is an appreciable change in land usage.

Fish Life

Fish population, both resident and migrant is extremely sensitive to changes in water quantity.

Low streamflows create temperature problems, spawning problems, and sometimes pollution problems. Excessive depletions, which result in stretches of the stream being dry or nearly dry, causes considerable losses of downstream migrants. Alteration of the watershed sometimes causes alteration of the streamflow pattern which will often affect or upset the fish growth pattern. Low streamflows presently occur each year in many parts of the Basin and, as further development takes place, conditions will become increasingly worse. Some streams which reportedly sustained large annual anadromous fish runs in the past are no longer capable of doing so because of inadequate flows resulting from depletions by man.

High flows can be as much of a problem as low flows since flood waters often wash eggs out of the gravel or fry out of the stream channel to become stranded on the countryside. Observers reported many areas covered with thousands of fish eggs and stranded fingerlings following the 1955 flood. Channel changes such as stream scouring, deposition of debris, and other alterations to the fish habitat are common during flood flows and often are detrimental to the resource.

Pollution Abatement

There is an insufficient volume of flow during the summer months to permit direct discharge of municipal sewage into the rivers and streams of the Basin. Because of this, the larger communities such as Medford and Grants Pass now have sewage treatment plants in operation. There are a total of seven sewage treatment plants in the Basin, two with primary and

five with secondary treatment, and some of these are presently operating at or near capacity. As the Basin population increases and industries expand, additional and more complete treatment of sewage wastes will become necessary and many communities which do not presently have sewage treatment facilities will be required to do so. This will result not only from the increased volume of waste but also from the decreased volume of flow available for dilution brought about by additional consumptive uses. It may also become necessary to prohibit the discharge of untreated domestic sewage directly into the tributary system of the Rogue Basin. Pollution has not yet become a serious problem except at a few locations on some of the minor tributaries.

QUALITY

Water quality problems are not as pronounced but are equally as important as those of water quantity. They will be illustrated in the following paragraphs.

Domestic

The Jackson County Water Resources Committee states that at least fifty percent of the present underground domestic supply in Jackson County is unsatisfactory because of pollution from surface sources or because of hard or saline water. Rural and semi-rural development of the future will require community-type water systems using surface water supplies.

Many domestic wells in the Basin are shallow and located within close proximity of septic drainage fields which makes them potential health hazards.

Water quality data inventories published by the State Water Resources Board, Bulletins No. 1 and No. 2, list the sources and types of data for quality samples from 72 different locations in the Rogue Basin.

Municipal

Illustration of the quality of water presently being used for municipal supplies can best be made by summarizing the statements made by each

municipality in filling out questionnaire for their respective water resources committees. The following tabulation lists those comments and indicates that water from wells tends to be hard and of high mineral content, in many cases requiring treatment; water from the Rogue requires clarification because of the heavy sediment load, and chemical treatment; and water from springs seems to be of excellent quality in all respects.

TABLE 9

QUALITY OF PRESENT WATER SUPPLY

MUNICIPALITY	SOURCE	COMMENTS (Quoted from County Water Resources Committee Reports)
Ashland	Ashland Creek & Hosler Dam	Stored water takes on vegetable taste late in the season.
Talent	Wells	Water is pure and hard; we use a little chlorine.
Phoenix	Wells	Clear, hard and chlorine treated.
Central Point	By pipeline from Medford system & wells	Water from Medford of finest quality; water from wells is hard and highly mineralized but, in emergency, is usable without treatment.
Cave Junction	Well	Very good; requires no treatment.

TABLE 9 (Continued)

MUNICIPALITY	SOURCE	COMMENTS (Quoted from County Water Resources Committee Reports)
Medford	Big Butte Springs	Excellent in all respects; requires no treatment.
Jacksonville	By pipeline from Medford system & spring in Jackson Cr.	Excellent.
Grants Pass	Rogue River	Requires clarification and purification.
Gold Hill	Rogue River	Must be chlorinated; during heavy runoff water is cloudy; filter not available-(8/31/57).

Irrigation

Water quality data pertinent to irrigation in the Basin has been collected by the Bureau of Reclamation for many years. The following statement is quoted from the Bureau's Project Planning Report on the Rogue River Basin Project, dated February, 1950: "Irrigation experience over a period of almost 100 years on lands within the Rogue River Basin has been highly successful. Analyses of soil samples from the lands in the individual divisions show that harmful soluble salt concentrations are negligible and would not render irrigation return flow unfit for rediversion and application of the land for agricultural purposes." The following table, from the same report, shows characteristics of representative samples of water.

TABLE 10

WATER QUALITY

Constituent	1/ Standards	Rogue River at Bybee Bridge June 1941	Hopkins Lateral near Camp White June 1941	Shallow Well near Central Point May 1944
Total dissolved solids	Under 700 ppm	82 ppm	145 ppm	379 ppm
Sulphate, SO4	Under 192 ppm	Trace ppm	Trace ppm	14.0 ppm
Chloride, Cl	Under 142	1.8 ppm	6.4 ppm	18.0 ppm
Percent sodium	Under 50%	32%	42%	16%

1/ From "South Coastal Basin Investigation-Quality of Irrigation Water," by C. S. Schofield, California Department of Public Works, Water Resources Division, Bulletin 40, pages 21 to 24, 1933.

Specific examples of water quality at other locations follows:

A report by the Bureau covering the Illinois Valley Division points out that analysis of a water sample taken from Sucker Creek near Holland on May 28, 1953, received a salinity laboratory rating of good while another sample from Kelly Creek and slough drainage, taken on the same date, was given a salinity laboratory rating of excellent.

Further indication of the quality of water for irrigation purposes is in the Bureau's report published in June, 1958, on the Merlin Division which shows that the analysis of a sample from Jumpoff Joe Creek on September 12, 1956, when the streamflow was low, which probably represents one of the worst conditions to be expected, was found to be low in salinity and sodium hazards.

Still another Bureau report covering the Agate Dam and Reservoir Project,

published in April, 1958, states: "Water samples collected and analyzed during 1956 resulted in laboratory ratings of excellent for water from Antelope Creek and good for water from Dry Creek. These waters would co-mingle with existing district water supplies which previous analyses have shown to be satisfactory for irrigation use."

Additional quality data are available from the sources inventoried in the State Water Resources Board's Bulletins Nos. 1 and 2.

Power

Quality is not a problem at present in power production in the Rogue Basin.

Power development projects presently existing in the Basin are of such a nature that quality factors do not present problems and whether or not they will in the future will depend entirely upon the physical characteristics and location of any future project.

Industrial

Industrial use of water in the Basin is small and of such a nature that water quality presents no problem for such developments. However, serious problems occasionally arise from the undesirable effect on water quality caused by uncontrolled industrial operations. A few examples of actual occurrences in the Basin are cited below.

Glue wastes from a plywood mill polluted water in Jumpoff Joe Creek during 1955 and 1956. This was corrected by the construction of a large settling basin and a drain field.

Gravel companies have created heavy silt loads in many streams at various times from gravel crushing and washing operations. Action by the State Sanitary Authority is sometimes necessary to stop such practices.

Logging operations creat silt loads in streams if soil management regulations are not followed. The reduction in logging activity resulting from the slump in the lumber market has greatly reduced this water quality problem.

Application of a chemical week killer to an irrigation canal resulted in a large mortality of fish in the stream below that point.

Plans for construction of a hardboard plant to be located north of Grants Pass were abandoned in 1953 because it was felt that pollution abatement requirements could not be satisfied at the sites being considered.

Mining

As with industrial use, water quality does not present a problem to the mining industry but mining does in some cases affect water quality, primarily by creating undesirable silting conditions. This factor is discussed under Pollution Abatement.

Recreation

Physical characteristics of water such as color, temperature, odor, etc. are important from an aesthetic viewpoint where water is used for recreational purposes. Biological characteristics are important from a health standpoint, while chemical characteristics are of significance in waters used for human consumption in developments such as campsites and parks. There are no water quality conditions harmful to the present recreational use in the Basin with the exception of the temporary occurrences of pollution such as those discussed above.

Wildlife

In general, water which is unsatisfactory for fish life from a pollution standpoint, will not meet the needs of wildlife. No serious problems are evident and the wildlife resource in the Basin seems to be that which is best suited to existing conditions.

Fish Life

Quantity and quality of water are directly related in the consideration of the fishery resource of the Basin.

Water temperature is an important factor in governing the success

or failure of a spawning cycle of an anadromous fish run. Temperatures in the high 70's are near the fatality point for anadromous fish while those much below 45 degrees Fahrenheit reduce the activity of these fish to a virtual standstill and limit growth. Fish runs have been blocked in the past by both high and low temperatures.

Summer temperatures in the Basin stream system, including the Rogue main stem, have been recorded in the 70's during periods of lowest flow. The location of climatological and water temperature stations is shown in Figure 30 and the pattern of water temperatures along the Rogue is shown in Figures 26-28 prepared from data supplied by the State Game Commission.

An attempt was made by the State Water Resources Board to determine the relationship in the Rogue Basin between streamflows and air and water temperatures. Water temperature data covering the period 1949-54 for several locations in the Basin as well as spot measurements at other locations were available from the State Game Commission. These were correlated with streamflow data where such information was available to see if definite trends could be established. Preliminary results led to the assumption that diurnal air temperature fluctuations were an important factor contributing to water temperature variations and could not be eliminated from consideration. Further correlations, which included air temperatures, tend to support the assumption that air temperature extremes at or near the source of a swift flowing stream in the Rogue Basin have considerable effect on downstream water temperatures. Available data is inadequate and more detailed analyses based on additional information will be necessary before specific conclusions can be advanced.

Siltation takes its toll since heavy silt loads are capable of covering spawning beds of gravel preventing the free passage of air necessary for the development of eggs and, in many cases, covering the gravel beds entirely.

Biological characteristics are important to fish life since they affect the oxygen content of the water and the biological growth which will occur. The Jackson County Water Resources Committee states that low flows in the main channel of the Rogue and lower Applegate Rivers cause aquatic weed growths to die and the biochemical oxygen demand

accompanying the decomposition process has been known to decrease the dissolved oxygen level during early morning hours below that needed for trout and salmon survival.

Unfavorable water quality conditions resulting from industrial and mining operations were discussed above.

Pollution Abatement

Temperature is a primary factor affecting the capacity of a stream to receive and reduce pollution elements to their stable condition without reducing the dissolved oxygen content of the water below the level considered necessary for other water resources use. For example, a streamflow of 50 cfs at a temperature of 60 degrees Fahrenheit could provide 2,700 pounds of oxygen daily without reducing the dissolved oxygen necessary for other resources below five parts per million. This is sufficient to satisfy the oxygen demand of the human waste from 13,500 people. At 85 degrees Fahrenheit, only 2,100 pounds per day could be provided which is enough to satisfy the oxygen demand for only 10,500 people.

Chemical characteristics of waste discharged into a stream may be such that the dissolved oxygen of the stream is removed as a result of a direct chemical reaction. This condition exists to a small degree at present but could become serious in the future with population and industrial expansion.

Organic loading depletes the dissolved oxygen level of a stream thereby reducing its downstream dilution potential. This condition usually exists during periods of heavy runoff throughout the stream system of the Basin and therefore is not serious because of the large quantity of water available for dilution purposes.

The Game Commission and Sanitary Authority work closely together in matters pertaining to pollution abatement since the Sanitary Authority standards are based upon water which is satisfactory for fish life.

FLOOD CONTROL

A continual battle is being waged during periods of high flow to

prevent erosion damage which occurs with bank-full stages as well as destructive damage from land inundation. This is particularly true in the Illinois Valley. Some attempted methods of bank protection, such as a line of logs fastened to the bank and extending out into the stream to deflect the current, have proven successful for a year or more and then suddenly failed due to a streamflow pattern with different characteristics than those preceding.

Bank revetments are too costly for most individual farmers and, in the Illinois Valley, the land to be protected in most cases does not meet the requirements for economic justification of a Corps of Engineers' revetment program. During the 1955 flood, which received nationwide attention, much of the Basin was affected as well as large areas in California. Nonreimbursable grants of federal funds were made available for agricultural rehabilitation. Widespread erosion damage occurred again in the Illinois Valley in December, 1957, and January, 1958, with three destructive river stages taking place during that two-month period. Damages in the Deer and Sucker Creek and East Fork areas of the Illinois were estimated by observers to be greater than those which occurred in 1955. Because of the limited area involved, expenditure of funds for rehabilitation could not be justified as a benefit to the nation.

In the Illinois Valley, land inundation, while very undesirable, is less damaging than the erosion occurring with extended periods of bank-full stages of flow. The former requires a clean-up period while the latter results in an irreplaceable loss of alluvial land.

Bank erosion is not confined to the Illinois Valley; all of the tributaries of the Rogue as well as the main stem itself have had this damaging effect in many areas many times in the past. Land inundation also is not uncommon to the Basin and is a serious problem which needs attention. Figure 31, prepared from data supplied by the Josephine and Jackson County Water Resources Committees and the Corps of Engineers, shows areas in the Basin subject to flooding.

History of Floods

In 1861 a flood occurred which, according to the best estimates,

ranked as the most damaging in the history of the Basin until the December, 1955, flood. Due to the higher level of development existing in 1955, this latter flood far surpassed all others in damages and, in many areas of the Basin, produced stages higher than those of any other flood. In the period between these two occurrences nine other major floods took place. Following is a tabulation of floods taken from the Corps of Engineers Report, "Floods of December, 1955" published in October, 1956, which lists the floods and their discharges, either estimated or measured, at two representative points in the Basin, Grants Pass and Raygold:

TABLE 11

MAJOR FLOODS IN THE ROGUE RIVER BASIN

Flood	Rogue River at Grants Pass Peak Discharge cfs	Rogue River at Raygold Peak Discharge cfs
Nov. - Dec. 1861	175,000*	131,000*
Feb., 1890	160,000*	120,000*
Feb., 1907	60,500*	60,000
Nov., 1909	70,000*	61,700
Feb., 1927	138,000*	110,000*
Dec., 1942	54,400	40,500
Dec., 1945	70,000	48,000
Jan., 1948	59,900	46,200
Oct., 1950	65,400	43,100
Jan., 1953	77,000	56,500
Dec., 1955	135,000	110,000

* Estimated instantaneous discharge

Flood Damages

Illustration of flood damages can best be made by discussing losses occurring in December, 1955, since this is a recent occurrence and would be most representative of the level of development existing today. A complete field survey of the damages from this flood was conducted by the Corps of Engineers and discussion of those damages appears in the Corps' Report mentioned above. The following detailed summary, Table 12, is reproduced from that report. This table shows that losses were not restricted to any one section of the Basin but were spread throughout the region with heavy losses occurring in many places. Direct agricultural losses in the Basin were over $1,347,000 and direct residential losses were nearly $838,000. Total damages exceeded $4,000,000.

TABLE 12

1955 FLOOD DAMAGES
Thousands of Dollars

SECTION	AGRICULTURAL		RESIDENTIAL		INDUSTRIAL		COMMERCIAL	
TRIBUTARY	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
Rogue main stem:								
mile 195-107	268		495	204	36	15	360	87
mile 107-95	162		227	10	3	6	82	3
mile 95-55	211		16	3	28	41	54	1
mile 55-0	78		75		44	2	68	11
Tributaries:								
Bear Creek	121		2		10	1	21	
Evans Creek	14		14	36				1
Big Butte Cr.	13		3					
Applegate R.	312	16	7	7	3	1	3	
Illinois R.	120	3					2	
Jumpoff Joe Creek	39							
Others	10							
TOTAL - Rogue River Basin	1,348	19	839	260	124	66	590	103

Source: Corps of Engineers, "Floods of December 1955," October, 1956

TABLE 12 (Continued)

1955 FLOOD DAMAGES
Thousands of Dollars

SECTION or TRIBUTARY	RAILROADS & UTILITIES Private	RAILROADS & UTILITIES Public	ROADS	DRAINAGE & IRRIG.	TOTAL PRIVATE	TOTAL PUBLIC	TOTAL
Rogue main stem:							
mile 195-107	33	18	25	16	1,498	194	1,692
mile 107-95	72	24	14	16	563	125	688
mile 95-55	10		3		363	3	366
mile 55-0	1		10		279	10	289
Tributaries:							
Bear Creek	17		18	42	172	61	233
Evans Creek			14	6	66	19	85
Big Butte Cr.			12	7	16	18	34
Applegate R.	4		9	55	352	66	418
Illinois R.			41	4	125	49	174
Jumpoff Joe Creek	20				59		59
Others			1		10	1	11
TOTAL - Rogue River Basin	157	42	147	146	3,503	546	4,049

Source: Corps of Engineers, "Floods of December 1955," October, 1956

Methods of Flood Control

Commonly-accepted measures of reducing flood damages are:

(1) Reduction of peak flows by reservoirs;
(2) Local protective works;
(3) Reduction of peak stage by increased velocities resulting from channel improvement;

(4) Diversion of flood waters through bypasses or floodways;
(5) Temporary or permanent evacuation of the flood plain (flood plain zoning);
(6) Reduction of flood runoff by watershed management.

Most comprehensive flood control projects involve combinations of several of these methods.

Control of floods to a desirable level in the Rogue Basin requires an inclusion of the first method, reservoir storage, in an overall plan.

Control by the use of levees for local protection would be effective but the many miles requiring protection would make the cost of such a measure prohibitive and much of the land to be protected would be occupied by the levees.

Channel improvement would be extremely beneficial in many areas. This includes the removal of debris which often acts as a deflector and forces destructive currents directly into the stream banks, resulting in more cutting and more debris being carried away by the waters to lodge further downstream and repeat the process. Debris removal is expensive and becomes practically valueless unless the stream is maintained free of debris. Initial removal of debris might possibly be financed with government funds but only if assurances were forthcoming from the areas benefited that the initial program would be continued in the future.

Diversion of flood waters would be impractical since the flashy nature of the Basin floods results in extremely high peaks which would require large-capacity, costly canals to divert the quantities flowing at those times. This could not be justified economically. Also, diversion of flood waters from one basin to another would add to the protection of the first basin but would make conditions worse in the second basin unless storage facilities were available since floods in the Rogue Valley usually cover the entire area.

Emergency evacuation of areas endangered from flooding is necessary and is a practical method of reducing flood damages in areas where development is so slight that costly methods of flood protection cannot be justified. The State of Oregon does not have

for other uses downstream from the point of diversion but water diverted for power ultimately becomes available again for other uses below the power plant. Storage for power aids rather than hinders downstream consumptive needs because it helps to supply the water necessary to satisfy downstream priorities.

Storage reservoirs having widely fluctuating pool levels create problems in their use for recreational purposes.

WITHDRAWALS AND MAIN STEM STATUTORY LIMITATIONS

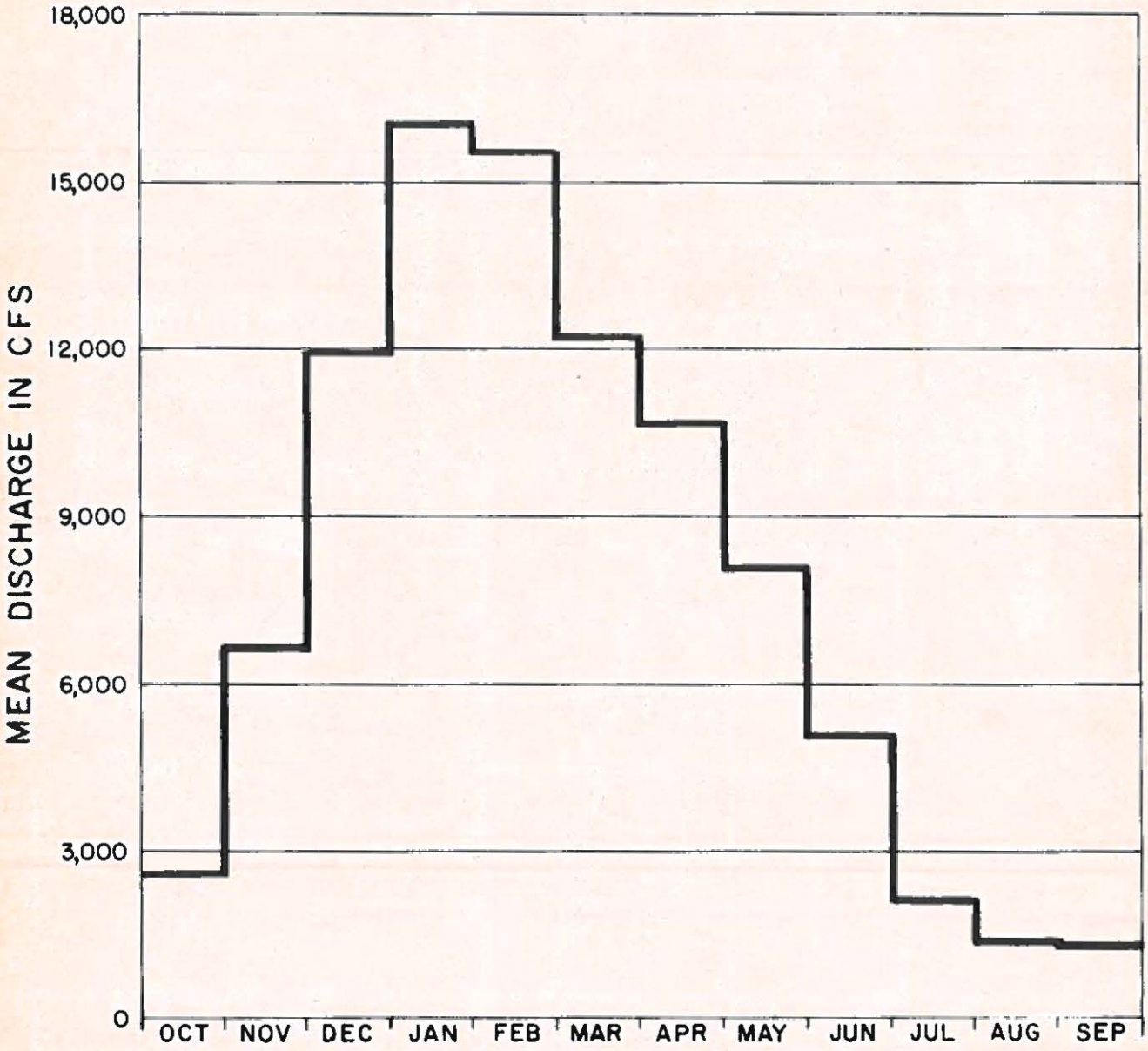
Withdrawal of all unappropriated water of the Rogue and its tributaries above Gold Ray for irrigation, power, domestic, and storage was made by the State Engineer in 1915, Application 4496. Subsequently, the 1949 Legislature enacted ORS 538.270 which, subject to existing rights, withdrew the water of the Rogue main stem below the south line of Section 10, Township 34 S., Range 1 W., (near Shady Cove) for domestic, stock, irrigation, and municipal purposes; and ORS 542.210, which does not permit the construction of dams or structures which would interfere with the free passage of fish on the Rogue below the south line of Section 10, Township 34 S., Range 1 W., (near Shady Cove) and also limits construction of dams from that point to the south line of Section 27, Township 33 S., Range 1 E., (near McLeod) to federal agencies only.

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER AT MOUTH

1933 - 1955

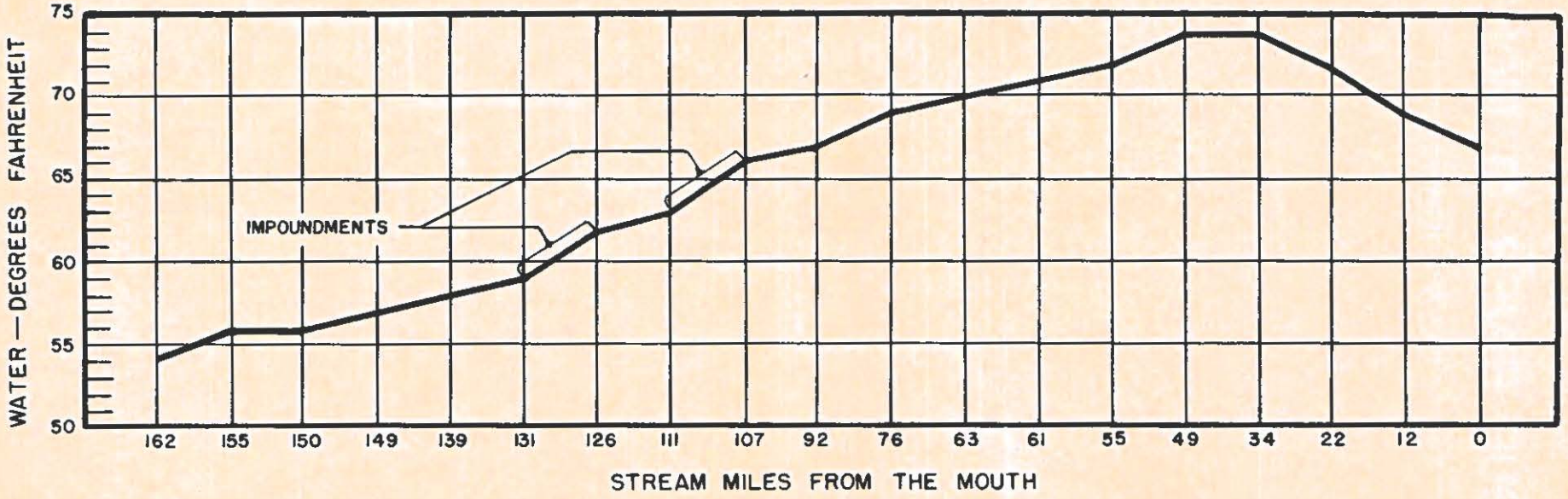


Drawn Nov. 15, 1958
File No. 15.202

FIGURE 25

STATE WATER RESOURCES BOARD
SALEM, OREGON

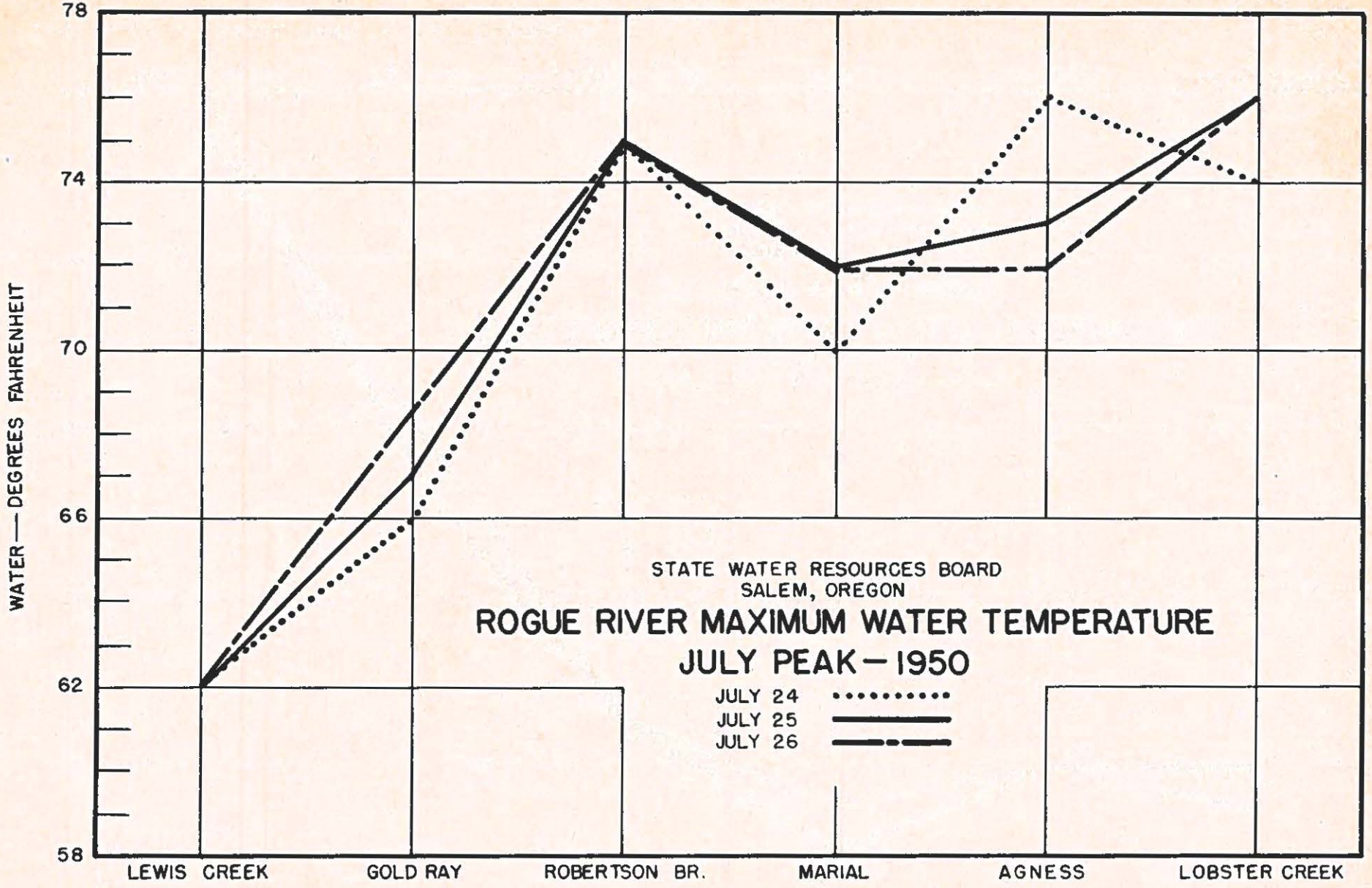
WATER TEMPERATURE STUDY
AUGUST, 1 TO 4-1949
ROGUE RIVER



Data Source: Oregon State Game Commission

12-57

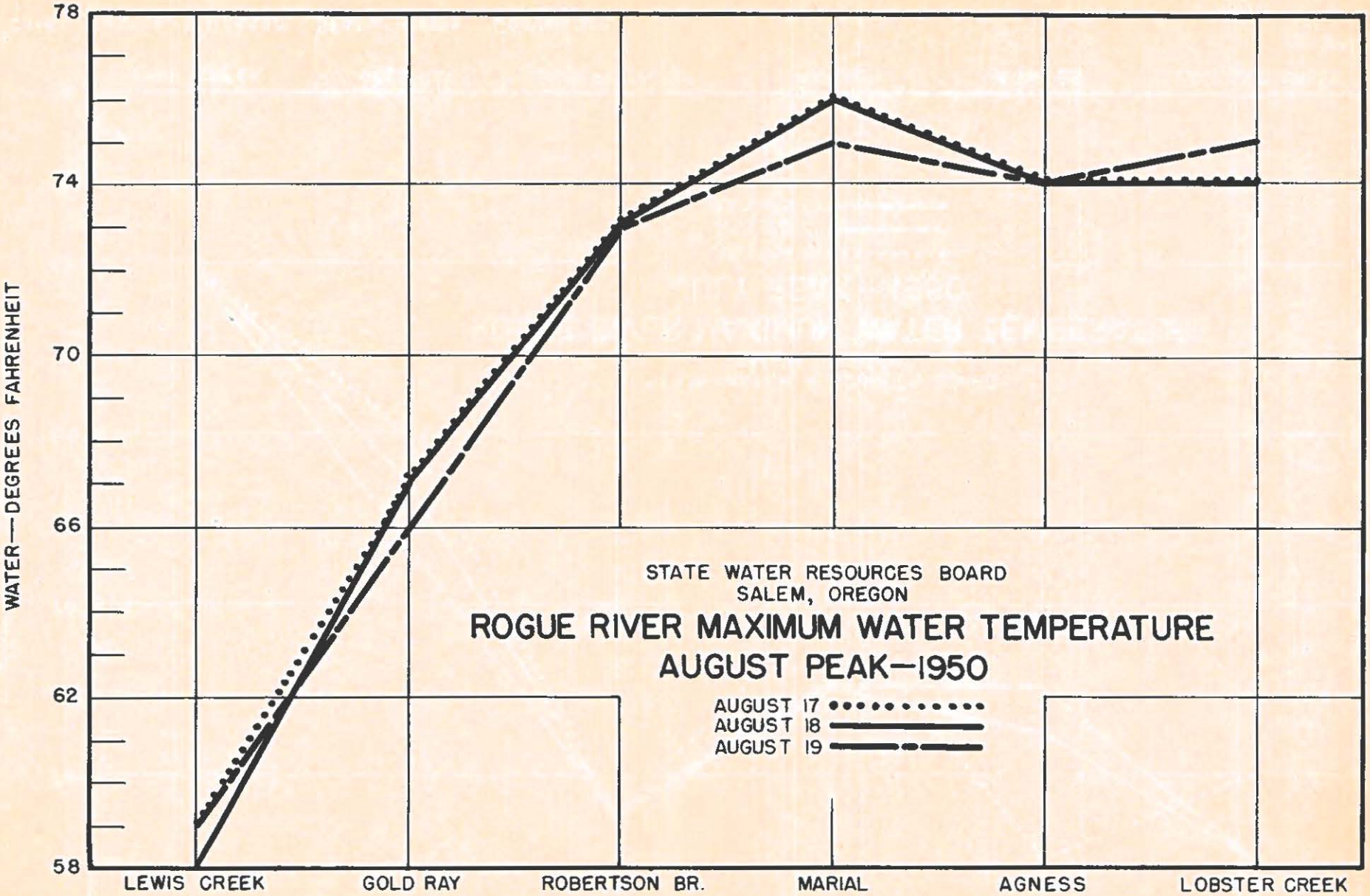
FIGURE 26



Data Source: Oregon State Game Commission

12-57

FIGURE 27

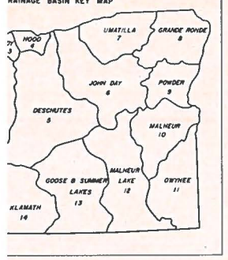


Data Source: Oregon State Game Commission

12-57

FIGURE 28

STATE OF OREGON
DRAINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON

LEGEND
▲ Active Gaging Stations
△ Inactive Gaging Stations

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN

CRATER LAKE

ROGUE RIVER

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

FIGURE 29

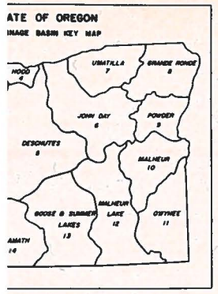
STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN STREAM GAGING STATIONS

Drawn	G.P.H.	date	1-20-61
Checked	E.P.H.	date	2-22-61
Revised	G.P.H.	date	4-11-61
Redrawn	STREAM GAGING STA'S ADDED	date	5-26-61
Approved		date	

File No. 15.201

ATE OF OREGON
IMAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON

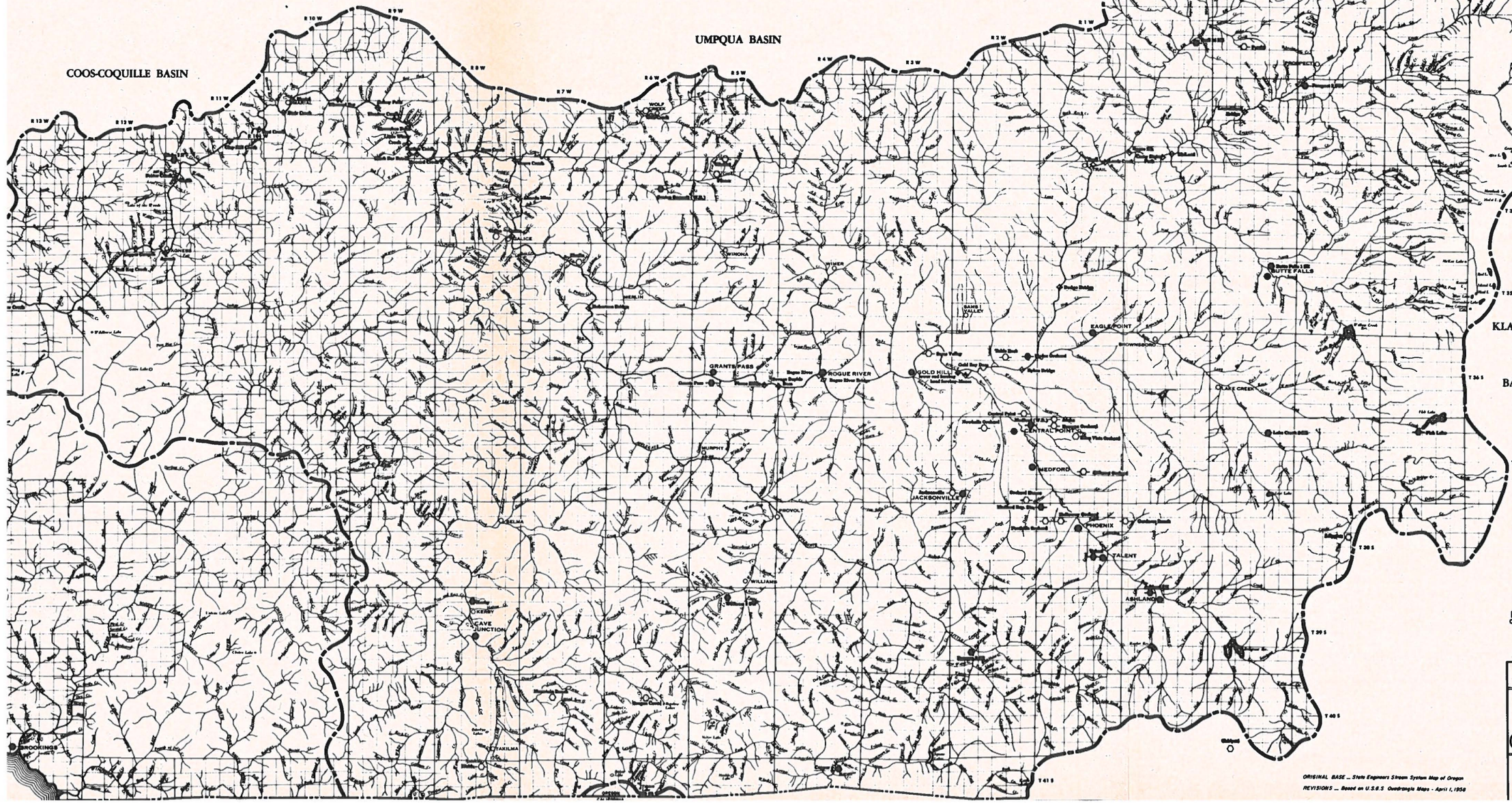
LEGEND

	Inactive	Active
Air Temperature & Precipitation Stations	-○-	-●-
Precipitation Stations	○	●
Water Temperature Stations	◇	◆

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN



N

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

ORIGINAL BASE — State Engineer's Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

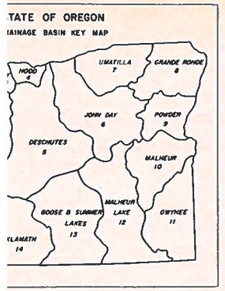
FIGURE 30

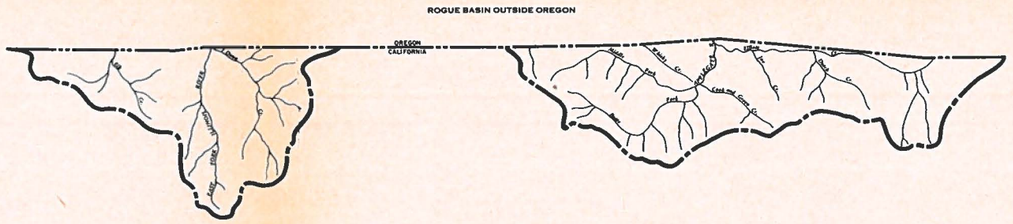
STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN CLIMATOLOGICAL & WATER TEMP. STA.

Drawn	K.W.M.	date	4-28-67
Checked	F.P.H.	date	4-28-67
Revised	K.W.M.	date	5-1-68
Redrawn	CLIM. & WATER TEMP. ST. ADDED	date	5-14-68
Approved		date	

File No. 15 221





Areas Subject to Flooding

COOS-COQUILLE BASIN

UMPQUA BASIN

KLAMATH BASIN

CRATER LAKE
PROSPECT
BUTTE FALLS
EAGLE POINT
BROWNSBORO
LAKE CREEK
CENTRAL POINT
MEDFORD
JACKSONVILLE
PHOENIX
TALENT
ASHLAND
GRANTS PASS
ROGUE RIVER
GOLD HILL
SAMS VALLEY
MERLIN
WIMER
WINONA
WOLF CREEK
MARIAL
AGNESS
GALICE
MURPHY
KERBY
CAVE JUNCTION
WILLIAMS
SELMA
TAKILMA
BROOKINGS
OREGON
CALIFORNIA

N

DATA SOURCE:
U.S. CORPS OF ENGINEERS
JACKSON & JOSEPHINE COUNTY WATER RESOURCE COMMITTEES

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

FIGURE 31

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN FLOOD PLAIN

Drawn	date	File No.	
Checked	date		15
Revised	date		207
Redrawn FLOOD PLAIN ADDED	date		
Approved	date		

CHAPTER IV THE BASIN POTENTIAL

FUTURE GROWTH

An important factor in determining the future needs of any area is the rate at which the population of that area increases. All counties in the Basin have experienced a rapid rate of growth since 1940 as is shown in Figure 32 which charts the population of the major counties from 1900 to 1956, and in Figure 33 which compares 1940 and 1950 populations of the major counties by age groups.

Several municipalities in the Basin included estimates of their population growth as part of their water resources committee reports. This information is part of Figures 34 and 35 which cover municipal growth from 1920 to 1957 and projected, by the above-mentioned estimates, to the year 2007. Other indications of growth, including economic trends, are shown in the following:

1. Figure 36 which lists county motor vehicle registrations from 1930 to 1955 and shows that the number of registrations has at least tripled in all counties of the Basin during that period;

2. Figure 37, a plot of bank debits in Curry, Josephine and Jackson Counties covering the period 1947 through 1957. The general trend is towards an overall increase in bank debits with occasional short leveling-off periods.

3. Figure 38, a plot of building permit valuations for Grants Pass and Medford covering the period 1947 through 1957. Valuations have been following a rising trend in Medford since 1954 but dropped off sharply in Grants Pass in 1957.

4. Other plots showing the overall rising trend and annual fluctuations in Jackson and Josephine Counties covered employment of the period 1948 through 1957. These were discussed in Chapter II and shown in Figures 5-12.

WATER SUPPLY

The trend of upward population and economic growth means that the future of the Basin will depend upon what utilization is made of its

natural resources. Since water is the controlling factor in all resource development, the potential of the Basin depends primarily upon the quantity of water available for development use.

Yield

The annual yield of water in the Basin is sufficient to meet all needs existing both now and in the future with the possible exception of pollution abatement. (See discussion in Chapter II and Figure 13.) However, the distribution of the annual yield with respect to time, as was shown in Figure 25, is such that all needs cannot be satisfied during periods of low flow and large quantities of water pass to the sea unused during periods of high flow. Storage is necessary to achieve maximum use of the available annual yield.

Yield diagrams for major tributary basins are included in Chapter V, Sub-basin Inventory, under the respective basins.

Depletion

If legal consumptive depletion rights in the Basin were used simultaneously and continuously, they would require nearly five million acre-feet annually. However, the value of 6,550 cubic feet per second for consumptive rights at river mile 0, shown in Figure 14, is the total of all legal consumptive rights in the Basin without regard to the pattern of usage. Since the majority of consumptive rights are for irrigation and would be exercised only as needed during irrigation seasons, the value of 6,550 cfs cannot be converted directly to an annual volume. The maximum legal rate of usage which could occur during the irrigation season seldom takes place and, when it does, not for any appreciable length of time.

Distribution

Therefore, the water supply problem facing the Basin is not one of quantity but rather of distribution, particularly with respect to time. The mean monthly discharge hydrograph of the Rogue River at its mouth,

Figure 25, showed the low flows occurring during the critical summer months when the level of water use is at its highest. Similar plots for other points in the Basin are included in the sub-basin inventory section in Chapter V.

IRRIGATION AGRICULTURE

The agricultural potential of the Basin is far from being fully realized. Dry farming is unprofitable because of the precipitation pattern which exists, but Basin lands become highly productive if they are adequately irrigated. There is much potentially-irrigable land which is presently undeveloped, and a large portion of lands classed as developed do not receive adequate irrigation water if any at all.

Because of the runoff distribution pattern in the Basin, full agricultural development cannot take place by irrigation from diversions alone. Storage is essential to augment low flows. A step in this direction is being taken by construction of the Talent Project, which, upon completion, will augment the present supply of irrigation water of the upper section of Bear Creek Basin. (Bear Creek Valley has the most intensively-developed agricultural lands in the entire Basin. Figure 15 showed the present agricultural situation in the Basin and the future potential for irrigable lands.)

Very few areas presently receive an adequate supply of irrigation water. For full development even the Bear Creek Basin will need more water than will be provided the Talent Project. Construction of the Illinois unit of the Bureau of Reclamation's Illinois Valley Division would result in the Sucker Creek and Illinois River East Fork Valleys being nearer complete development but would not affect the Deer Creek Basin of the Illinois Valley. Construction of the Bureau's Merlin Division would adequately care for most of the irrigable lands along Jumpoff Joe Creek. Other major blocks of potentially-irrigable lands still requiring storage developments to realize their full potential are those in Evans Valley, Sams Valley, Grave Creek Basin, and Applegate Valley. These areas are scheduled for further study by the Bureau of Reclamation.

POWER

Rough estimates of the installed power potential of the Rogue Basin, ranging from 500,000 to 700,000 kilowatts, have been made by many

groups and individuals. Most of those estimates were based upon proposed plans of development for flood control and did not consider the entire power potential of the Basin.

Computations for this study were made by the State Water Resources Board. It sought to determine the total potential of the Basin if the head not in conflict with existing developments were used in utilizing actual streamflow. To facilitate selection of sites, only those which had been studied by a group or agency were considered. Heads selected for use at each site were maximum heads not conflicting with existing features. The sites used in this study are shown in Figure 41 along with the amount of head developed at each site. The factor of storage was not included in the computations.

The results of the study are shown in Figure 39 which is a plot of the power potential by months for the Rogue Basin, utilizing the mean flow of the stream over the head available at each site. Figure 40 is a power duration curve which shows that the potential of the Basin without using storage is 760,000 kilowatts 50 percent of the time while for 100 percent of the time this potential drops to 175,000 kilowatts.

INDUSTRY

Several important questions should be considered when examining the industrial development potential of the Rogue River Basin:

1. What need is there for industrial expansion, and what level of expansion will be consistent with the optimum development of the Basin's water resource potentials?

2. What is the character and magnitude of the industrial potential of the Rogue Basin?

3. What factors are involved in the location of industrial plants in the Rogue Basin?

4. What are the deterrents to the development of the industrial potential of the Basin?

5. What are the major advantages which will promote the potential development?

6. *What restrictions will the quantitative water needs of the potential industrial development have upon other water needs of the Basin both with respect to geography and time?*

7. *What restrictions will be placed on industrial development due to the quality of water available for process operations and what restrictions could result from the discharge of industrial waste products into residual water resources?*

8. *Will any quantitative and/or qualitative advantages accrue to the Basin's water resources from various types of industrial development possible within the Basin?*

9. *What conflicts can be anticipated between industrial and other beneficial uses? Will the possibilities of conflict restrict industrial development?*

Although there are valid reasons for objecting to industrial expansions of specific types within defined areas of the Rogue River Basin, there are equally undeniable reasons for an expansion and utilization of the industrial potential of this drainage basin.

Under existing conditions in the Rogue River Basin much employment is of a cyclic and seasonal character. Timber operations form the major base of employment in both Jackson and Josephine Counties. About 38 percent of covered employees in Jackson County work in the timber processing field while Josephine County's comparable figure is 52 percent. Employment in Curry County has not been considered as only a small portion of that county lies within the Basin. Employment in the Basin is primarily in logging, sawmilling and plywood production. All of these operations reflect, very rapidly, depressed economic conditions in the country. This is a serious disadvantage to people employed in this line of work. Operations are also subject to seasonal shutdowns or limitations.

Some people in the Basin, particularly in the Bear Creek sub-basin, are employed in the fruit processing and packing industries. Employment in fruit packing and processing operations has improved somewhat due to gift pack activities and extension of the operating season by utilizing cold storage facilities. It still is not steady, year-around employment

for most workers. Such employment does not encourage establishment of a stable population. Service-type operations within the Basin are adversely affected by the fluctuations of resource-based operations which are the backbone of the area's economy.

Stable growth of the area will require reasonable employment continuity for an expanding population. If such employment is not provided many young people will emigrate from the Basin.

One of the major requirements for development of the industrial potential of this area is to utilize timber resources that are presently being wasted. The average annual timber cut total for the three major counties in the Rogue River Basin, Jackson, Josephine and Curry, for the period 1947 to 1957 has been estimated at 1,110 million board feet. Present waste is estimated at 40 percent of the total cut, or over 440 million board feet has been wasted, on the average, each year. Of course, not all of the waste can be economically utilized with present operations, techniques and available markets. However, the potential for expanded markets in the foreseeable future is such that immediate consideration should be given to the development of industrial facilities that utilize these otherwise abandoned resources.

As requirements for pulp, paper and other secondary wood products grow, consumer demand will eventually result in the tapping of the available timber resources of the State of Oregon and the Rogue River Basin. Forest Resource No. 14, dated January, 1958, issued by the Forest Service, U. S. Department of Agriculture, gives some indication of the future growth in demand for paper, pulpboard and wood products: "The medium projected demand for lumber in the United States is estimated at 55.5 billion board feet in 1975 and about 79 billion in the year 2000." The report further states that if the populations reach the levels anticipated, but prices of lumber rise considerably faster than the prices of competing materials, lumber demand is calculated to be approximately 48 billion board feet by 1975 and 55 billion by the year 2000. Since the total lumber consumption of 1952 was placed at 41.5 billion board feet, an increase to the medium projection of 1975 would represent an annual demand approximately 33 percent greater than that of 1952.

The State of Oregon and the Rogue River Basin are major suppliers

of timber, and of saw timber in particular. It is anticipated that the level of lumber operations will trend rapidly towards sustained yield limits in the Rogue River Basin.

Forest Resource Report No. 14 estimates that the per capita domestic consumption of paper and paperboard will probably increase from 420 pounds in 1955 to 588 in 1975 and to 750 pounds or more in the year 2000. The medium demand predictions are for 60 million tons of paper and paperboard in 1975, 105 million tons in the year 2000. Upper demand estimates are placed at 135 million tons in the year 2000. On the basis of 1955 consumption of 34.5 million tons, the projected medium for 1955 represents a 74 percent increase in the use of pulp and paperboard products. These future domestic requirements will be a strong force in promoting the utilization of the presently wasted timber resources of the Rogue River Basin.

Although the coniferous dominated forests of North America are not the major source of wood pulp in the world, they are the source of about 90 percent of all wood pulp manufactured today. The balance is largely manufactured from temperate hardwoods. The more advanced utilization of North American supplies stems from the fact that the utilization of the tropical forests, the major source of wood pulp, presents special problems. The undeveloped regions of the world have not possessed the financial resources or technical experience necessary to overcome these problems. In addition, the proximity of the coniferous supply to the major consumptive centers has presented North America and Europe with a definite economic advantage.

Industrial operations based on the mineral deposits of this area do not raise the problem of utilization to prevent waste. For the materials are in effect "in storage" until needed to provide for expanding consumer requirements.

Stable mineral industries would help satisfy the need for a more satisfactory type employment.

If the population of the Basin continues to expand through the influx of retired people, natural birth expansion, and population growth connected with the utilization of basic resources, there will be a need for expansion of industries to supply local consumer markets. Growth of this type of activity is varied and complex, and no attempt is made here to evaluate its effect on water resources of the Basin except in a most preliminary way.

THE BASIN POTENTIAL - INDUSTRY

Expansion of industrial activities in the Basin would result in a more favorable ratio of import to export dollars for the communities effecting such growth.

To evaluate the effect of industrial development upon the water use and control requirements of the Rogue River Basin, knowledge of the character and magnitude of potentials is necessary. Industrial potentials, other than those of the basic resource oriented industries, can only be estimated because of limitations in information. Quantitative requirements for such development may approximate 25 percent of the projected municipal demand for the City of Medford for the year 2007, or approximately 20 to 25 cfs. Although quantitatively this is not an excessive amount, the type of development could result in significant problems with respect to pollution of the Basin's water resource supplies.

The mineral resources of the Rogue River Basin are not sufficiently well known to project adequately the magnitude of industrial growth that will result from their utilization. On the basis of available data, it is anticipated that foreseeable needs for mineral industries will not exceed 15 to 20 cfs of depletion potential; however, this figure could be materially altered if new, higher grade, or more extensive resources were identified and developed. Pollution problems resulting from the development of mineral resources in the Basin could be severe but will probably be local in nature and controllable under such criteria as may be established by the State Sanitary Authority.

The major potential industrial users of water in this drainage basin are the secondary wood utilization operations, primarily for pulp and paper production. In their report, Rogue River Valley Pulp and Paper Development Study, dated March 31, 1958, and submitted to the Oregon Development Commission, Sandwell and Company defines the character, magnitude and pattern of development that can be anticipated for the development of the pulping capacities in the Basin. Their general recommendation is that there is justification for the initial installation of kraft pulp and paper operations of an initial capacity of 300 tons per day and probable economic justification for an ultimate capacity between 600 and 700 tons per day depending upon the supplementing of the raw material supply from the sources outside the Basin.

Sandwell and Company summarized its report with the following five conclusions:

1. *Sufficient suitable raw material from sawmill and veneer plant residues is available in the Rogue River study area to support a new kraft pulp and paper mill of an initial capacity of 300 tons per day, although long-range expansion might depend upon raw material from outside the study area, for example, from Northern California.*

2. *The nature of the raw materials and consideration of other factors, such as, effluent disposal preclude the consideration of products other than those produced by the kraft process.*

3. *General consideration of market trends indicates that unbleached kraft papers and linerboard are the most favorable products.*

4. *The study area has suitable sites in both the Grants Pass and Medford areas on which to locate a kraft pulp and paper development. The possibilities of excessive air pollution owing to natural weather phenomena appear, however, to make impractical the consideration of the Medford area as a prospective new location. The problem of plant location is aggravated by the problems of water supply and effluent disposal which, because of the laws that are understood to prohibit the use of Rogue River for either purpose, will require solution before a mill in the study area can be considered.*

5. *An attractive return could be realized on the invested capital for the proposed development at present market prices and present production and construction costs.*

Results from Sandwell's studies indicated that, in view of the Basin's pulp and chip resources, an initial development producing 51,000 tons per annum each of linerboard and unbleached kraft paper was feasible. A new pulp and paper development would be based at first upon mill residue because of the availability of that relatively cheap pulp supply. Upon the expansion to the level of 6 to 7 hundred

tons capacity for the Basin, it would be necessary to employ pulp wood from other sources including logging residue, forest thinning, farm wood lots, as well as supplies outside the drainage basin boundaries. On an assumption that a pulp and paper company could be reasonably assured of obtaining 60 percent of the new residue available in the study area, an operation supporting a production of 100,000 tons per annum, 300 tons per day, would be justified for kraft pulp and paper operation. In addition, pulp wood chips from forests, equivalent to approximately 115,000 tons per annum, could be obtained using 10 percent as the long-term ratio between unused merchantable timber left in the woods and the average annual removal of timber products. To determine total water requirements and effect on water resources of the wood processing industrial potential of the Rogue River Basin, plant capacities indicated by Sandwell and Company have been assumed to represent the probable pattern of development.

Factors affecting industrial plant location within an area are:

1. *A market for the products of industrial operations.*

2. *The availability and cost of raw materials.*

3. *The availability, adequacy and cost of utility items, such as, water, power, fuel, transportation, waste treatment facilities, and related items.*

4. *The size and character of the local labor market.*

5. *The tax situation with respect to the industry and with respect to industry-employed personnel.*

6. *The character of site terrain, proximity to labor market, proximity to transportation facilities, requirements for air and water pollution abatement, and other items which in a sense overlap the utility factors.*

7. *The competitive characteristics of the area as compared with the desirability of locating the facilities in other drainage basins or general geographic areas.*

THE BASIN POTENTIAL - INDUSTRY

The expanding population of the United States in particular and the world in general will provide a favorable market for the products of pulp and paper operations in the Rogue River Basin.

Sandwell and Company's evaluation of the raw materials availability within the study area is based on the existence of 13 large sawmills, 23 medium-sized sawmills, and 8 green veneer mills, none of which is presently owned by a pulp and paper company. Of these, 12 large sawmills, 16 medium-sized sawmills, and 7 green veneer mills are considered to have sufficient prospect of continued operation to warrant the assumption that they will be long-term suppliers of pulp wood chips. Several of the potential suppliers are currently selling chips to pulp and paper mills outside the Basin but would possibly shift in part to supplying an operation in the Basin if such were developed.

Utility items present a very serious problem in the Basin, in terms of availability, adequacy and cost. Rail and road transportation, water supply, and air and water pollution abatement are problem areas.

Rail facilities for the development of the timber processing operations are adequate for the Bear Creek and Middle Rogue sub-basins; all other areas have very limited facilities, if any at all.

Under conditions of existing stream regimen, the only dependable source of water supply is the main stem of the Rogue River. If use of main stem water continues to be restricted and the development of storage facilities is required to meet the demand for industrial water in this Basin, economic restrictions may be placed on its growth due to the cost of such storage facilities. Water pollution from expanding industrial activity in the Basin will be a serious problem. Specific and detailed evaluation of the proposed operations will be required and treatment standards prescribed before any major development can be allowed to go forward. Effluent treatment facilities will be necessary for any pulp and paper operations established within the confines of the Basin, for minimum flows of the Rogue River and its tributaries are not sufficient to provide adequate dilution of untreated effluents from conventional kraft mills. The maintenance of safe levels of dissolved oxygen and toxic materials will require rigidly designed and carefully controlled waste treatment facilities. Waste treatment costs are a major deterrent to the development of some types of industry.

THE BASIN POTENTIAL - INDUSTRY

A seasonal pollution problem not directly related to water use exists in the Medford area because of unusual atmospheric conditions which prevent the dispersion of smoke and odors into the upper atmosphere.

The most favorable labor markets within the Rogue River Basin are in the vicinity of Medford and Grants Pass.

The tax situation presumably will not be significant in any restriction of natural resource industrial development in the Rogue River Basin.

The most favorable industrial sites are located in the Middle Rogue and Bear Creek sub-basins. In these areas terrain for plant construction is suitable, utilities are generally more adequate than in other areas, and proximity to labor markets is advantageous. Excepting the cost of transportation of finished products to market, the cost of supplying adequate process water of suitable quality and sufficient quantities, and the cost of providing adequate treatment facilities for industrial wastes, the economic environment of the Basin is favorable to industrial development of timber and metal industries.

If raw material availability and cost factors are excluded, the greatest deterrents to the development of the industrial potential of the Rogue River Basin lie, in general, in possible water resource conflicts. Under existing stream regimen flows of the main stem of the Rogue River and all of its tributaries, except the extreme headwater areas, are inadequate during significant portions of the year. In the section of the Rogue main stem between Dodge Bridge and the confluence of the Applegate and Rogue Rivers a desired base flow has been set by the state fisheries agencies at a discharge of 1,200 second feet. For the period 1929 to 1956 the mean monthly flow of the Rogue River at Dodge Bridge was under 1,200 second feet for the months of August and September and just slightly above 1,200 second feet (1,275 cfs) for October. If consumptive diversions were exercised to the optimum value for industry, municipal and irrigation uses, the diversion potential for stretches of this section would amount to some 250 second feet which, on the basis of past records, would indicate a mean monthly flow value below the 1,200 second feet for July, August, September and October. Analysis of past data indicates that a period of one month with a mean flow less than 1,200 second feet would occur with an average recurrence interval

of every other year. If the desired flow for fisheries resources was reduced to a level of 800 cfs, the exercise of a downstream depletion potential of 250 cfs would result in flows at or below the 800 second foot level once every three years. If this depletion potential was not exercised flows at or below this desired level would have a recurrence interval of approximately once in thirty years. The drought frequency curves upon which the average recurrence intervals for flows of the minimum month are computed are probably slightly on the conservative side, reflecting a somewhat less critical situation than actually exists. This is due largely to the fact that the drought frequency curves are based on observed flow data which give undue weight to the observed flows of earlier periods of record which do not reflect water rights subsequently put into the depletion potential picture. The relationship of the mean monthly flows of record to the desirable base flow for fisheries is an indication of the degree of criticality of any given location in the system in regard to the satisfaction of consumptive uses during the low flow periods of existing stream regimen. Sub-basin data show these values are generally inadequate throughout the Rogue River Basin. The establishment of the requested flows as a level below which no depletion potential can be allowed will result in definite restrictions on the development of the industrial potential of this Basin.

It is apparent from the data at hand that the natural or existing stream regimen of the Rogue River watershed is in general unsatisfactory to accomplish the maximum enhancement of the Basin's resources.

Under the conditions of anticipated stream regimen for the foreseeable future, pollution will be a significant problem in industrial expansion in this watershed. Using as a basis the better waste treatment facilities now operating in the State of Oregon, a rule of thumb for analysis is that the effluent from the waste treatment facilities of a pulp and paper operation of the kraft type can be assimilated with a flow of 500 cfs for every 100 tons per day of pulp processed. Under this criteria the full receiving capacity of the main stem of the Rogue River at a flow level less than 1,000 cfs would be insufficient to handle the waste products coming from the treatment facilities of a 200 ton kraft pulp and paper operation. Because of the frequent recurrence interval of flows of this magnitude, it is apparent that more efficient methods of waste treatment will have to be installed for Rogue River pulp and paper operations than has otherwise been the case in the State of Oregon.

Costs of such facilities place Rogue River wood utilization development at a disadvantage when competing for plant installations with areas having less stringent requirements.

There is a demonstrated potential for industrial development in the Rogue River Basin particularly in the wood utilization process industries.

Relatively short-range market requirements indicate additional pulp and paper supplies will be needed in the foreseeable future.

There are locations within the Basin where all factors pertaining to the establishment of industrial operations are favorable, or at least satisfactory, with two exceptions: (1) water supply and (2) industrial waste disposal. These two factors are the major deterrents to the establishment of known potential resource-based industries.

MINING

Mineral deposits in the Basin having economic significance and presently active mines and mills were shown in Figure 17. Development of these deposits will depend upon more detailed knowledge of the extent of such deposits, the cost of development, and the prevailing markets. Other factors of mining development have been discussed above under INDUSTRY.

RECREATION

The recreational potential of the Basin is large and development should be expanded to meet the demand of increasing population and tourist travel and the increasing amount of leisure time becoming available to most people.

According to the report of the Oregon State Parks Division to the State Water Resources Board, "It would be difficult to underestimate the importance of water to recreation in this state and more specifically its role in regard to state parks. It may be said that water is the basis for a majority of the state's recreational and scenic attractions . . . Water is used in state parks for both recreational and utilitarian purposes. Boating, swimming, water sports, and sightseeing are some of the uses made of the lakes, streams, rivers, and bays upon which state parks are

located. Present use and future trends are towards increasing recreational use of the nation's waters. It is estimated that throughout the country one out of every four adults is a licensed fisherman and one person of every 29 to 30 now owns some type of boat. Thus the use of water for recreational purposes is a highly important feature. In addition, water is necessarily used for drinking, washing, cleaning, sewage disposal, and irrigation. Adequate amounts of water for these purposes must be available if people are to use and enjoy the recreational attraction of state parks."

Full development of recreational resources depends first upon water and second upon accessibility. The Rogue River Basin's recreational resources include outstanding scenic wilderness areas on the west coast, in particular the lower river section. Proper development of this section of the river for public recreational use means having adequate transportation facilities and, at the same time, maintaining a protective strip along the river to keep from destroying the natural beauty of the many falls, canyons and other scenic attractions. This could be done without major interference with the use of this portion of the Basin for other purposes and would aid the timber industry by making the area more easily accessible.

WILDLIFE

Settlement and development of an area restrict the numbers of the more wilderness-type animals, but at the same time improves the habitat for other forms, resulting in population increases. According to the Oregon State Game Commission, the number of animals any given water supply can support is limited by the distance an animal will willingly travel to reach it. Since wild animals do not tolerate crowding, the maintenance of bird and animal life will depend upon the adequacy of water supplies.

In the Rogue Basin, blacktail deer is the principal big game species and the population trend presently is upward because logging is providing more suitable habitat for this animal. The annual deer harvest is increasing with 4,000 deer killed in 1956 in Southern Oregon by 10,400 hunters--a hunter success of 38.5 percent.

Small game species are found primarily in the central valleys and their populations are subject to annual fluctuations. About 36 percent of the licensed hunters of the state hunt upland game, that is, nearly 7,800 persons annually pursue this game in the Rogue watershed.

Waterfowl population in the Basin is slight but the potential is large, particularly if there is any great amount of storage reservoir development.

Interest is lacking in the harvesting of wild furs due to the low market values for pelts. Approximately 50 trapping licenses are sold annually in Jackson and Josephine Counties and about 2,000 fur-bearing animals are cropped.

FISH LIFE

Fishing in the Rogue has always been popular and the stream system, in its natural state, was well suited to the anadromous fishery resource. However, fish population levels which existed in the Basin before it was developed by man cannot be represented as the Basin potential because of the present level of development. Water use for other purposes reduces summer flows, in some locations, below the level of desirable base flows for fish specified by the State Game Commission. The flow levels recommended for the proper management of the fishery resources are shown in Figure 42. Such flow levels have never existed during critical periods in some areas and the only way in which many of those flows can be established is by use of headwater storage.

Storage presents problems since some of the natural spawning areas of anadromous fish would be inundated by reservoirs and the problem of fish passage, both upstream and downstream, has not been completely solved, particularly over dams above 100 feet in height.

This does not mean that fish and man cannot exist together. The potential of the Rogue as a fishing stream should be developed. Maintaining conditions as they presently stand is not the answer to the maintenance of the fishery resource because inadequate flows and high temperatures presently exist in many areas of the Basin.

If storage reservoirs were built on the multipurpose concept, as well as supplying needs for irrigation, power, and flood control, they would make additional water available for industrial, municipal and other uses. While they would inundate some of the fish spawning areas, they might also improve conditions in other areas by increasing low

flows. This means that the loss at one point might be balanced, in part, by the gain at other points.

The areas of the Basin where development is both improbable and impractical could be set aside for recreation and fish uses. This would permit concentration of efforts by the fishery interests in improving those areas reserved for fish, thus requiring less time and money to be spent trying to maintain the marginal areas which would best be adapted to development by man.

The present widespread use of the Basin by anadromous fish was shown in Figures 22-24 prepared from data supplied by the U. S. Fish and Wildlife Service from their survey of the anadromous fish runs in the Basin from 1949 through 1954. These plots show that anadromous fish use almost every tributary which carries water throughout the year. To maintain all such streams for fish alone would not be making the best use of the water resources of the Basin.

FLOOD CONTROL

Computations were made by the State Water Resources Board, for this study, to determine the optimum level of flood control which could be obtained in the Basin if all physically practical storage sites which have been studied by any group or agency were considered. Sites in conflict with existing developments or with other sites were not included. Reservoirs utilized for the optimum control study are shown by name and location in Figure 43.

The primary purpose of this phase of the study was to determine the maximum practical physical level of flood control which could be achieved in the Basin, thus providing a base for comparison with other levels of control proposed in studies by other agencies.

Due to the complexity of routing floods through so many reservoirs, 30 sites, a semi-graphical approximate method was used. This method does not give precise results, but the same criteria were applied to all combinations which gives a valid basis for the comparison of relative magnitudes of results.

Four major flood periods were selected for the optimum control

study. These floods and their recurrence frequencies and relative magnitudes at Grants Pass are:

FLOOD	AVE. RECURRENCE INTERVALS* Years	RELATIVE MAGNITUDE*
February 1890	63	2
February 1927	38	3
December 1955	37	4
January 1953	8	5

* At Grants Pass

The historical flood of greatest known magnitude occurred in the Basin in 1861, but data relative to this flood is inadequate for a flood control study.

For the flood routing it was necessary to know the travel times of the regulated flows between sites. These were determined by establishing the relationship between average velocities and average discharges in each reach of the stream system under consideration. This relationship was well defined for moderate flows but could not be established for very high or very low flows. Since the regulated outflows from the control reservoirs were in the range of moderate flows, the relationships established gave results within the accuracy of the data used in the computations.

Initially the four floods listed above were routed individually through the storage sites to find the reservoir capacities necessary to provide varying degrees of control. This was followed by the selection of a hypothetical flood of large magnitude but low frequency of occurrence. Inspection of discharge records for the Rogue Basin stream system for years of major floods shows that the average interval between peak flows during those flood periods was 20 days. From this it was assumed that a flood of large magnitude could possibly be followed in 20 days by a flood of even greater magnitude. Therefore, the critical flood used in the optimum control

routing was the 1927 flood followed in 20 days by the 1890 flood, the former being comparable to the 1955 flood. Storage necessary to control this critical flood to regulated reservoir outflows below the damage stages would be sufficient to reduce the outflow to an even lower level with any one of the four floods listed above.

The results of the Optimum Control with the critical flood are shown in Table 13. This table lists, for each site, the maximum natural flows, the maximum regulated flows, the percent reduction of each flood peak which is a measure of the effectiveness of the control, and the storage required to achieve this level of control. Also included is a comparison between natural and regulated flows and percent reduction of flood peaks at Grants Pass and at Agness, both upstream and downstream of the confluence with the Illinois. The peak natural flow of 65,600 cfs at Grants Pass for the 1927 flood would be reduced to 25,800 cfs and the following peak of 128,000 cfs for the 1890 flood would be reduced to 34,600 cfs. In both cases the regulated flow would be less than the flow at damage stage, 35,600 cfs. Refer to Table 13 for flow reductions at other locations.

The results listed here depend upon optimum reservoir operation and perfect forecasting. Therefore in actual operation, if this degree of control is to be achieved, additional storage would be necessary to compensate for inaccuracies in forecasting and below optimum reservoir operation.

This study indicates the large magnitude of control necessary to eliminate damages from floods. The Optimum Control would reduce damages from the 1955 flood to a negligible amount but the dollars saved in so doing would not begin to justify economically such an extensive plan of control.

Flood control is both desirable and necessary in some areas of the Rogue Basin but the cost of storage for that single purpose cannot meet the test of economic justification under present levels of development. Storage for flood control will, of necessity, be included as part of multipurpose projects.

TABLE 13

OPTIMUM CONTROL OF CRITICAL FLOOD

SUMMARY

SITE	STREAM	MAX. NAT. FLOW CFS 1927 Flood	MAX. NAT. FLOW CFS 1890 Flood	MAX. REG. FLOW CFS	REDUCT. OF PEAK % '27	REDUCT. OF PEAK % '90	STORAGE REQUIRED ACRE-FEET
McNeil	Big Butte Cr.	3,100	12,100	1,300	58	89	67,000
Elk Creek	Elk Creek	13,800	18,700	2,500	82	87	76,000
Lewis Creek	Rogue River	26,100	65,300	5,400	79	92	283,000
Trail Creek	Trail Creek	6,200	8,400	800	88	91	52,000
Debenger Gap	Rogue River	34,300	78,100	6,300	82	92	48,000
Reese Creek	Reese Creek	1,000	2,200	500	53	79	7,000
Lake Creek	L. Butte Cr.	1,500	5,700	600	59	89	39,000
Brownsboro	L. Butte Cr.	4,300	12,700	1,500	65	88	49,000
Antelope Cr.	Antelope Cr.	1,100	2,800	400	69	87	16,000
Agate	Dry Creek	400	1,100	200	53	81	5,000
Emigrant	Emigrant Cr.	3,200	2,200	300	91	86	19,000
Meadows	Evans Creek	2,300	3,000	400	82	86	13,000
Upper Evans	Evans Creek	7,500	9,800	2,000	60	79	21,000
Homestead G.	Evans Creek	8,000	10,400	1,300	84	87	41,000
Evans Valley	Evans Creek	14,900	19,500	1,900	87	90	90,000
ROGUE RIVER @ GRANTS PASS		65,600	128,000	34,600	61	73	------
Carberry Cr.	Carberry Cr.	2,100	5,400	600	72	89	20,000
Copper	Applegate R.	7,600	19,800	1,600	79	92	88,000
McKee Bridge	Applegate R.	8,000	20,800	1,700	79	92	7,000
Yale	L. Applegate R.	1,600	9,000	500	70	95	27,000
L. Applegate	L. Applegate R.	1,800	10,300	600	70	95	4,000
Ruch	Applegate R.	9,800	31,100	1,900	81	94	19,000
Applegate	Applegate R.	10,300	33,900	2,000	81	94	9,000
Williams Cr.	Williams Cr.	2,300	6,000	1,200	47	80	17,000
Slate Creek	Slate Creek	3,800	4,900	1,800	53	74	10,000
Sexton	Jumpoff Joe Cr.	2,100	2,700	400	80	85	19,000
Pease Bridge	Grave Creek	3,300	4,300	500	86	89	26,000
Althouse Cr.	Althouse Cr.	1,500	2,900	400	77	87	12,000
Sucker Cr.	Sucker Creek	3,200	5,900	700	80	89	33,000

TABLE 13

OPTIMUM CONTROL OF CRITICAL FLOOD

SUMMARY

SITE	STREAM	MAX. NAT. FLOW CFS 1927 Flood	MAX. NAT. FLOW CFS 1890 Flood	MAX. REG. FLOW CFS	REDUCT. OF PEAK % '27	REDUCT. OF PEAK % '90	STORAGE REQUIRED ACRE-FEET
McNeil	Big Butte Cr.	3,100	12,100	1,300	58	89	67,000
Elk Creek	Elk Creek	13,800	18,700	2,500	82	87	76,000
Lewis Creek	Rogue River	26,100	65,300	5,400	79	92	283,000
Trail Creek	Trail Creek	6,200	8,400	800	88	91	52,000
Debenger Gap	Rogue River	34,300	78,100	6,300	82	92	48,000
Reese Creek	Reese Creek	1,000	2,200	500	53	79	7,000
Lake Creek	L. Butte Cr.	1,500	5,700	600	59	89	39,000
Brownsboro	L. Butte Cr.	4,300	12,700	1,500	65	88	49,000
Antelope Cr.	Antelope Cr.	1,100	2,800	400	69	87	16,000
Agate	Dry Creek	400	1,100	200	53	81	5,000
Emigrant	Emigrant Cr.	3,200	2,200	300	91	86	19,000
Meadows	Evans Creek	2,300	3,000	400	82	86	13,000
Upper Evans	Evans Creek	7,500	9,800	2,000	60	79	21,000
Homestead G.	Evans Creek	8,000	10,400	1,300	84	87	41,000
Evans Valley	Evans Creek	14,900	19,500	1,900	87	90	90,000
ROGUE RIVER @ GRANTS PASS		65,600	128,000	34,600	61	73	------
Carberry Cr.	Carberry Cr.	2,100	5,400	600	72	89	20,000
Copper	Applegate R.	7,600	19,800	1,600	79	92	88,000
McKee Bridge	Applegate R.	8,000	20,800	1,700	79	92	7,000
Yale	L. Applegate R.	1,600	9,000	500	70	95	27,000
L. Applegate	L. Applegate R.	1,800	10,300	600	70	95	4,000
Ruch	Applegate R.	9,800	31,100	1,900	81	94	19,000
Applegate	Applegate R.	10,300	33,900	2,000	81	94	9,000
Williams Cr.	Williams Cr.	2,300	6,000	1,200	47	80	17,000
Slate Creek	Slate Creek	3,800	4,900	1,800	53	74	10,000
Sexton	Jumpoff Joe Cr.	2,100	2,700	400	80	85	19,000
Pease Bridge	Grave Creek	3,300	4,300	500	86	89	26,000
Althouse Cr.	Althouse Cr.	1,500	2,900	400	77	87	12,000
Sucker Cr.	Sucker Creek	3,200	5,900	700	80	89	33,000

TABLE 13 (Continued)

SITE	STREAM	MAX. NAT. FLOW CFS 1927 Flood	MAX. NAT. FLOW CFS 1890 Flood	MAX. REG. FLOW CFS	REDUCT. OF PEAK % '27	REDUCT. OF PEAK % '90	STORAGE REQUIRED ACRE-FEET
Indian Hill	Wood Creek	800	1,400	200	76	87	6,000
Kerby Peak	Deer Creek	2,000	3,800	500	76	87	16,000
ROGUE R. ABOVE AGNESS		100,600	188,600	81,200	47	57	------
ILLINOIS R. @ AGNESS		82,100	153,100	145,800	1	5	------
ROGUE R. BELOW AGNESS		141,600	270,900	192,600	16	29	------
			TOTAL				1,139,000

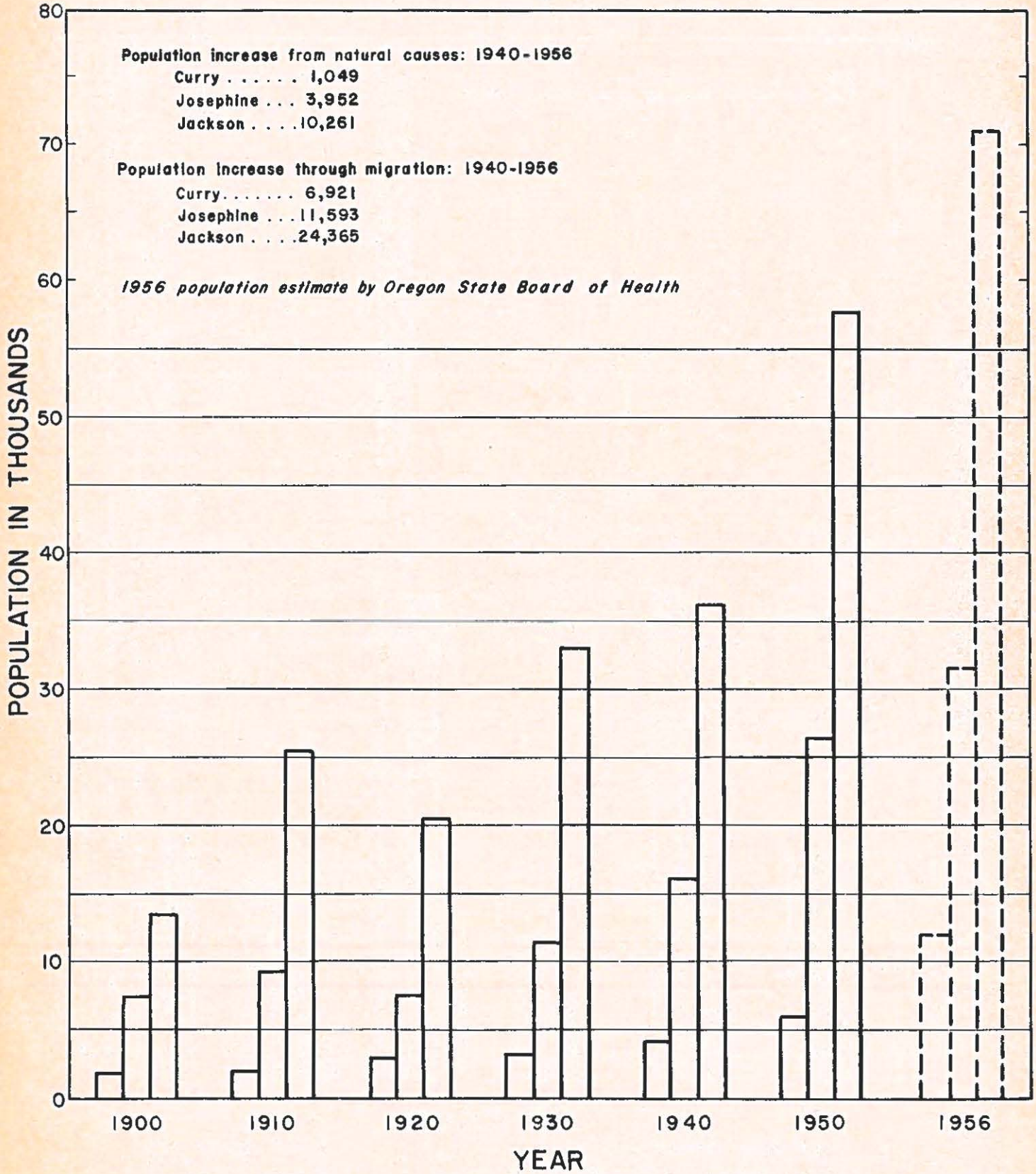
Note: The CRITICAL FLOOD is the 1927 flood followed in 20 days by the 1890 flood.

MAXIMUM FLOWS are average daily discharges, not instantaneous peaks.

STORAGE REQUIRED is the active flood control space in each reservoir.

POPULATION GROWTH

CURRY, JOSEPHINE & JACKSON COUNTIES
1900 - 1956



Graph shows counties in order of Curry, Josephine & Jackson for each census year.

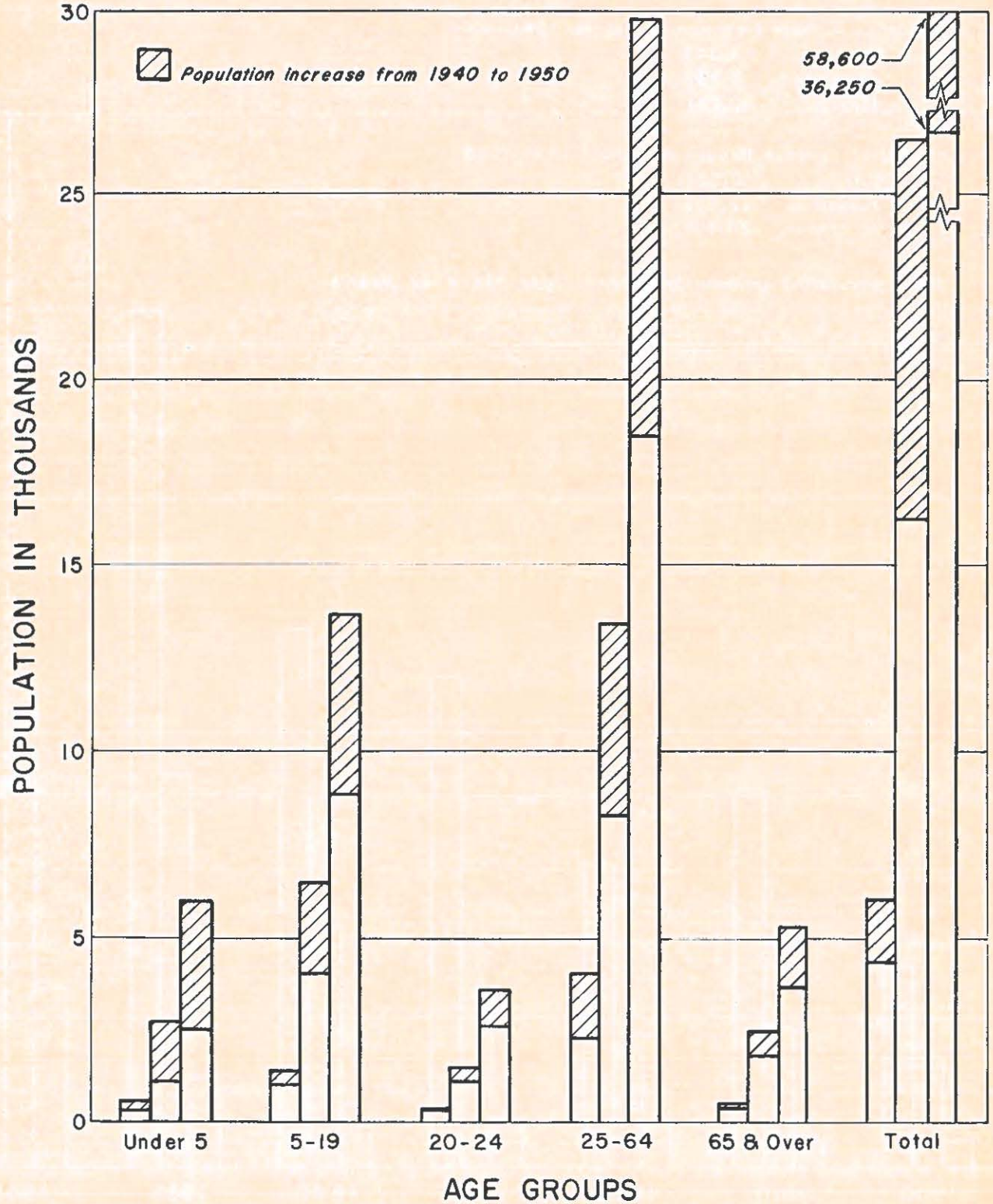
Source: Bureau of Municipal Research and Service, University of Oregon.

Drawn: July 17, 1958
File No. 15.8
FIGURE 32

POPULATION BY AGE GROUPS

CURRY, JOSEPHINE & JACKSON COUNTIES

1940 & 1950

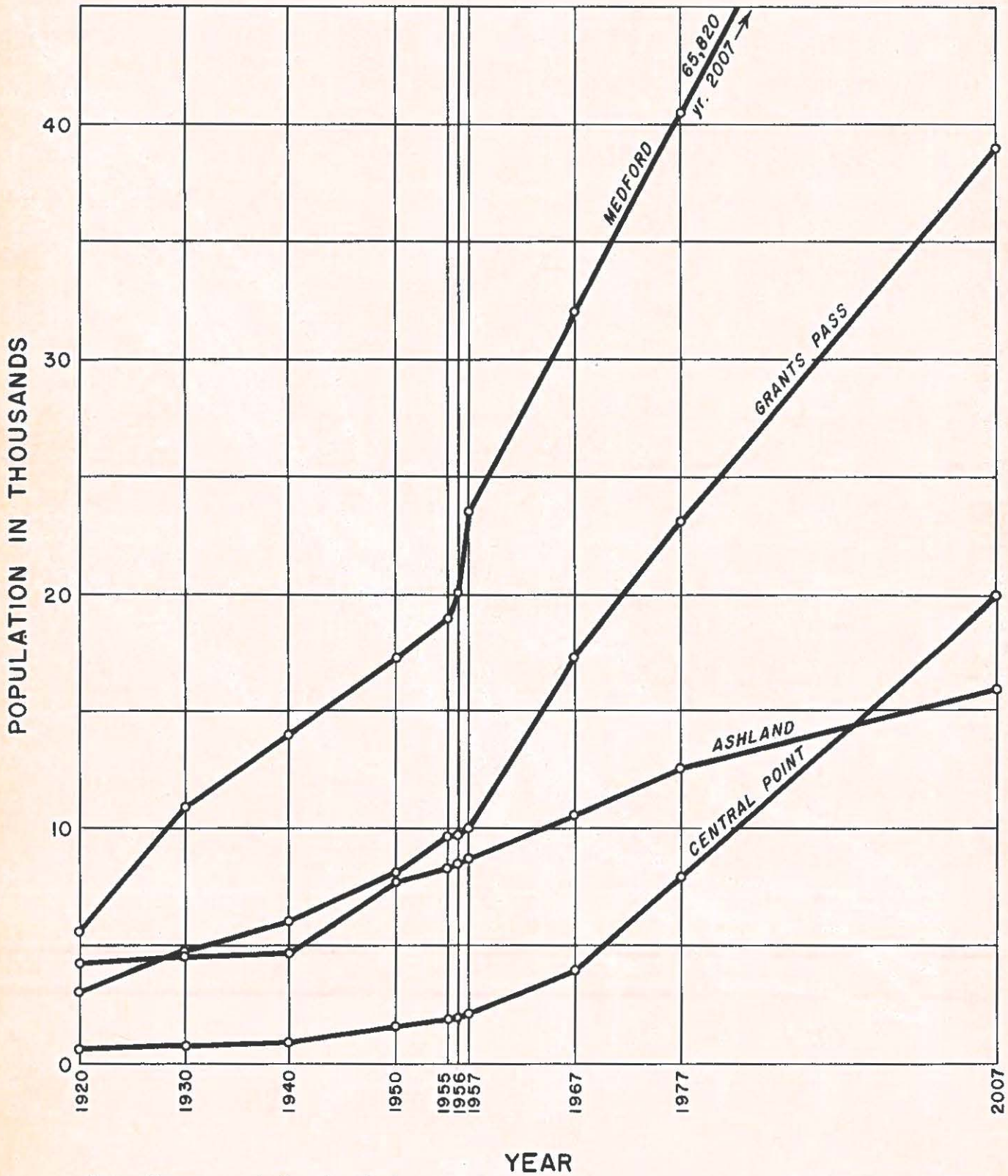


Graph shows counties in order of
Curry, Josephine & Jackson for each age group.
Source: U.S. Dept. of Commerce, Bureau of the Census

Drawn: July 18, 1958
File No. 15.8
FIGURE 33

POPULATION GROWTH

MUNICIPALITIES
1920 - 2007

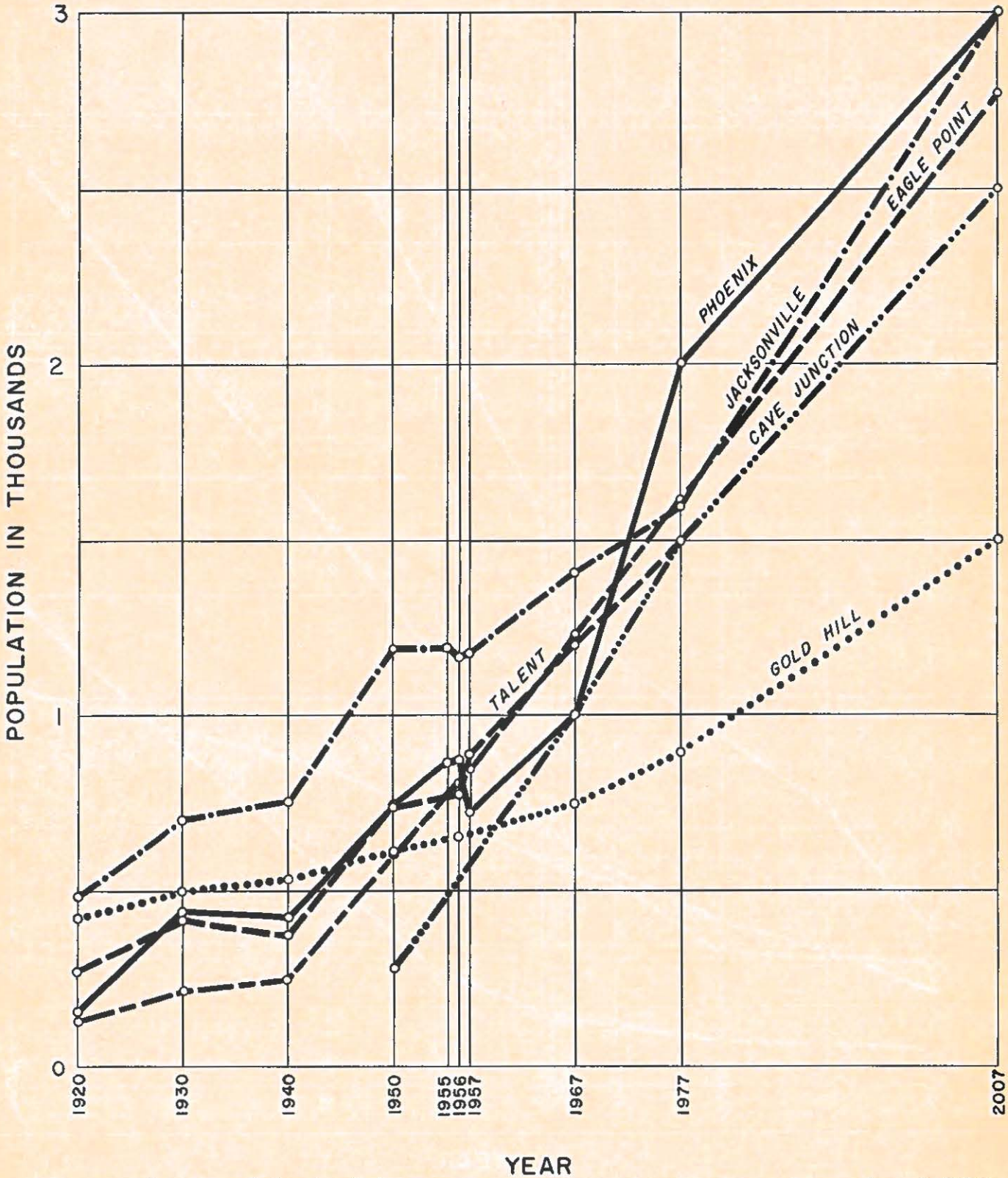


Note: Future population trends for years after 1957 estimated by municipalities.

Drawn: August, 1958
File No. 15.8
FIGURE 34

POPULATION GROWTH

MUNICIPALITIES
1920 - 2007

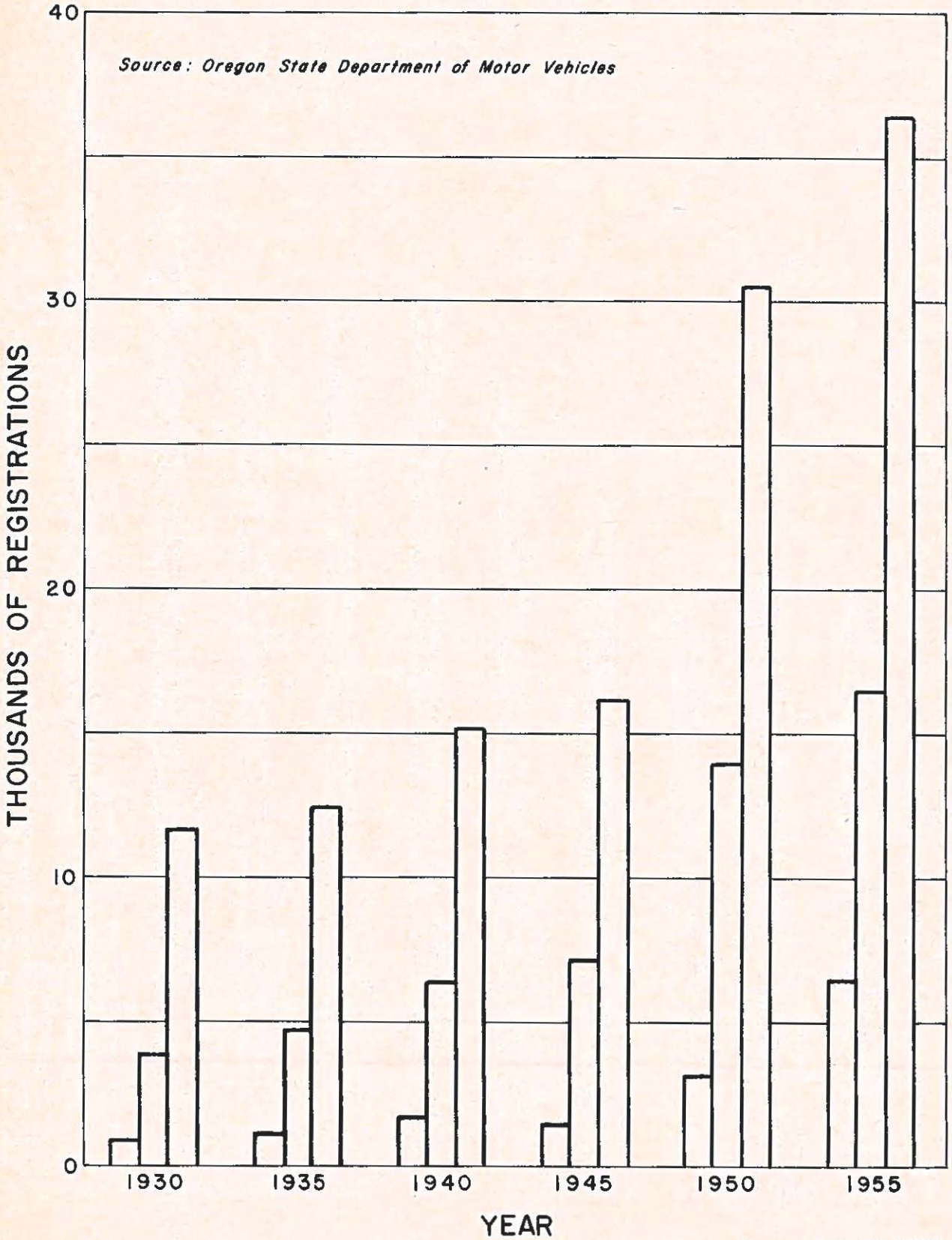


Note: Future population trends for years after 1957 estimated by municipalities.

Drawn: August, 1958
File No. 15.8
FIGURE 35

MOTOR VEHICLE REGISTRATIONS

CURRY, JOSEPHINE & JACKSON COUNTIES
1930 - 1955



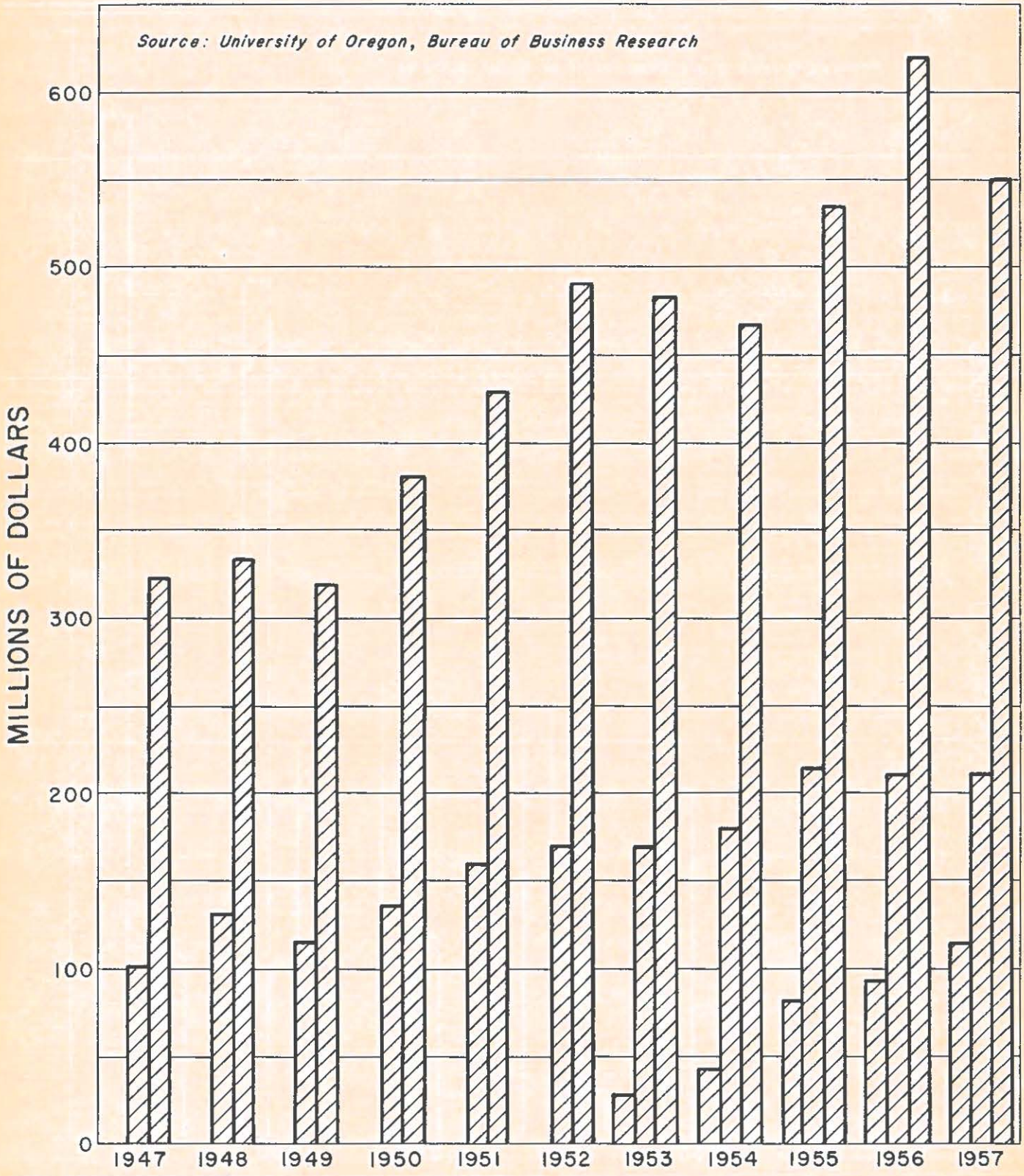
Drawn: July 25, 1958
File No. 15.8
FIGURE 36

Graph shows counties in order of
Curry, Josephine & Jackson for each year.

BANK DEBITS

CURRY, JOSEPHINE & JACKSON COUNTIES

1947 - 1957



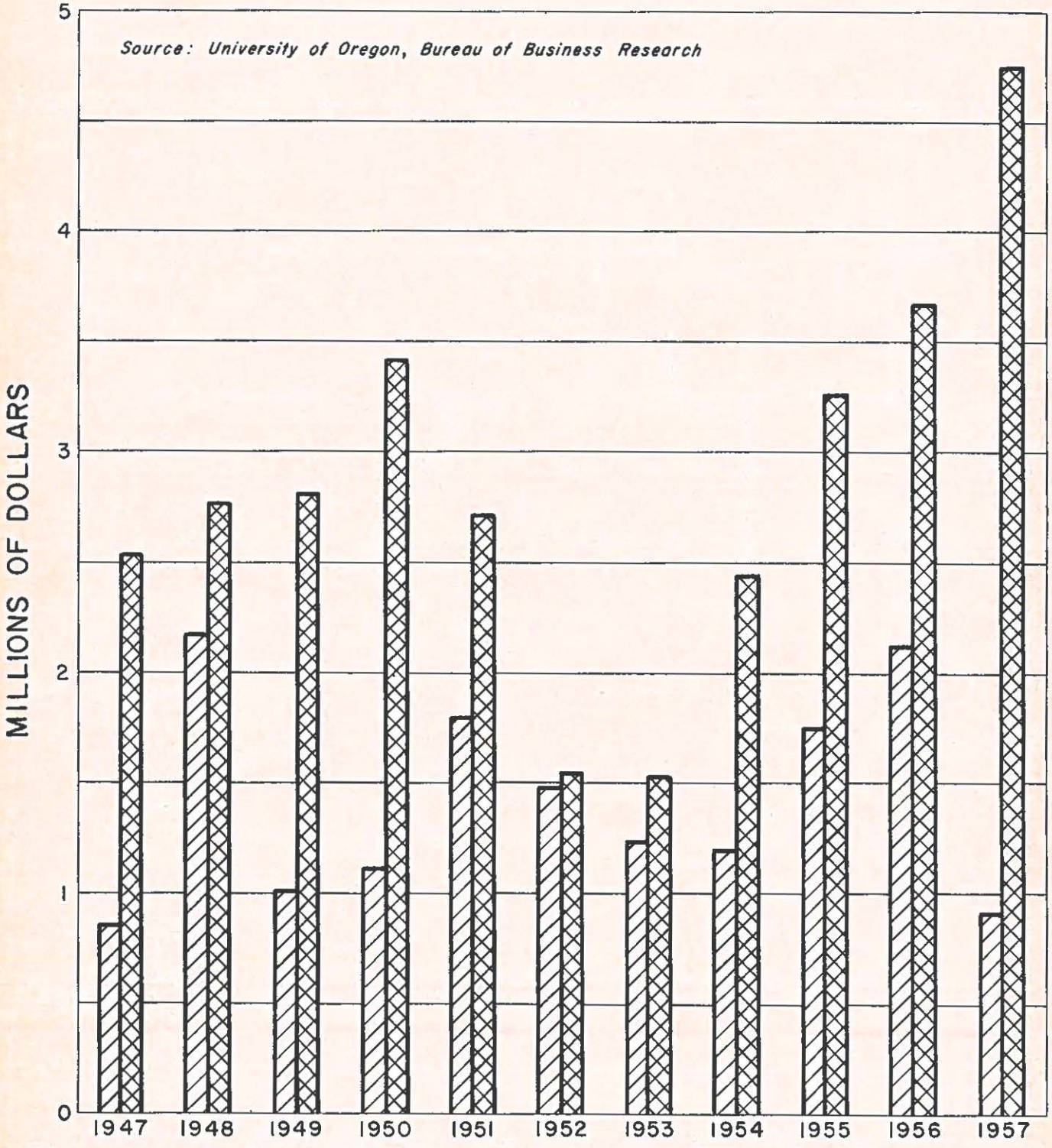
Graph shows counties in order of
Curry, Josephine & Jackson for each year.
Curry County data prior to 1953 not available.

Drawn: July 31, 1958
File No. 15.8
FIGURE 37

BUILDING PERMIT VALUATIONS

GRANTS PASS & MEDFORD

1947 - 1957

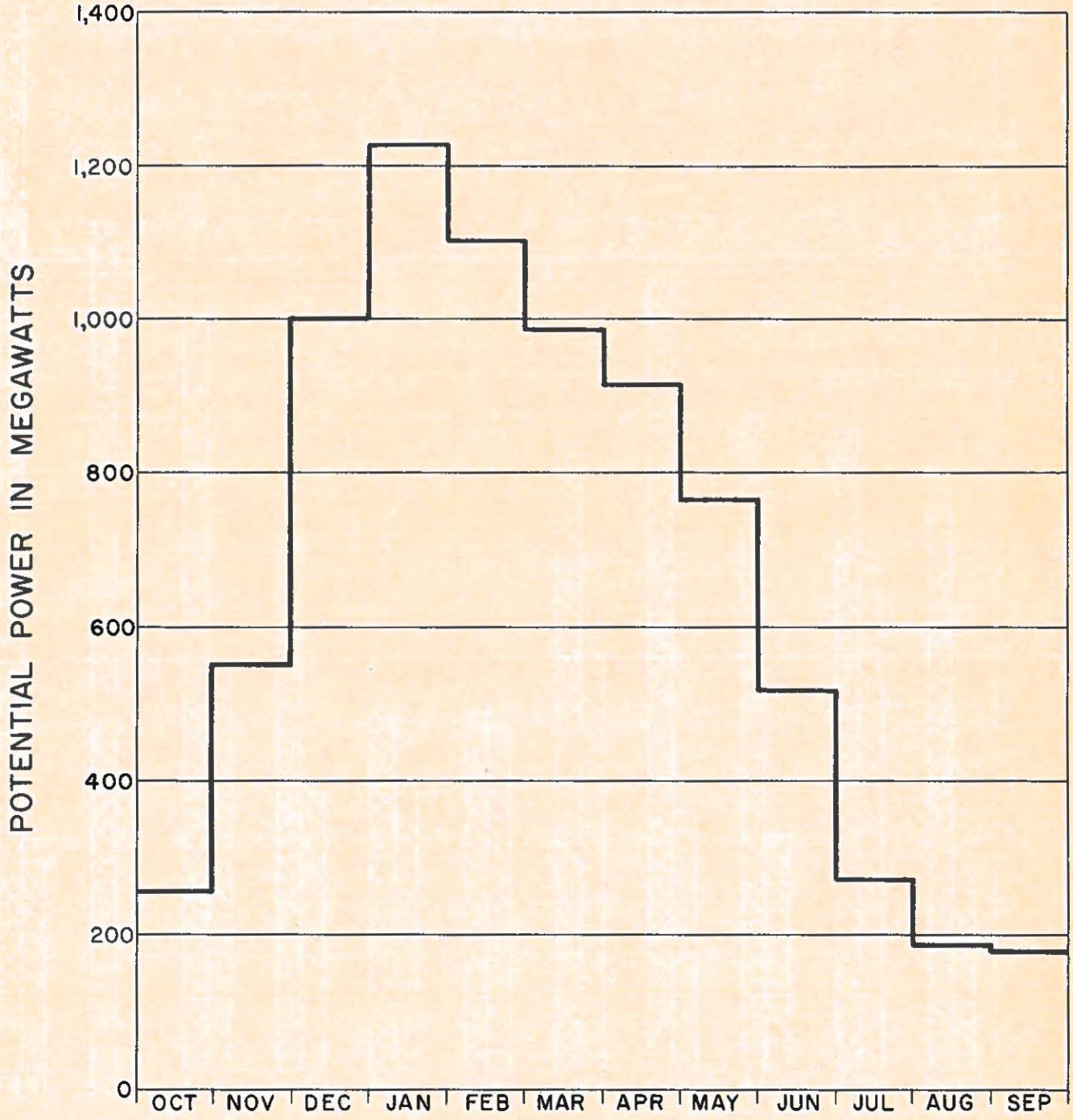


Drawn: August, 1958
File No. 15.8
FIGURE 38

ROGUE RIVER BASIN

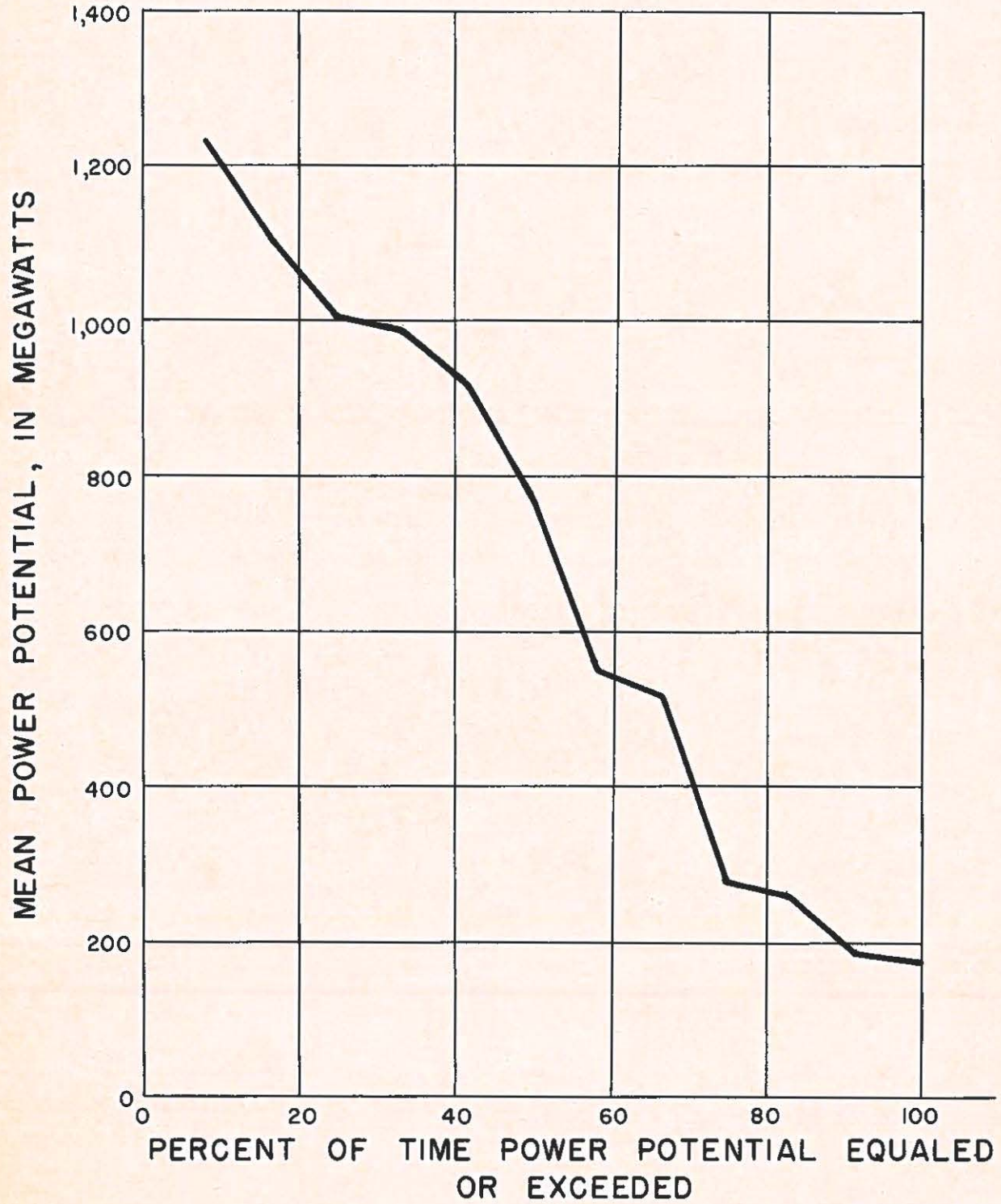
MEAN MONTHLY POTENTIAL POWER

ROGUE RIVER AT MOUTH



Drawn: Aug. 15, 1958
File No. 15.202
FIGURE 39

ROGUE RIVER BASIN
MEAN MONTHLY POTENTIAL POWER
DURATION CURVE
for
ROGUE RIVER BASIN



Drawn Sept. 8, 1958
File No.
FIGURE 40

ROGUE RIVER PROFILE

POTENTIAL POWER SITES

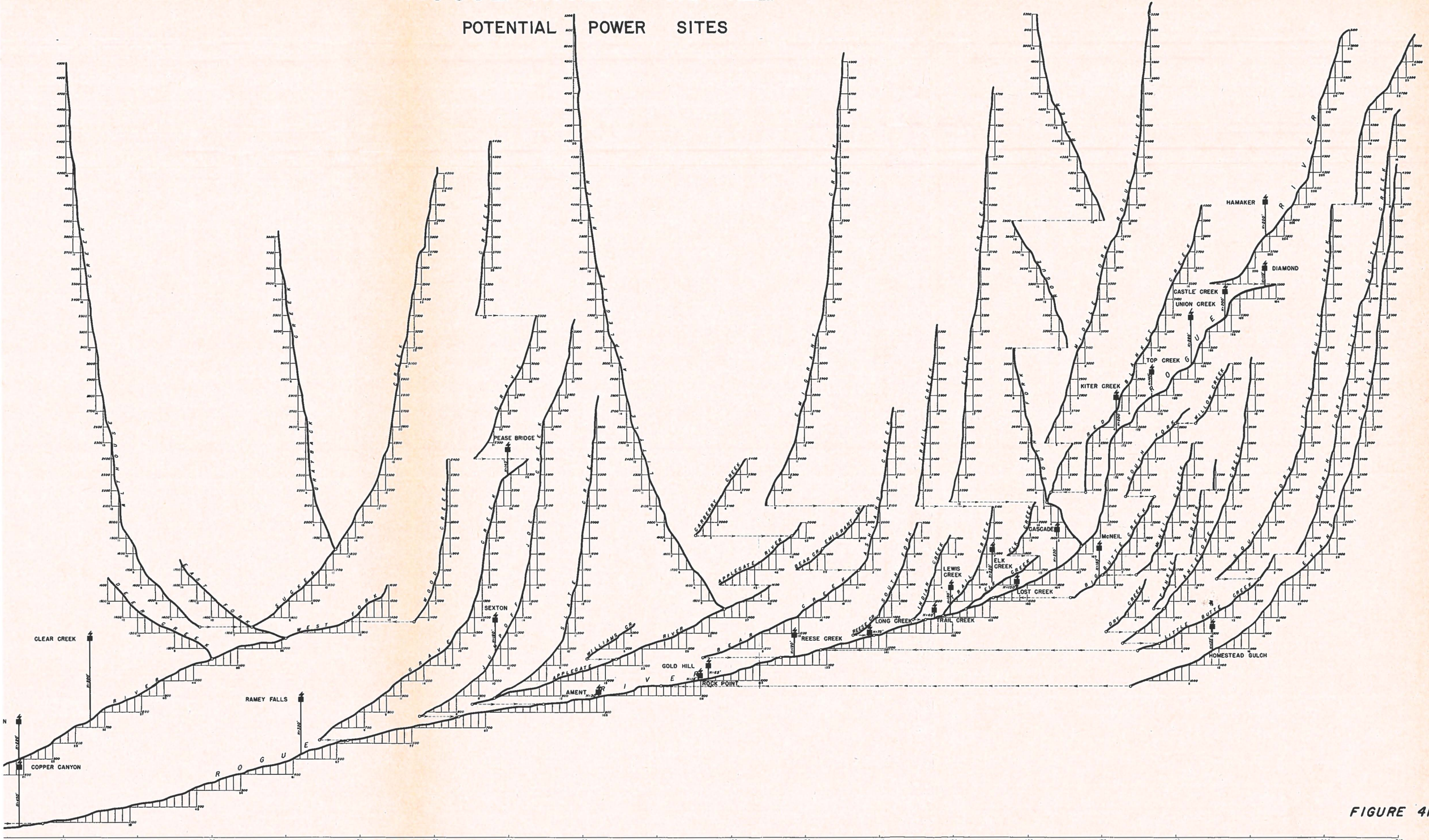
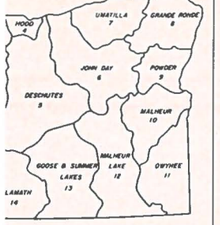


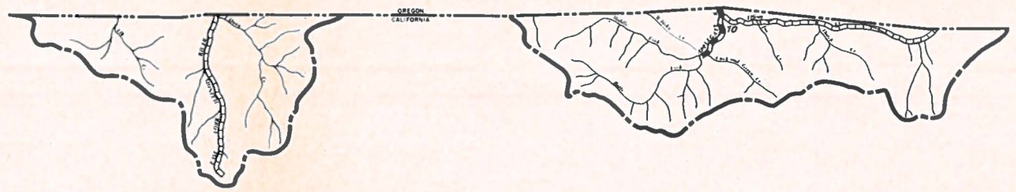
FIGURE 41

STATE WATER RESOURCES BOARD OF OREGON 1958

TATE OF OREGON
AINAGE BASIN KEY MAP



ROGUE BASIN OUTSIDE OREGON



LEGEND
(flow in c f s)

- below 5
- 5 to 49
- 50 to 499
- 500 and above

NOTE: Numbers indicate desirable base flows for fishery management as specified by the Oregon State Game Commission, Dec. 11, 1957.

UMPQUA BASIN

COOS-COQUILLE BASIN

KLAMATH BASIN

N

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 15

FIGURE 42

STATE WATER RESOURCES BOARD
SALEM, OREGON

ROGUE DRAINAGE BASIN FISH WATER REQUIREMENTS

Drawn	date	File No.
Checked	date	15
Revised	date	1084
Addition FISH WATER REQUIREMENTS	date 8-20-58	
Approved	date	

ORIGINAL BASE — State Engineers Stream System Map of Oregon
REVISIONS — Based on U.S.G.S. Quadrangle Maps - April 1, 1958

ROGUE RIVER PROFILE

OPTIMUM FLOOD CONTROL STORAGE SITES

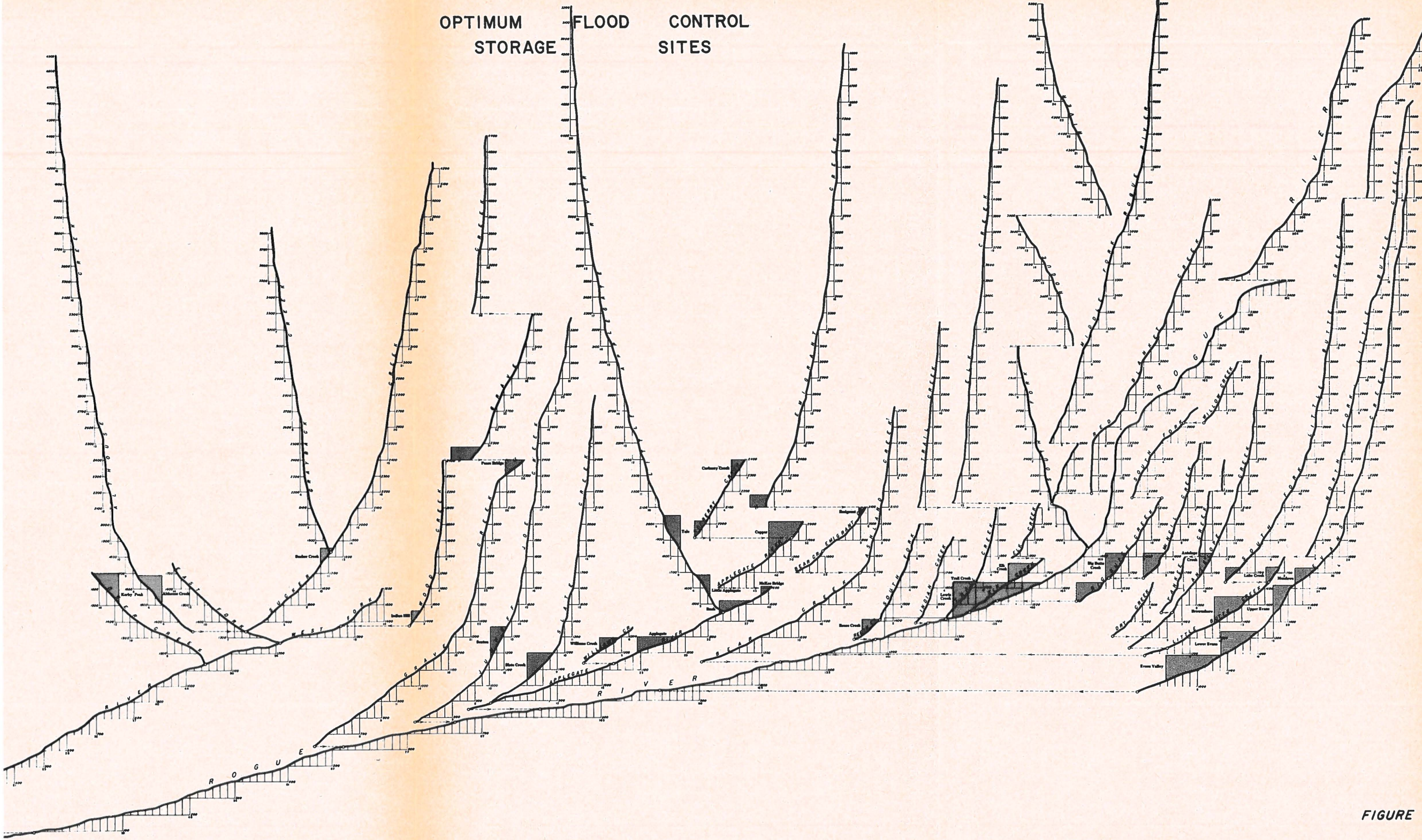


FIGURE 43

STATE WATER RESOURCES BOARD OF OREGON 1958

CHAPTER V SUB-BASIN INVENTORY

SECTION 1 UPPER ROGUE

GENERAL DATA

Location

All of the Rogue watershed above river mile 133 is included in this section which encompasses the major tributary basins of the Rogue South Fork and Elk and Big Butte Creeks as well. The confluence of the South Fork of the Rogue River is at mile 167 while Big Butte and Elk Creeks join the Rogue at miles 156 and 152 respectively.

The Cascade Range forms the eastern boundary of the Upper Rogue section while the northern boundary, which is the divide between the Rogue and Umpqua Basins, is commonly called the Rogue Range. Figure 44 shows the complete stream system for this section.

Size

This is the largest of all the sub-basins, containing 1,250 square miles, one-quarter of the Rogue Basin, of which 945 square miles are in Jackson County; 200 in Klamath County; and 105 in Douglas County. About 20 percent of the sub-basin area is Big Butte Creek drainage, another 20 percent is Rogue South Fork drainage, a little over 10 percent is Elk Creek drainage, and the remainder is drainage distributed among the many other tributaries. One hundred and nine square miles of Klamath County, nine percent of the Upper Rogue section, are in Crater Lake National Park. There are more than 1,200 miles of streams in the Upper Rogue section with the Rogue main stem making up six percent of this total, the South Fork two percent, and most of the remaining streams each less than one-half of one percent.

Topography and Geology

Less than five percent of the area is classed as agricultural land and most of the remainder is unsuitable for such use because of mountainous terrain while a small part is unsuitable because of climate.

Bottomland elevations run from 1,200 feet above mean sea level at mile 133 on the Rogue to 2,000 at mile 170. There are many peaks

in the area above 7,000 feet in elevation with the highest point being Mt. McLoughlin, elevation 9,495, located in the southeast corner on the Cascade Divide.

The Rogue travels on a steep gradient in its headwater areas, averaging 71 feet of drop per mile above mile 167. Headwater gradients of the major tributaries are even more extreme with Elk Creek dropping nearly 500 feet per mile for its first five miles; South Fork averaging 140 feet per mile for its upper 20 miles; Middle Fork averaging 200 feet per mile for its upper 13 miles; and Big Butte Creek having tributary headwater slopes averaging 100 feet per mile for its upper 4 miles. Below mile 167 the slope of the Rogue begins to decrease until at mile 156 a fairly constant drop of 14 feet per mile is reached and maintained for the rest of this section. The average drop of the Rogue between miles 167 and 156 is 27 feet per mile. The Rogue Basin stream system profile was shown in Figure 2.

A pumice deposit three feet or more thick, resulting from the explosion of Mt. Mazama, which occupied the site where Crater Lake now exists, blankets the upper portion of this section and extends down the Rogue canyon to mile 150. Here the Rogue flows in deep cuts in lava or pumice while further downstream the channel is cut primarily in alluvium (stratified gravel, sand, and silt).

From its headwaters, mile 213 and elevation 5,100, the Rogue travels in a southwest direction to mile 180 where it takes a nearly southern course to the town of Prospect, mile 171. Here it swings again to a southwest heading for another 23 miles and then continues south for the remainder of the Upper Rogue section.

The Rogue South Fork and Big Butte Creek flow in a generally northwest direction from their headwaters on the western slope of the Cascades while Elk Creek travels from the north to its juncture with the Rogue.

Climate

The higher levels of the upper end, above 4,000 feet, experience an average annual precipitation of about 60 inches and below 2,500 feet, average annual precipitation drops to 30 inches. About 75 percent of the annual precipitation occurs during the months of November through April

with an average annual snowfall of 68 inches in the valleys and 318 inches in the mountains.

Average air temperature variations go from 33 to 64 degrees Fahrenheit in the summer and 19 to 33 during the winter at higher elevations and, at lower elevations from 40 to 75 in the summer and 29 to 52 in the winter.

Annual growing seasons indicated by the Bureau of Reclamation's climatological map range from 120 to 210 days with the longest season occurring in valley areas below 1,300 feet in elevation.

Population

This is a sparsely-settled area with a total population of less than 6,000 people. Prospect and Shady Cove are the largest towns, each having a population of 500 at the time of the 1950 census. There are six other small towns scattered throughout the sub-basin, all but two having a population of less than 100 persons. The location of towns is shown on the sub-basin stream system map, Figure 44.

In addition to permanent residents, there is a considerable increase in population during the tourist season. A survey conducted by the National Park Service showed that 86,037 summer visitors to Crater Lake in 1950 came by way of the Crater Lake highway, Oregon 62, and 95,322 visitors used that route upon leaving.

Land Ownership

Sixty percent of the Upper Rogue is government timber land managed by either the Forest Service or the Bureau of Land Management, one percent public domain lands, and the remainder privately owned. The majority of the tributary timber land is located on the South Fork drainage which has approximately three-quarters of its area in government-owned timberland. Little land in the area is farmed because the rugged topography and unfavorable climate preclude such operations. Major land ownership divisions by sub-basins for the Rogue Valley were summarized in Table 2.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19.

Crater Lake highway, Oregon 62, linking Medford and the west entrance of Crater Lake Park is the primary transportation route in the sub-basin. In addition, Oregon 227 branches off at Trail and winds north to the Umpqua Basin and then east to join U. S. 99 at Canyonville, and Oregon 230 from Diamond Lake joins the Crater Lake highway about one mile east of the town of Union Creek.

A major secondary route of local importance is the road up Big Butte Creek through Butte Falls to Fish Lake, Fourmile Lake and Lake O'Woods, and also connecting with Dead Indian road from Ashland. Many other secondary roads allow access to Elk and Trail Creeks, the Rogue South and Middle Forks and other points. There are also more than 200 miles of unimproved dirt roads.

A logging railroad runs north from the Southern Pacific siding at Medford to White City and Eagle Point and then curves eastward through Butte Falls and finally winds in a northern direction to terminate at Mill-Mar Ranch which is located on Buck Creek three miles south of the Rogue South Fork.

There is no direct boat or bus transportation service in this sub-basin and no regular freight truck routes are maintained but irregular service is available from Medford. A privately-owned landing strip for small planes is located at Shady Cove.

Present Economy

Tourist trade is important to this region and is maintained by the heavy traffic to Crater Lake National Park with fishing and sightseeing along the way as an added attraction. Each summer nearly 90,000 people enter the Park from the Crater Lake highway and more than 90,000 use this route upon leaving the Park. There are many facilities available for use by tourists in this region and these are discussed under the section on Recreation.

Available information indicates that there are about 40 farms in

the area with some consisting of cropland and some of pastureland, grazing beef and dairy stock.

Logging and log-hauling takes place in some of the forest areas and a few sawmills operate in this region.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

Precipitation data is obtained at Crater Lake National Park headquarters, Trail, Prospect, and Butte Falls. Only the gages at Trail and Butte Falls are of the recording type. All of these stations except the one at Butte Falls give air temperature data as well (Figure 30). Average annual precipitation for the Rogue Basin was shown in Figure 3 and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

There are 15 active stream gaging stations in this sub-basin. These, along with 9 inactive stations, are located as shown in Figure 29. Stream gaging records are published in water-supply papers by the U. S. Geological Survey.

Yields

Annual yields for the years 1929 through 1956 computed for several points along the Rogue and at the mouths of its South Fork, Big Butte, and Elk Creeks are shown in Figures 45-50. All of the yield diagrams show a similar pattern with a relatively wet cycle existing since 1951 with the exception of 1955. Average annual yields for all years of record are: Rogue River above Dodge Bridge, 1,725,000 acre-feet; Elk Creek, 122,000 acre-feet; Big Butte Creek, 203,000 acre-feet; Rogue River above mile 164 (below South Fork), 1,270,000 acre-feet; South Fork, 509,000 acre-feet including COPCO diversions; and Rogue River above mile 174 (above Prospect), 581,000 acre-feet.

Mean monthly discharges for the same points are shown by hydrographs in Figures 51-56. These plots show the distribution of the

average annual yields with respect to time. It is important to note that the peak monthly discharge for the Upper Rogue River, and its tributaries whose headwaters are on the western slopes of the Cascades, occurs in the month of May as the result of melting snow (Rogue River above mile 174, South Fork, Rogue River above mile 164). Other tributaries which do not have heavy snowpacks on their headwater areas have peak monthly discharges occurring in January and February as the result of winter rains (Elk Creek). Tributaries originating in the Cascades at lower elevations with lesser snowpacks have peak flows starting with winter rains in January and February and remaining at a high level through March and April due to melting snow at the lower elevations (Big Butte Creek). The effect of both winter rains and spring snow melt is evident in flows of the Rogue further downstream with a January or February rain-caused peak followed by an April or May spring-freshet peak (Rogue River above Dodge Bridge).

Minimum flow and minimum yield hydrographs for the critical year of record at the gaging stations existing in the area are shown in Figures 57-69. The critical flow and yield year was 1931 at all locations having records which go back that far with the exception of the Rogue River below South Fork near Prospect (mile 164) which had a minimum flow of 493 cubic feet per second recorded in 1934 and the Rogue River above Prospect (mile 174) where a minimum of 200 cfs was recorded in 1932. The minimum of record for the Rogue at Dodge Bridge is 830 cfs in 1940 but records for this station did not start until 1938 and it is very probable that a lower minimum occurred along about 1931. Tables 7 and 8 summarize the critical flow and yield conditions which have occurred in the Rogue Basin.

Drought frequency curves for the gaging stations on the Rogue River below its South Fork and at Dodge Bridge along with flood frequency curves for the same locations are shown in Figures 70 and 71. Maximum flood curves were prepared from work by the Corps of Engineers and minimum curves were computed independently by the State Water Resources Board using data from water-supply papers. The curves for the Rogue at Dodge Bridge, Figure 71, show that for a 10-year average recurrence interval a flood of 46,000 cfs could be expected or low flows averaging 1,800 cfs for 365 consecutive days, 880 cfs for 30 consecutive days, and 780 cfs for 1 day. The recurrence interval cited in the above

example does not mean that flows of this magnitude will occur once every 10 years but rather that over a long term period, say 100 years, such flows will probably occur 10 times at irregular intervals which average once every 10 years.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin was shown in Figure 20.

Table 14 is a summary of the water rights by classification existing at present in the Upper Rogue section of the Basin. Power rights, the largest group, total 1,225 cfs, which becomes available for downstream use, and there is a total of 461 cfs for irrigation of 20,440 acres. Industrial rights total 6 cfs and municipal rights are approximately 162 cfs. All of the rights in this section total 1,881 cfs of which 638 are consumptive in nature.

Depletions

Depletion diagrams of legal rights versus stream miles for the Upper Rogue River and two of its tributaries, Elk Creek and Big Butte Creek, are shown in Figures 72-74. The plots show the total of all rights but do not indicate the actual water use for the following reasons:

1. Irrigation rights are seasonal in nature with the legal irrigation season usually being from May 15 to October 15 and actual use depends upon the pattern of rainfall occurring during the specific season in question.

2. Some irrigation rights are filed with the knowledge that low flows of the streams are fully appropriated and the right can only be exercised during higher flows occurring during the first and last parts of the season.

3. Return flows from irrigation, particularly from the flooding type, means that all water diverted for this purpose is not used.

TABLE 14

WATER RIGHTS SUMMARY

UPPER ROGUE RIVER BASIN

USE	STREAM	TOTAL RIGHTS CFS	
Domestic	Rogue River	0.2	
	Others	8.6	
	Total - Domestic		8.8
Municipal	Big Butte Creek	30.0	
	Big Butte Springs	132.1	
	Total - Municipal		162.1
Irrigation	Big Butte Creek	278.7	
	Elk Creek	6.8	
	Rogue River	91.4	
	Others	84.3	
	Total - Irrigation		461.2
Power	Big Butte Creek	100.0	
	Red Blanket Creek and tributaries	120.0	
	Rogue River	675.0	
	Rogue South Fork	300.1	
	Mill Creek and tributaries	30.3	
	Total - Power		1,225.4
Industry	Big Butte Creek	0.5	
	Mill Creek and tributaries	1.9	
	Others	3.6	
	Total - Industry		6.0
Fish life	All		17.1
Mining Recreation Wildlife Pollution abatement	None		
	TOTAL UPPER ROGUE RIVER BASIN		1,880.6

4. Power rights are for the maximum rate of usage but cannot always be exercised to such an extent because at times the stream flows drop below that level.

5. Power production is a nonconsumptive use so that water for this purpose becomes available for other use at downstream locations.

Ordinate values on the plots do not include supplemental irrigation rights and these are not part of Table 14. Supplemental rights permit alternate sources of supply but do not add to original rights.

Rights on Elk Creek are entirely consumptive as are the majority of rights for Big Butte Creek water. Two-thirds of the total Upper Rogue section rights are for nonconsumptive usage.

EXISTING NEEDS

Domestic

Rights for domestic usage total less than 9 cfs for surface water from the streams.

Municipal

There is sufficient water to meet existing needs. Nearly all of the municipal rights are for water from Big Butte Creek including Big Butte Springs and are held by the City of Medford by virtue of Oregon Revised Statutes 538.430 which grants exclusive rights, subject to rights existing on May 29, 1925, to the City of Medford for municipal use of all the waters of Big Butte Creek, its headwater springs, and its tributaries; and, subject to rights existing on July 21, 1953, including the above right, the Eagle Point Irrigation District may appropriate and use up to 100 cfs of the waters of Big Butte Creek for the purpose of generating electrical energy. This water is used outside the sub-basin. The remainder of the rights are small and from other sources, mostly for use at Crater Lake National Park.

Irrigation

The Bureau of Reclamation report of 1950 indicates that agricultural

land along Reese Creek and along the Rogue from mile 136 to 142 is adequately irrigated at present. This is part of the area served by the Eagle Point Irrigation District. The district boundary and irrigation canals were shown in Figure 16.

Nearly 70 percent of the sub-basin irrigation rights are for Big Butte Creek water and are held mainly by Medford and Eagle Point Irrigation Districts who divert part of the water for use outside of the sub-basin; 17 percent of the irrigation rights are for Rogue River main stem water; and the remainder are for water from Rogue tributaries including Mill Creek, Red Blanket Creek, Elk Creek, Rogue North and South Forks and others. About half of this latter group are located on Elk Creek and consist of small rights, none larger than seven-tenths of a cfs, scattered throughout its drainage area.

Irrigation lands in the Rogue Basin were shown in Figure 15.

Power

None of the existing power installations in this sub-basin utilize storage so power production drops off during low flows and water is bypassed during high flows. The California-Oregon Power Company holds rights for 75 cfs from Red Blanket Creek, 400 cfs from the Rogue main stem, and 300 and 275 cfs from the Rogue North and South Forks respectively, for a total of 1,050 cfs which is equal to 86 percent of the total power rights in the Upper Rogue section. This water is used in Copco's Prospect developments which were shown in Figure 21.

Another right for 100 cfs is held by Eagle Point Irrigation District and is used to produce power at Nichol's Drop on its irrigation canal. This power is included as part of Copco's Rogue River system.

Existing power installations of 47,770 kilowatts represents about 30 percent of the total potential of the Upper Rogue sub-basin.

Power sites along with their capacity and annual generation were listed in Table 5 and physical features - diversions, canals, powerhouses, etc. - were shown in Figure 21.

Industrial

Industrial rights are small, consisting of boiler and millpond use

by lumber companies, fire protection use by school districts, and railroad use, and are easily met with the water available.

Mining

There are no water rights for mining in the Upper Rogue section. The location of mineral deposits and active mining operations in the Rogue Basin were shown in Figure 17.

Recreation

There is no consumptive use for recreational purposes in the Upper Rogue section but water does play an important part of the overall recreational resource of this area.

All of the natural lakes in the sub-basin are small. Crater Lake National Park is located on the crest of the Cascade Range just outside the northeast corner of the sub-basin. More than 300,000 people from all parts of the Nation visit the park annually with nearly 100,000 traveling through the Rogue Basin. Most of the smaller lakes lie south of Crater Lake along the Cascade Divide within the Sky Lakes limited area. They comprise the Seven Lakes Basin, Sky Lakes group, and the Blue Canyon Lakes. Two small privately-constructed irrigation reservoirs, Fourmile Lake and Willow Creek Reservoir, provide recreation opportunities of some importance to the central valley residents. The scenic qualities and high recreation character of the Lake O'Woods area have been recognized by the Forest Service through establishment of the 36 square mile Lake O'Woods Recreation Area surrounding the lake.

The total surface area of all lakes and reservoirs above five acres in size lying within this section is 833 acres, the largest of these being Willow Creek Reservoir, 435 acres. The lakes located just outside the sub-basin on the east, Crater Lake and Fourmile Lake, have surface areas of 14,720 and 690 acres, respectively.

The stream system itself is a major scenic attraction due to the rugged topography which results in cascading water and in some cases attractive waterfalls. The part of this section receiving the heaviest use is the Union Creek unit, comprising that portion of the sub-basin from Trail to the headwaters of the Rogue. The beauty of the area is enhanced by the preservation, within the boundary of the Rogue River National Forest, of roadside zones of from 200 to 500 feet on each side of all major roads, and waterfront zones of from 100 to 200 feet on each side of all fishing streams.

There are 18 forest camps in this area, 7 of which are located along the Rogue above mile 184 and the remainder are located up and down the eastern edge of the sub-basin. Four state parks and one wayside park are found along the Rogue between miles 155 and 163. There are public boat landings at Dodge Bridge and Shady Cove.

Recreation areas in the Rogue Basin were shown in Figure 18.

Wildlife

Blacktail deer is the most abundant game species in this region. There are also species of upland game, waterfowl, and furbearers.

Wildlife needs for water are small and easily satisfied due to the low level of development by man in this area.

Fish Life

Fish life is an important resource in this area. The fall chinook run does not come this far upstream, but approximately 75 percent of spring chinook spawn in these waters as do 40 percent of the silvers and 15 percent of the steelhead. The chinook spawn in the Rogue main stem while silvers and steelhead use the tributaries with Elk Creek receiving the majority of tributary fish traffic. Fish spawning areas in the Rogue Basin were shown in Figures 22-24.

Sufficient water to adequately cover the spawning gravel in some of the smaller tributaries is not always available. Mean monthly discharge hudrographs with desirable base flows for fish as recommended by the State Game Commission for critical points in the Upper Rogue stream system are shown in Figures 75-79. These indicate that, for average flow conditions, there is sufficient water throughout the year to satisfy requirements on the Rogue Middle Fork but the following streams have insufficient flows for the periods indicated: Rogue South Fork, all months except April, May and June; Big Butte Creek, July, August and September; Elk Creek, August and September; Rogue at mile 138.5 (Dodge Bridge), August and September.

Fish water requirements for the entire Rogue Basin stream system were shown in Figure 42.

Water temperatures above 65 degrees Fahrenheit, which sometimes accompany the low flows occurring during warm, dry summers,

are detrimental to fish life. Water temperature data for this sub-basin are plotted in Figures 26-28 and 80. Most of the temperature data covers only the peak periods of the summers of 1949 and 1950 and is only sufficient to give an indication of the magnitude and relationship of water temperatures occurring at that time. The plots indicate a gradual increase in temperatures from Laurelhurst Bridge, the uppermost station, to Dodge Bridge, the station farthest downstream in the sub-basin. The temperature change between these stations, measured during the period August 1 to 4, 1949, was from 54 degrees Fahrenheit at Laurelhurst Bridge to 58 degrees Fahrenheit at Dodge Bridge. Continuous temperatures take at the Lewis Creek site during the summer of 1950 show a maximum water temperature of 62 degrees Fahrenheit occurring on July 25 of that year. The location of water temperature stations in the Rogue Basin was shown in Figure 30.

It is estimated by the State Game Commission that a total of 75 stream miles available to migratory fish with 341,000 square yards of spawning gravel exist in the Upper Rogue section.

Pollution Abatement

Pollution abatement problems are not serious in this section although the needs are not completely satisfied on some of the smaller tributaries which have low summer flows. There are no sewage treatment plants in this sub-basin.

Flood Control

Many streams of the Upper Rogue Basin are flashy in nature. Elk Creek is typical of flashy streams having high flows during heavy rains but low flows for most of the remaining time.

Runoff occurs rapidly after rainfall except in the porous lava areas which act like a sponge by taking a long time to become saturated and yielding their load slowly. These latter areas lie at higher elevations where winter precipitation is usually in the form of snow and is not often a very large part of the flood waters. Runoff patterns at representative locations in the sub-basin are shown in Figures 51-56 which were discussed in the section under Yields.

Flood damages of significance start about mile 148, near Trail, on

the Rogue main stem and become progressively worse as the floods move downstream. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 listed damages which occurred during the 1955 flood, the amount for the Upper Rogue being $406,000 of which $34,000 occurred along Big Butte Creek and most of the remainder along the Rogue main stem below the town of Trail (mile 149).

Local damages are not high enough to justify the cost of storage for flood control alone but storage located in the Upper Rogue Basin is necessary to control damages occurring downstream and possibly could be justified by the downstream benefits.

FUTURE NEEDS

Domestic

Population growth will occur slowly in this region and future domestic needs can probably be met from surface water supplies.

Municipal

Future requirements for the City of Medford, the major municipal user of water from the Upper Rogue section, cannot be met with the available supply and in anticipation of this, the City of Medford has applied for 100 cfs of Rogue main stem water to be diverted at mile 132 in the Middle Rogue section. Other municipal usage will not increase much above the present level and should not pose a problem in the future.

Irrigation

About 4,000 acres of land located near the downstream end of the sub-basin are potentially irrigable according to the Bureau of Reclamation survey. There is also need for supplemental water for some of the presently irrigated acreage. Storage could not be justified for use in this area alone but would be valuable if used to serve other, more productive regions as well.

Power

Figure 41 was a profile showing the location of sites, along with the

heads, used in the power potential computations. Those on the main stem of the Rogue in this sub-basin are Hamaker, Diamond, Castle Creek, Union Creek, Top Creek, Kiter Creek, Cascade, Lost Creek, Lewis Creek, Trail Creek and Long Creek. In addition, McNeil on Big Butte Creek and Elk Creek on the stream with the same name were included in the study.

Average discharges for each month were determined for every site and discharge duration curves were prepared from this information. These are shown in Figures 81-94.

Using heads and discharges, monthly power potentials were determined for each site and duration curves were prepared from this information. Using these plots, Figures 95-108, the power potential at each individual site can be determined.

Potentially there is sufficient water flowing in the Upper Rogue stream system in the month of September to develop an average of 75,000 kilowatts of power (54,000,000 KWH of energy per month) if the head shown in Figure 36 were utilized. This potential varies by months to a maximum during the spring freshets which usually occur in May of 234,000 kilowatts (168,480,000 KWH of energy per month), giving an average for the mean discharge for all years of record of approximately 143,000 kilowatts (102,960,000 KWH of energy per month) for the Upper Rogue section which is equivalent to 1,252,680,000 kilowatt hours of energy annually. This is the potential in addition to existing installations which means that roughly 30 percent of the total power potential of the Upper Rogue Basin has been developed.

Industrial

Additional industrial growth within the Upper Rogue sub-basin above its confluence with Big Butte Creek will have little effect on the quantity, quality, or distribution of the water resources of the area.

Two factors are fundamental to this conclusion:

First, industrial growth will be limited in scope, and,

Second, the establishment of operations with inherent problems of quantity or quality is unlikely.

SUB-BASIN INVENTORY - UPPER ROGUE

The major asset, exclusive of water, available as a base for industrial growth in the Upper Rogue sub-basin is the timber resource. Utilization of this resource can be classified in a number of ways. In this report the categories are primary operations including logging, sawmilling, and plywood production (from veneers to plywood sheets); and secondary processes which are broken into waste utilization and remanufacturing operations. Pulp and paper operations are considered as waste utilization operations on the basis that timber not suitable for saw timber is nonmerchantable and thereby an unusable (waste) product available for pulping operations. Composition board production is classified as a waste utilization activity.

The Upper Rogue sub-basin contains a large supply of saw log timber but increased industrial activity within the sub-basin due to this supply will be slight.

Saw timber cuts during the period following World War II approached and in some years exceeded the estimated sustained yield growth for the Rogue River Basin. Establishment of mill facilities during the past decade have probably provided, in a general sense, the production capacity to handle the sustained yield cuts of the Basin. Major expansion of saw timber plants in the sub-basin would replace or restrict existing facilities elsewhere in the Rogue Basin and would represent a shift in economy without a material gain in overall development. Transfers of operations may take place in specific cases where private interest can realize some increase in profit. These activities being limited do not pose problems of material significance. The expansion of this type of development does not involve large quantities of water or insurmountable water quality problems.

The assumption of a limited increase in rate of harvesting of saw timber is predicated on the application of sustained yield operations to the timber utilization of the Rogue River Basin. Approximately 60 percent of the land in the Upper Rogue sub-basin is held in federal ownership. Since the sustained yield policy of the forest management agencies of the federal government is not likely to change, this major portion of the sub-basin, most of which is saw log timber, is committed to sustained yield operations.

It is anticipated that the private interests holding larger blocks of

land will, as a matter of sound long-range business practice, tend toward sustained yield operations. The smaller holders who cannot operate on the long-range cycle because of financial restrictions represent a segment that cannot be evaluated to any reasonable degree.

Should extraordinary circumstances result in a departure from the sustained yield operation the fact remains that primary timber plant operations generally do not present major problems of water resource management and utilization. Quantitative use is, for a saw log operation, small and qualitative problems are susceptible to control.

Veneer and plywood manufacture in the sub-basin is unlikely because the proximity of the basic resource is not sufficient to compensate for the adverse features affecting site selection in this sub-basin which parallel the adverse features of locating pulp, paper and hardboard operations in the sub-basin. As in the case of sawmill operations the sustained yield program will probably place a limit on expansion although the limit may be extended beyond present levels by virtue of log upgrading, improved patching procedures, and the combination with plywood backing of other surface facing materials. Although quality problems exist they can be controlled.

Composition board, pulp, and paper operations, are not promising operations for the Upper Rogue area. These operations are eliminated from consideration because the area offers no material advantage over downstream locations. The area has limited rail facilities, limited highway facilities (poor alignment, bad grades, inadequate width, etc.), rugged terrain limiting site location, and unavailability of semi-skilled and skilled man power all of which are detriments to the location of plants in the sub-basin.

In the case of pulp operations it has been pointed out in the general section that the potential plant capacity for the Basin is 600-625 tons per day which might be concentrated in one mill or at most two. This would indicate that the location of plant facilities in the Medford-White White City-Grants Pass area would serve a larger basic resource area more effectively than a plant in the Upper Rogue sub-basin.

The Big Butte Creek sub-drainage area is served by a logging railroad

but other adverse factors parallel those of the balance of the sub-basin. In addition, deterrents lie in the status of water supplies and water rights on Big Butte Creek and its tributaries. The City of Medford is granted the exclusive right to the waters of Big Butte Creek. Any major industrial expansion in this area requiring water would be subject to acquisition of its supply from the City of Medford.

In view of the water supply situation and less favorable site location factors as compared with central valley potentials, industrial development is expected to be negligible for the Big Butte Creek drainage for the foreseeable future.

The same restrictions outlined for pulp, paper, and hardboard operations apply to remanufacturing potentials in general. There are some possibilities for development of additional industrial payrolls through integration of remanufacturing with existing mill operations. This potential does not appear to be large in this sub-basin nor does it warrant more extensive investigation as its effect on the water resources picture is minor. Hardboard operations could conceivably be developed in the downstream section of the sub-basin. This should not be of concern as hardboard or particle board processes are available that do not create major water problems.

Increased activity should be experienced in salvage (relogging) operations in the Upper Rogue sub-basin due to the expansion of waste utilization operations elsewhere in the Basin. Field pulp supply operations will provide more employment but on a less stable basis than mill operations. The expansion of this activity should not create major water resource problems.

Available data indicates that problems resulting from use of timber resources of the Upper Rogue area will not be significant within the sub-basin itself because timber processing operations are unlikely to be located in the area.

There are indications that a potential exists in the sub-basin for development in the mineral industries field. Known assets indicated by the Oregon Department of Mines and Mineral Industries are gold, semi-precious stones, and pumice deposits. Under federal controls relating to gold, major industrial expansion in this direction is doubtful. Industrial potential as related to

semi-precious stones has not been determined. Its effect on the water resource picture is assumed to be negligible in light of existing knowledge.

The development of the pumice deposits of the area, while representing a potential, will need to be evaluated against the comparative economy of the use of similar deposits in other watersheds, some of which have more advantageous rail and road facilities, better terrain for mining operations, etc. It is assumed that the needs developed by the utilization of this asset will not be significant in the foreseeable future.

Future industrial development, in general, within the Upper Rogue Basin should have little effect on the quantity and quality of the water resources of the area providing reasonable control of the limited industrial growth by agencies charged with water resource regulation is continued. The amount, distribution with respect to time, and quality aspects of the water resource will be a significant factor if not the most important factor of industrial development downstream.

Mining

According to the State Department of Geology and Mineral Industries, mineral deposits of significance in this area are those of gold, pumice, and semi-precious gems. The probability of development of these deposits is discussed above. Mineral deposits and active mines and mills in the Rogue Basin were shown in Figure 17.

Recreation

Recreational needs for the area's population is slight although the region is heavily used by tourists. Many of the best locations for camps and parks along the Rogue main stem have already been developed. Increasing pressure on such developments will require expansion of the facilities to their fullest potential.

There are no roads providing access to the small lakes lying on the Cascade Divide and these areas are visited only by hiking enthusiasts.

Storage reservoirs for multipurpose uses would help to meet the recreational needs of the Basin.

Wildlife

Wildlife needs will probably remain static unless their habitat is appreciably changed by future developments which now seem unlikely.

Fish Life

If the existing characteristics of the stream system remain unaltered, changes in the fishery resource could result primarily from increasing fishing pressure. One possible means of maintaining, or even improving, the fish runs is by use of off channels spawning beds.

Construction of storage reservoirs in this region would enhance the fishery resource by making it possible to meet desirable base flow requirements in locations where insufficient summer flows exist. These locations were discussed in the section on fish life existing needs and are shown in Figures 75-79. Such reservoirs would reduce the miles of streams available to migratory fish and the area of spawning gravel within the reservoir would be inundated but the usable area downstream would increase due to higher flows.

Pollution Abatement

Requirements for pollution abatement will not increase much over the present level in view of the small potential for population, industrial and mining expansion all of which are contributors to pollution.

Flood Control

Because of the limited increase in development anticipated for this area, future needs for flood control will not be much greater than present needs.

However several flood control sites, which would appreciably reduce damages occurring in the more highly developed areas downstream, are located in the Upper Rogue sub-basin. The sites within the sub-basin used in determining the optimum flood control potential of the Rogue Basin are Lewis Creek and Debenger Gap on the Rogue main stem and McNeil, Elk Creek, Trail Creek and Reese Creek on the tributaries.

These were shown in Figure 43. The regulated outflows at these sites for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13.

Currently the Corps of Engineers is studying the Lost Creek, Elk Creek and McNeil sites as an alternate to the Lewis Creek proposal by the Bureau of Reclamation in 1948.

UPPER ROGUE

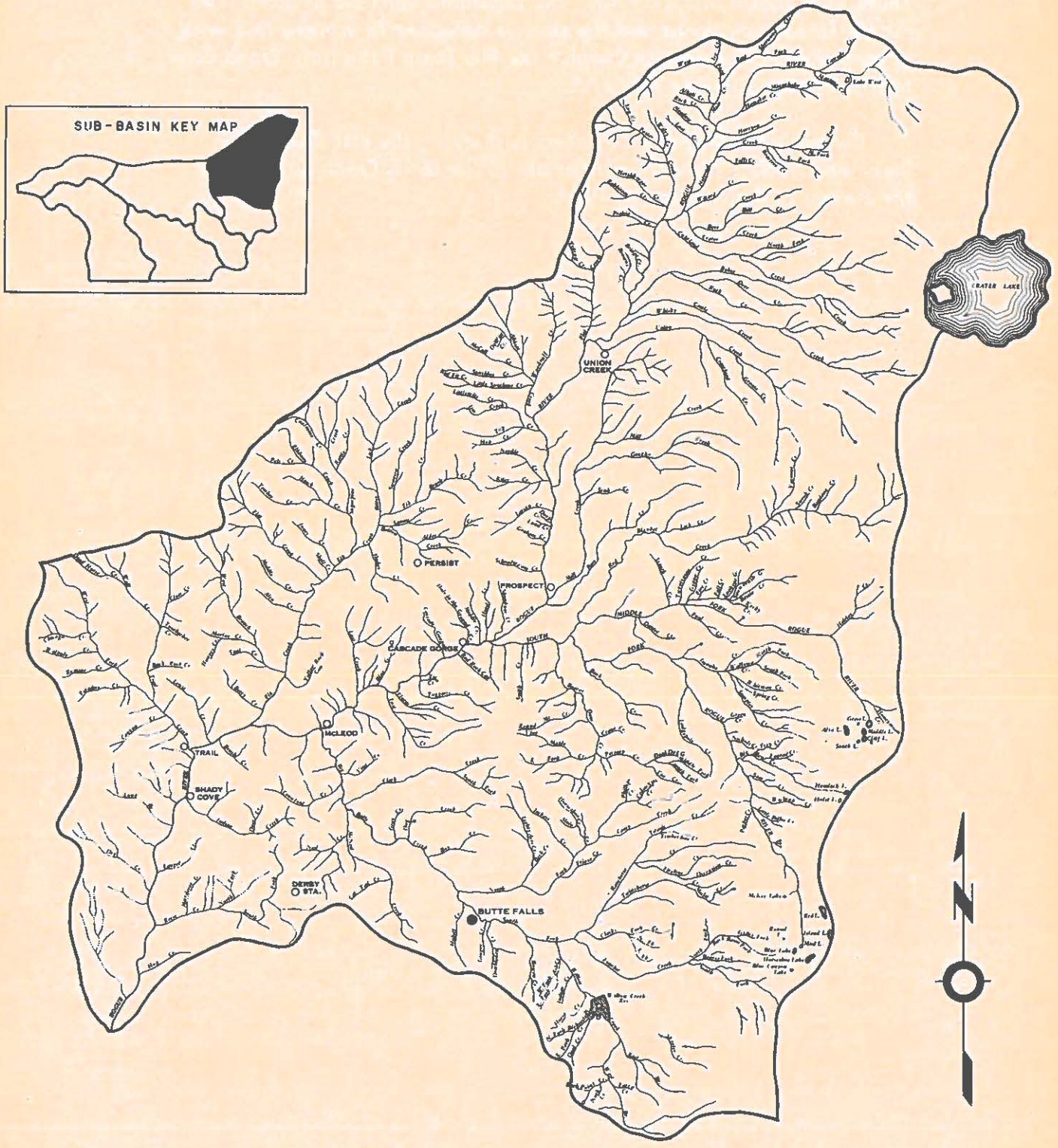
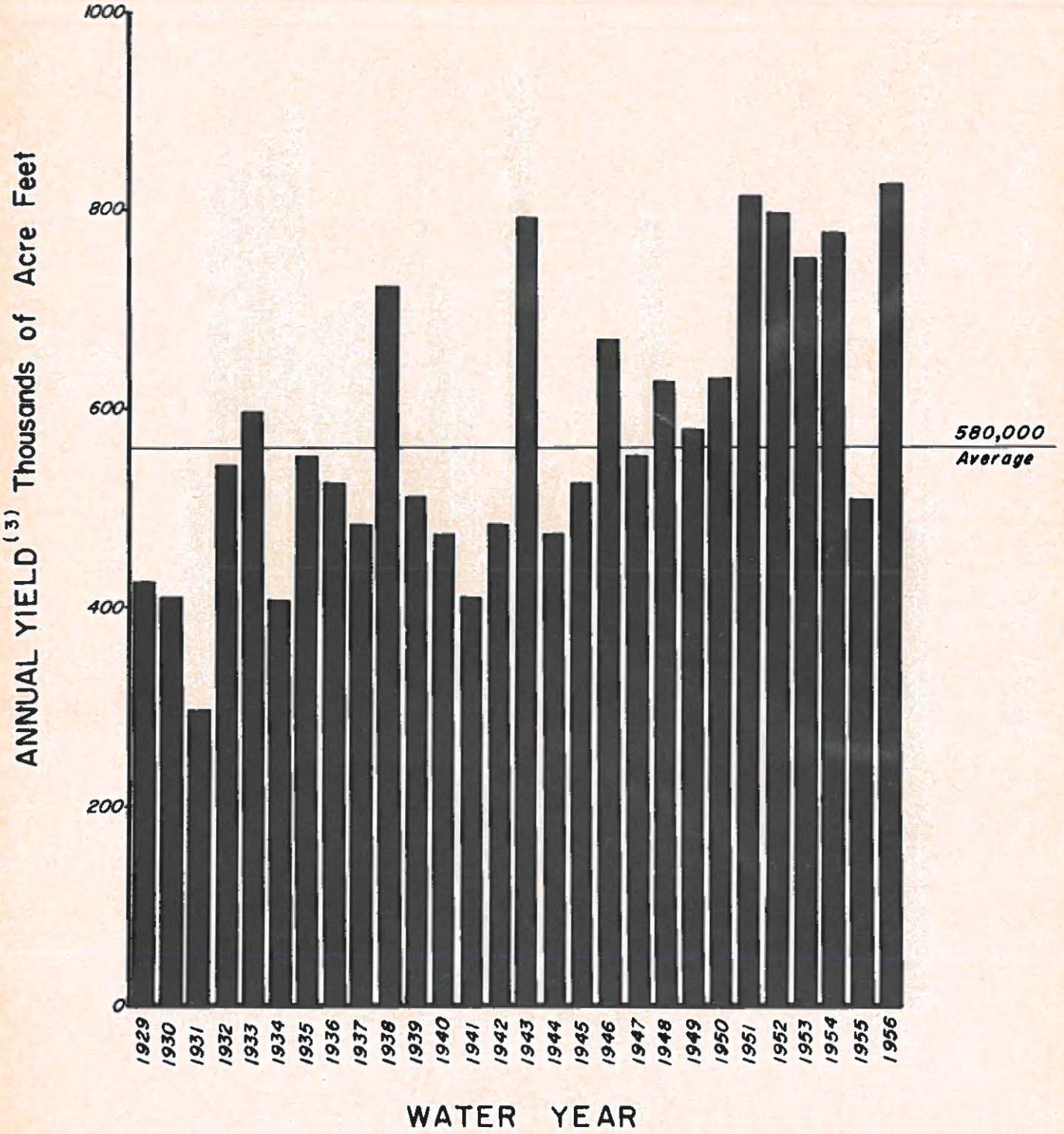


FIGURE 44

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(3)
OF
ROGUE RIVER ABOVE MILE 174

Drainage Area 332 Sq. Mi.



(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

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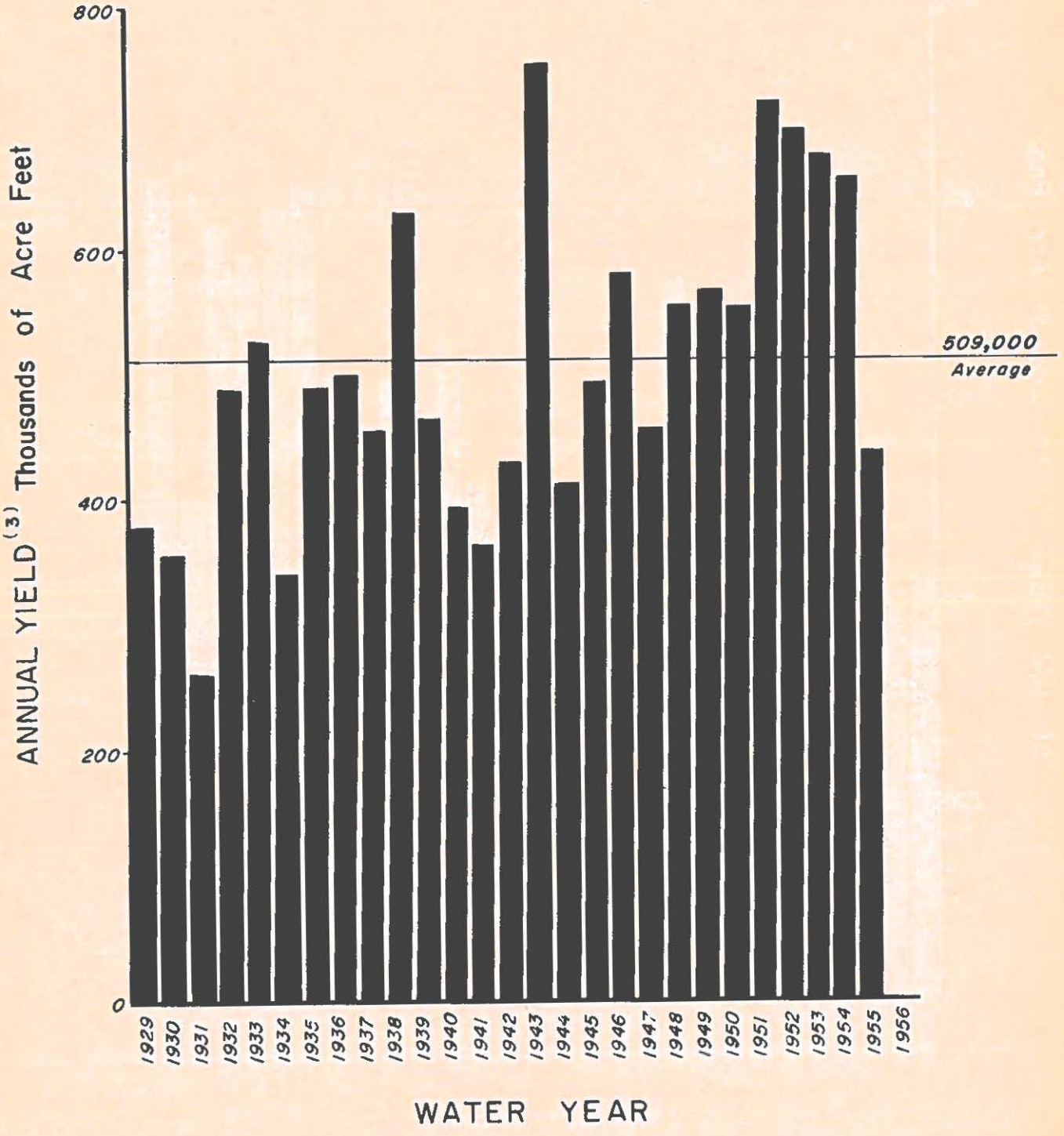
File No. 15.220

FIGURE 45

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
SOUTH FORK ROGUE RIVER

Drainage Area 245 Sq. Mi.



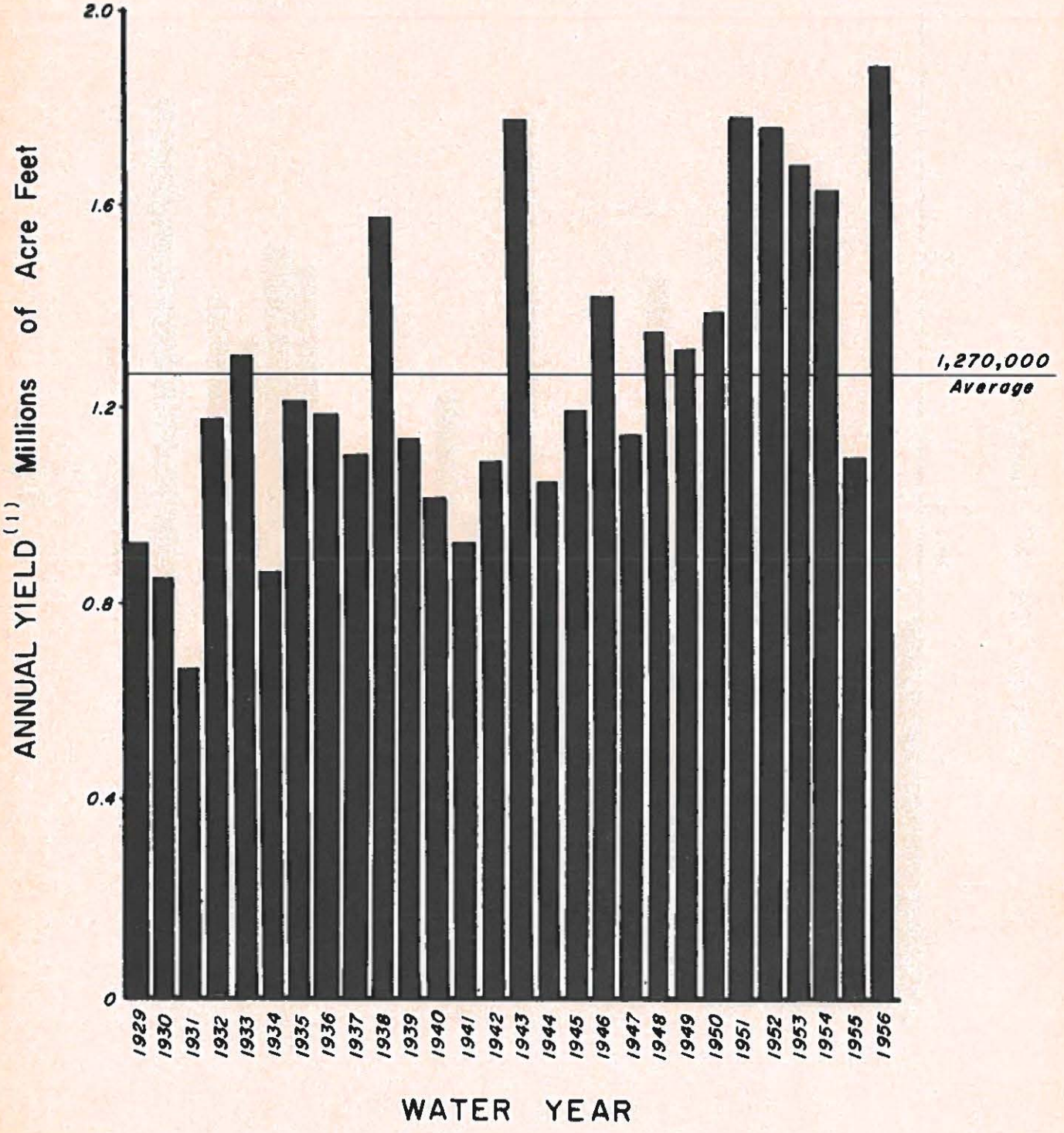
(3) Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.

Drawn 6-10-58
File No. 15.220

FIGURE 46

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(1)
OF
ROGUE RIVER ABOVE MILE 164

Drainage Area 643 Sq. Mi.



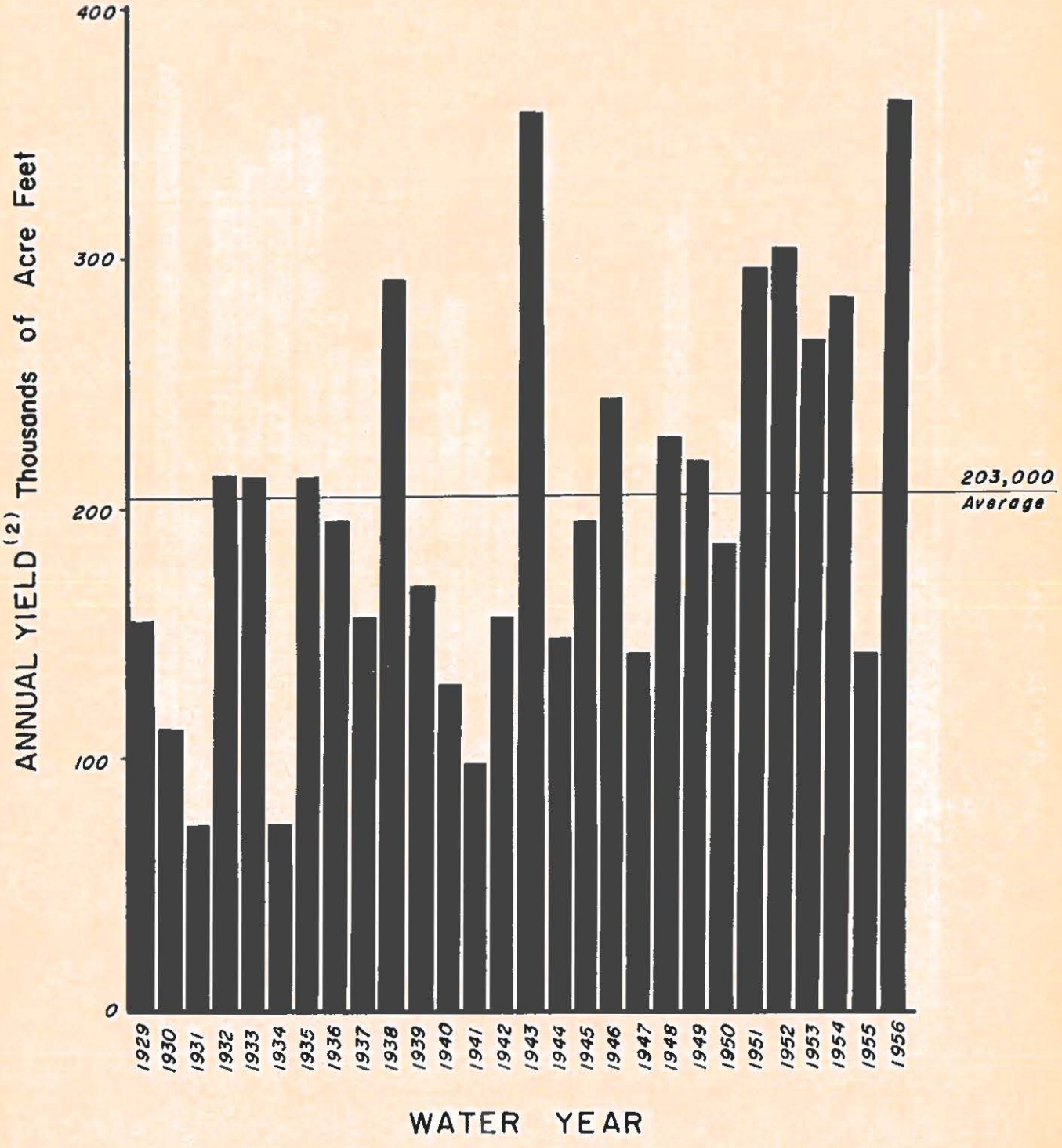
(1) Determined directly from USGS Water Supply Papers for all years.

Drawn: 6-14-58
File No. 15.220

FIGURE 47

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[2]
OF
BIG BUTTE CREEK

Drainage Area 253 Sq. Mi.



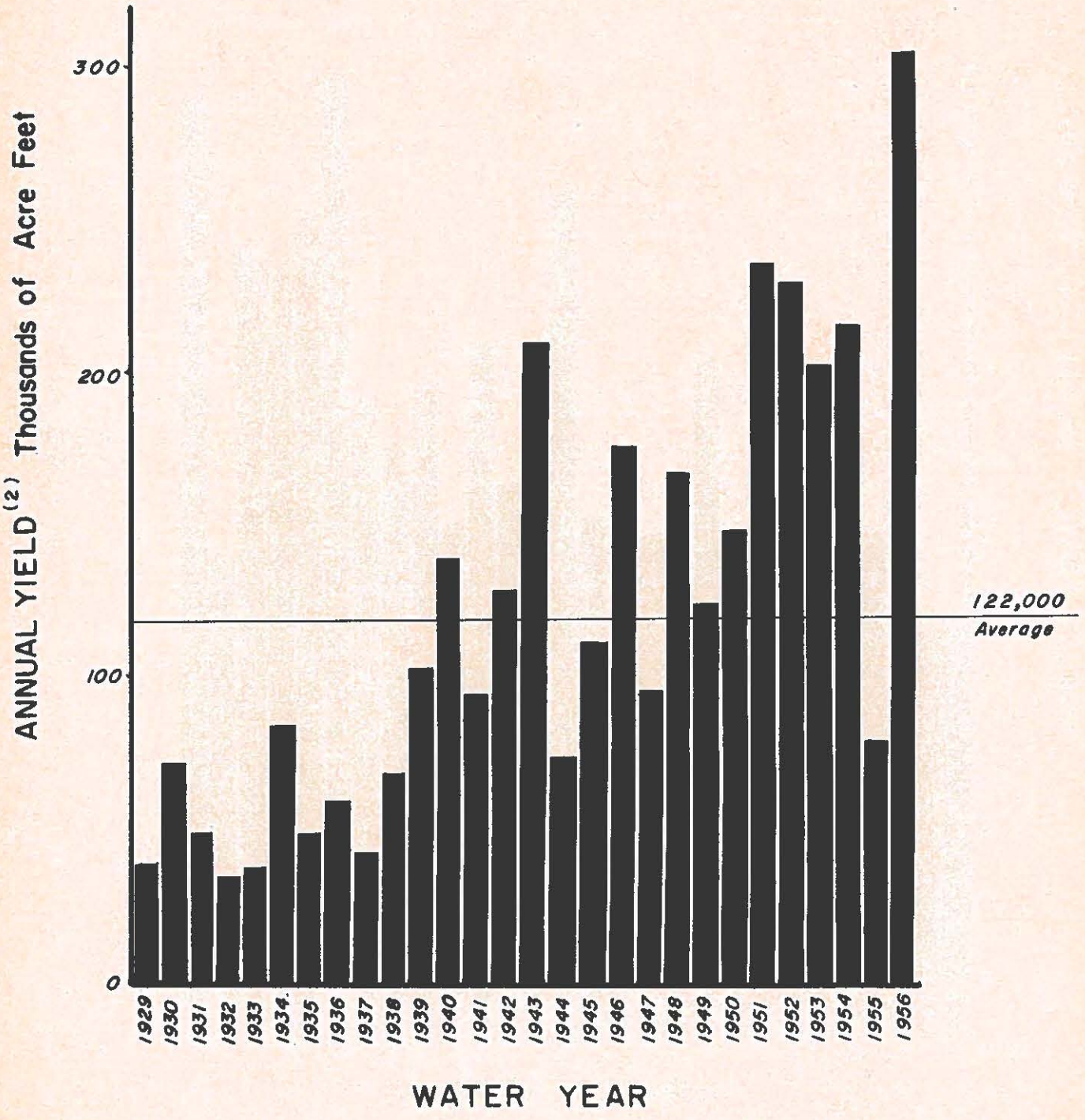
(2) *Determined directly from USGS Water Supply Papers for years of record. Direct stream flow correlations used for remaining years.*

Drawn 6-11-58
File No. 15.220

FIGURE 48

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[2]
OF
ELK CREEK

Drainage Area 135 Sq. Mi.



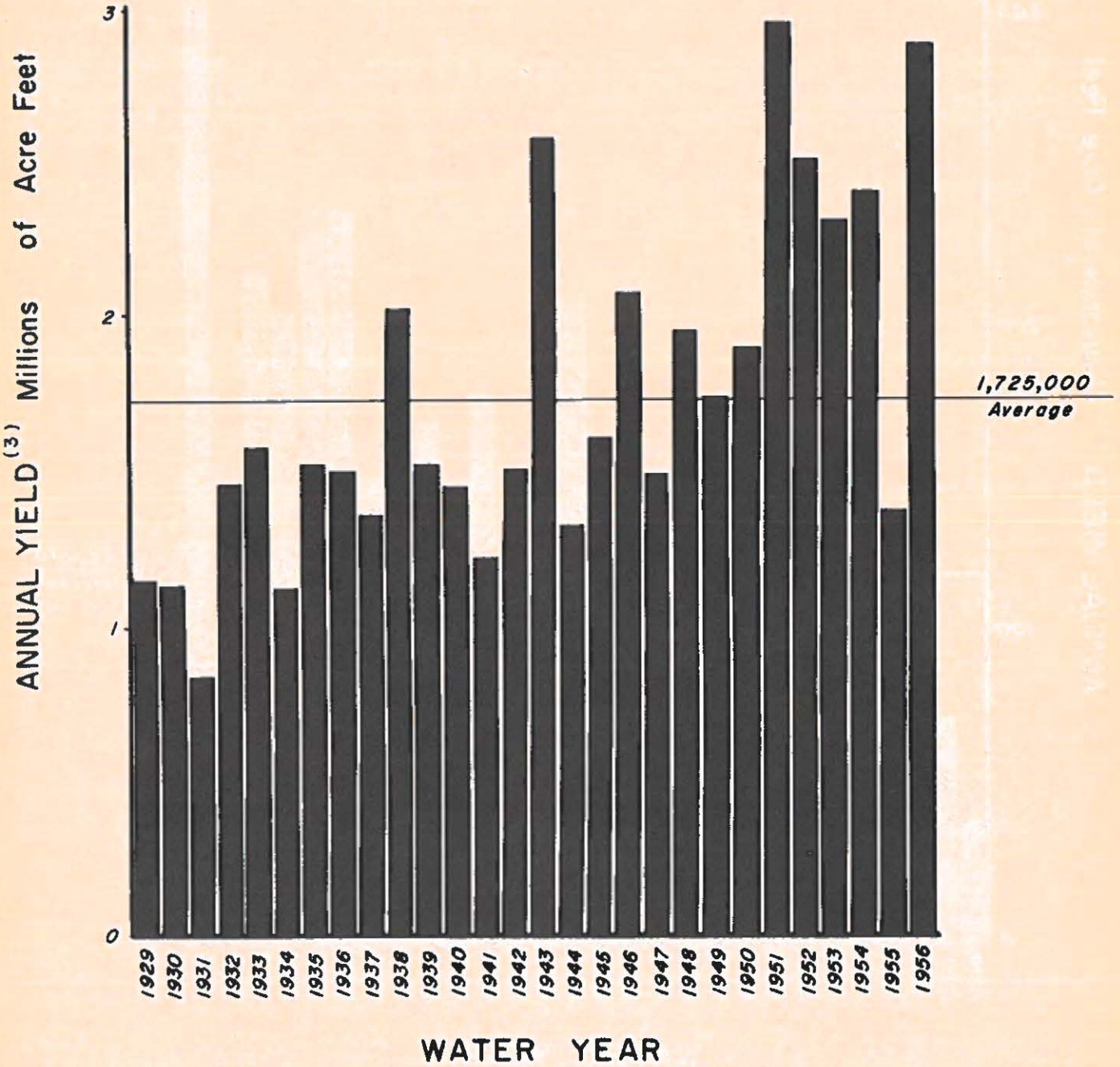
(2) *Determined directly from USGS Water Supply Papers for years of record. Direct stream flow correlations used for remaining years.*

Drawn: 6-11-58
File No. 15.220

FIGURE 49

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
ROGUE RIVER ABOVE DODGE BRIDGE

Drainage Area 1210 Sq. Mi.



(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

Drawn: 6-11-58
File No. 15.220

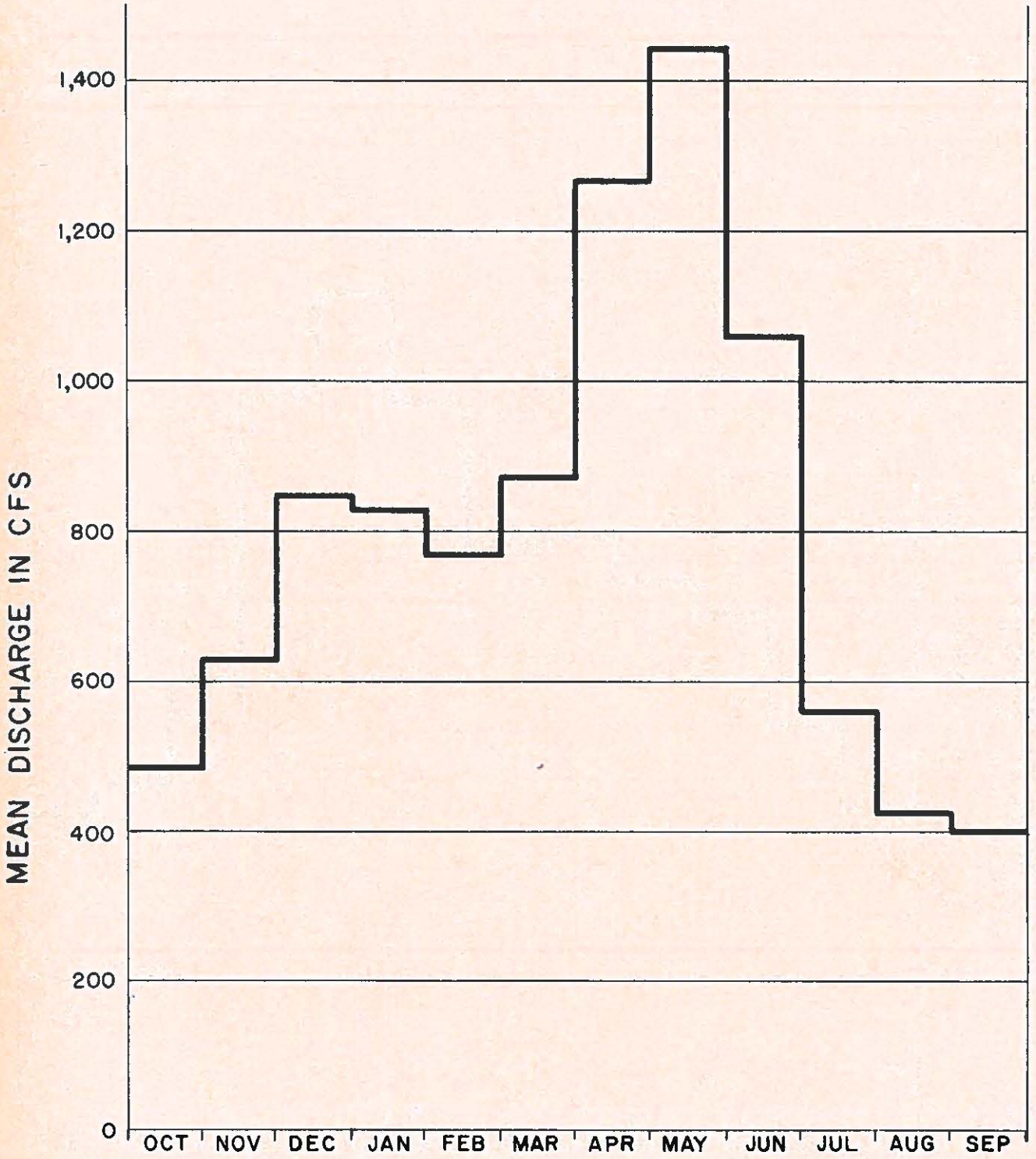
FIGURE 50

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER ABOVE MILE 174

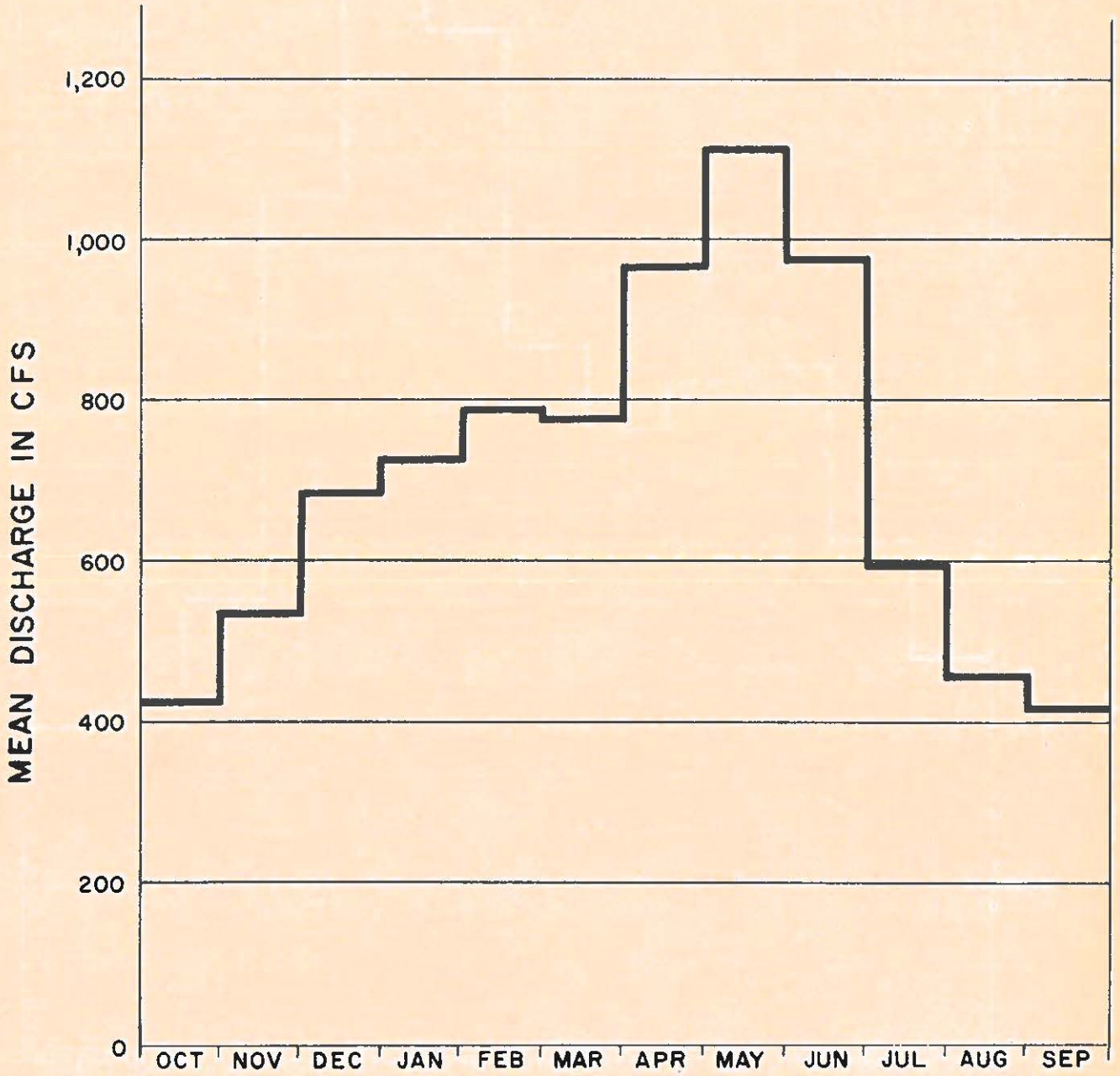
1929 - 1956



Drawn Aug. 15, 1958
File No. 15.202

FIGURE 51

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
SOUTH FORK ROGUE RIVER
1929 - 1955



Drawn Aug. 18, 1958
File No. 15.202

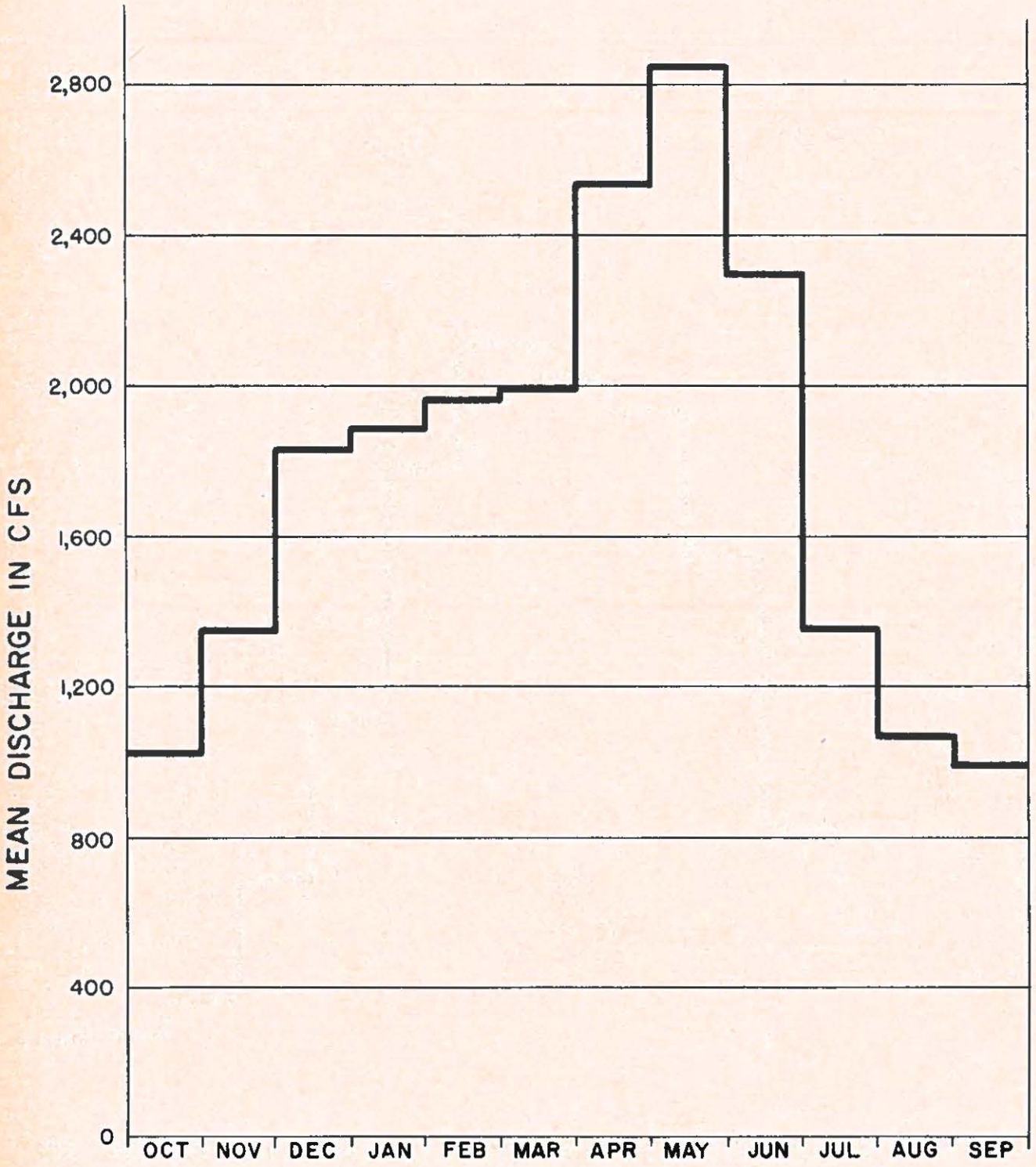
FIGURE 52

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER ABOVE MILE 164

1929 - 1956



Drawn Aug. 15, 1958
File No. 15.202

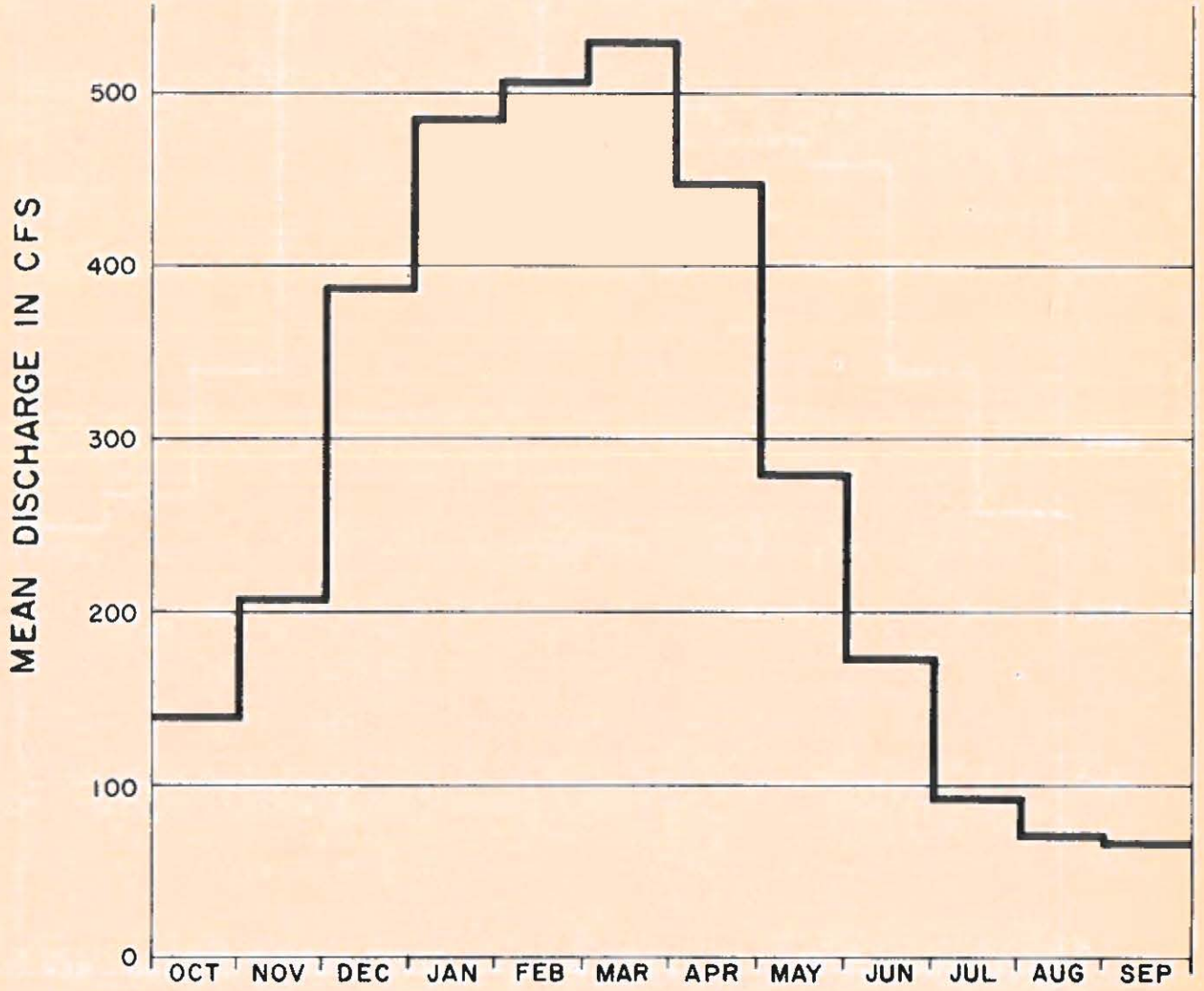
FIGURE 53

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

BIG BUTTE CREEK

1929 - 1956



Drawn Aug. 18, 1958
File No. 15.202

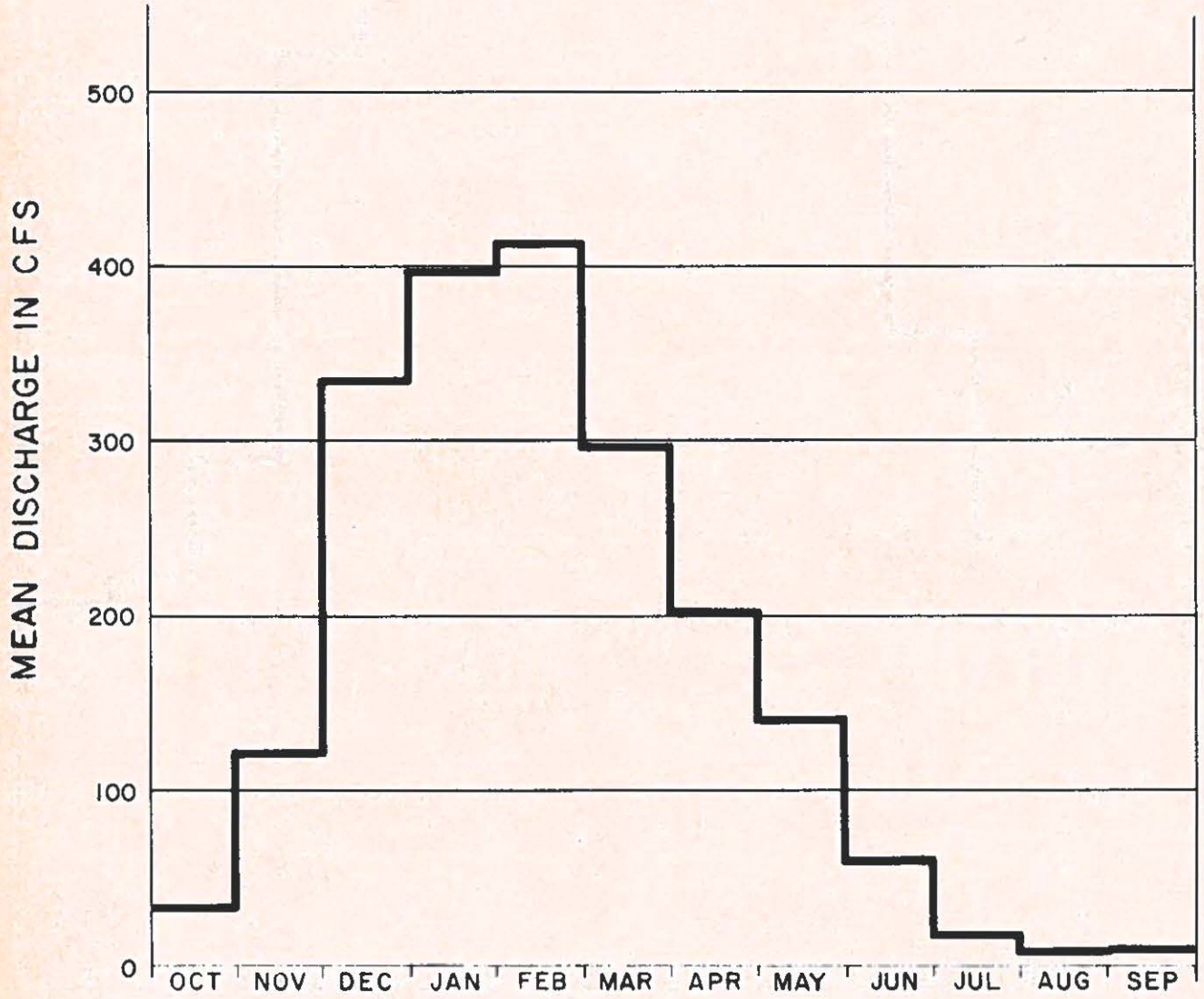
FIGURE 54

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ELK CREEK

1929 - 1956



Drawn Aug. 18, 1958
File No. 15.202

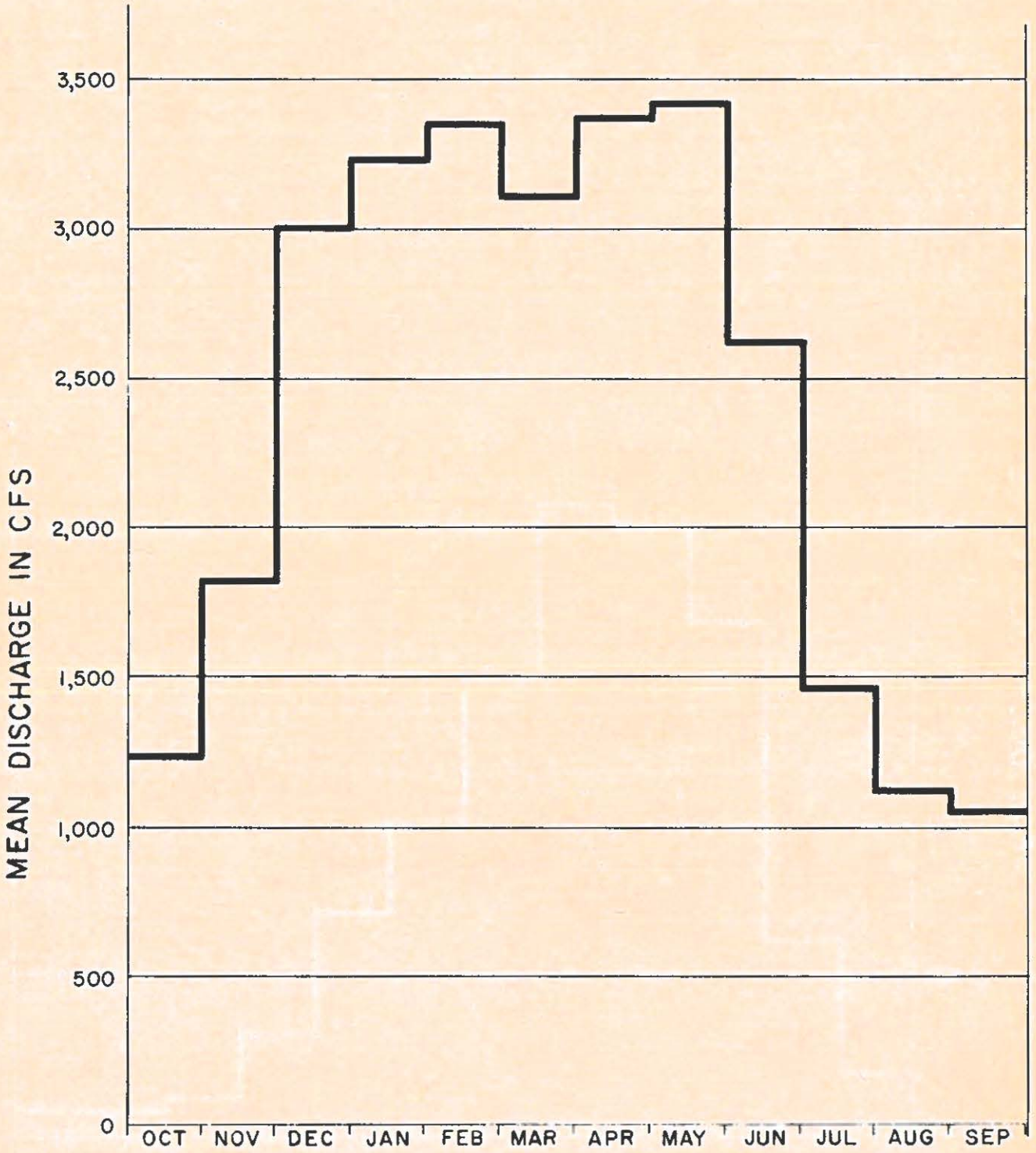
FIGURE 55

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

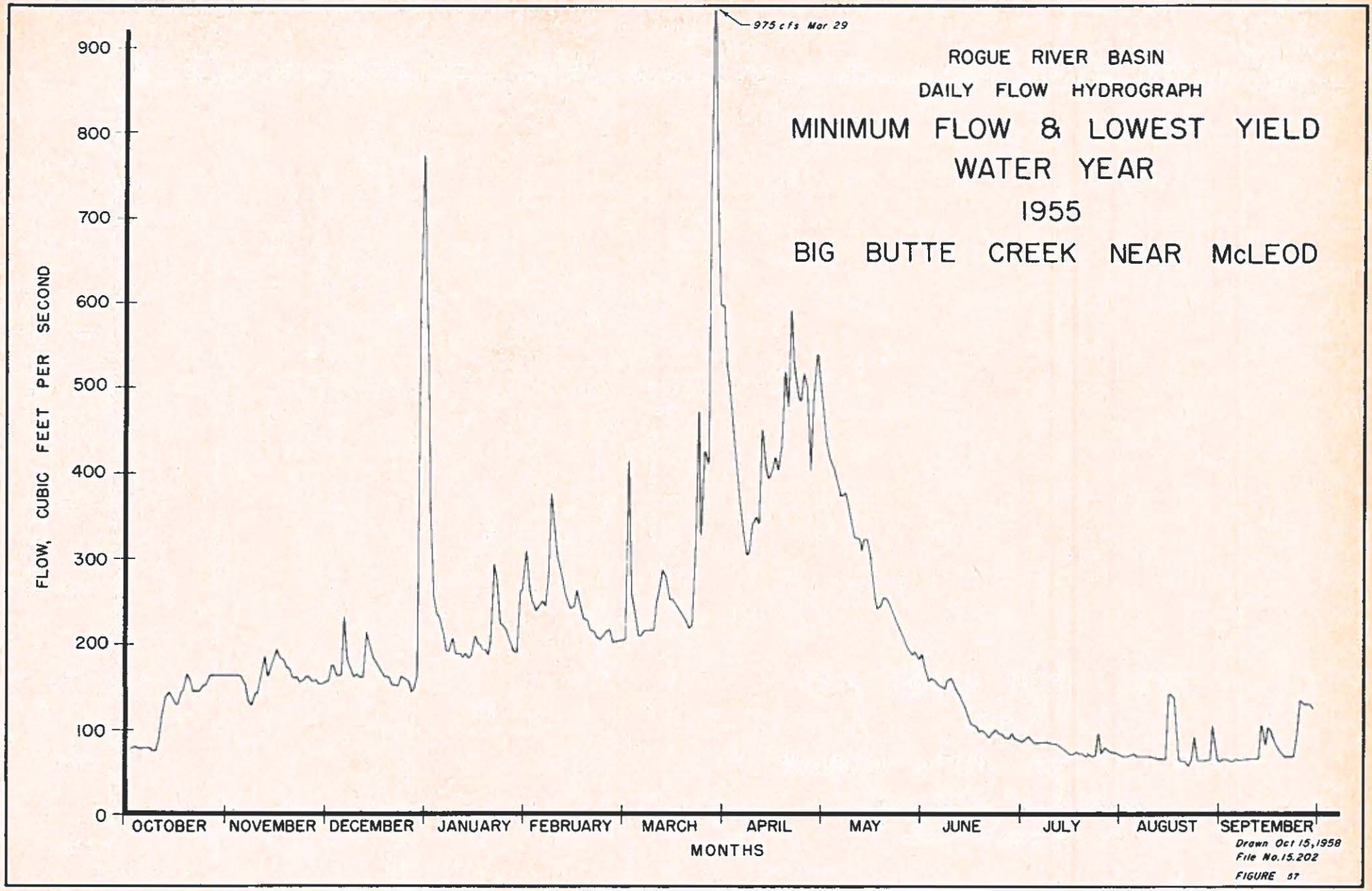
ROGUE RIVER ABOVE DODGE BRIDGE

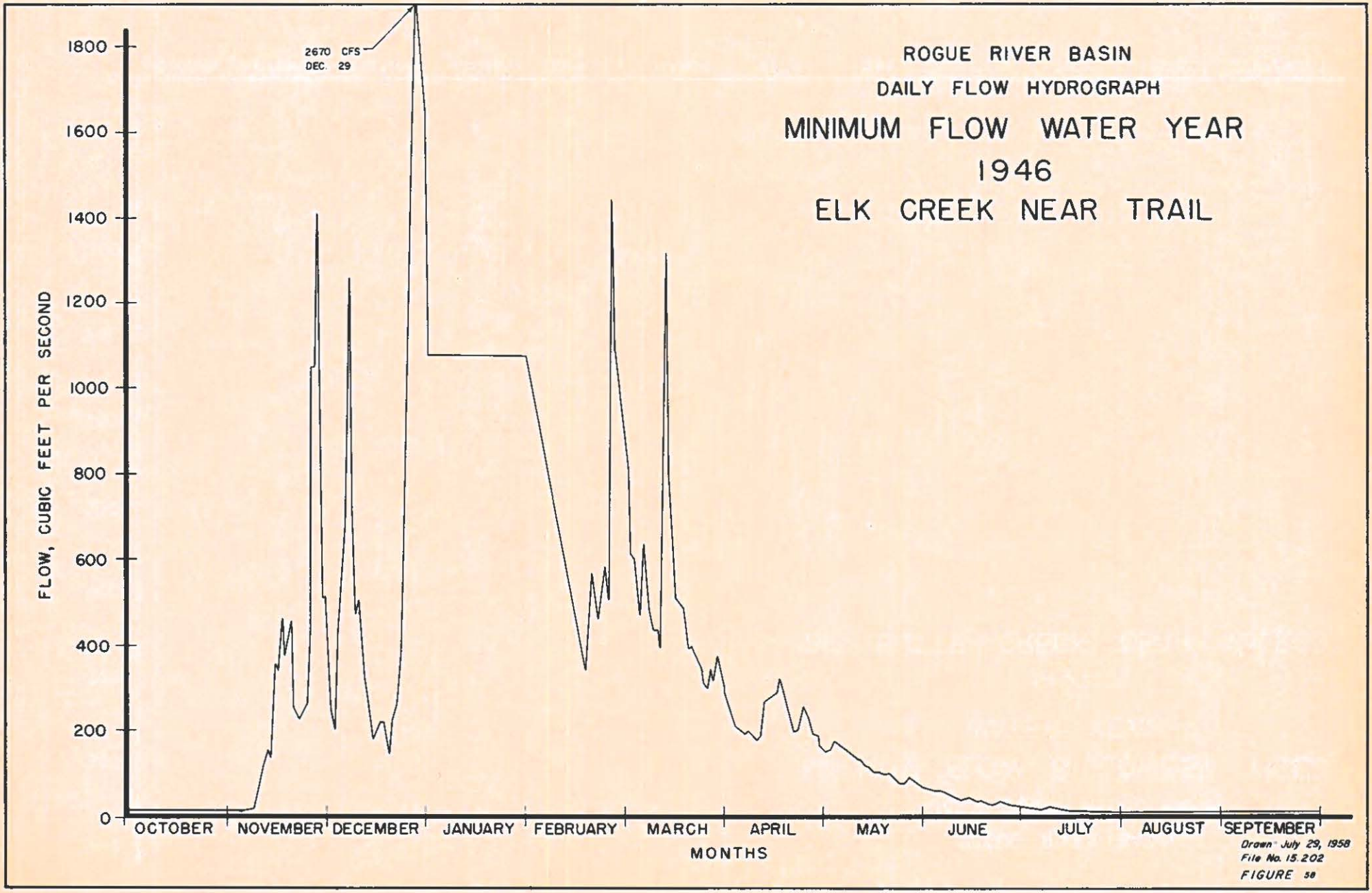
1929 - 1956

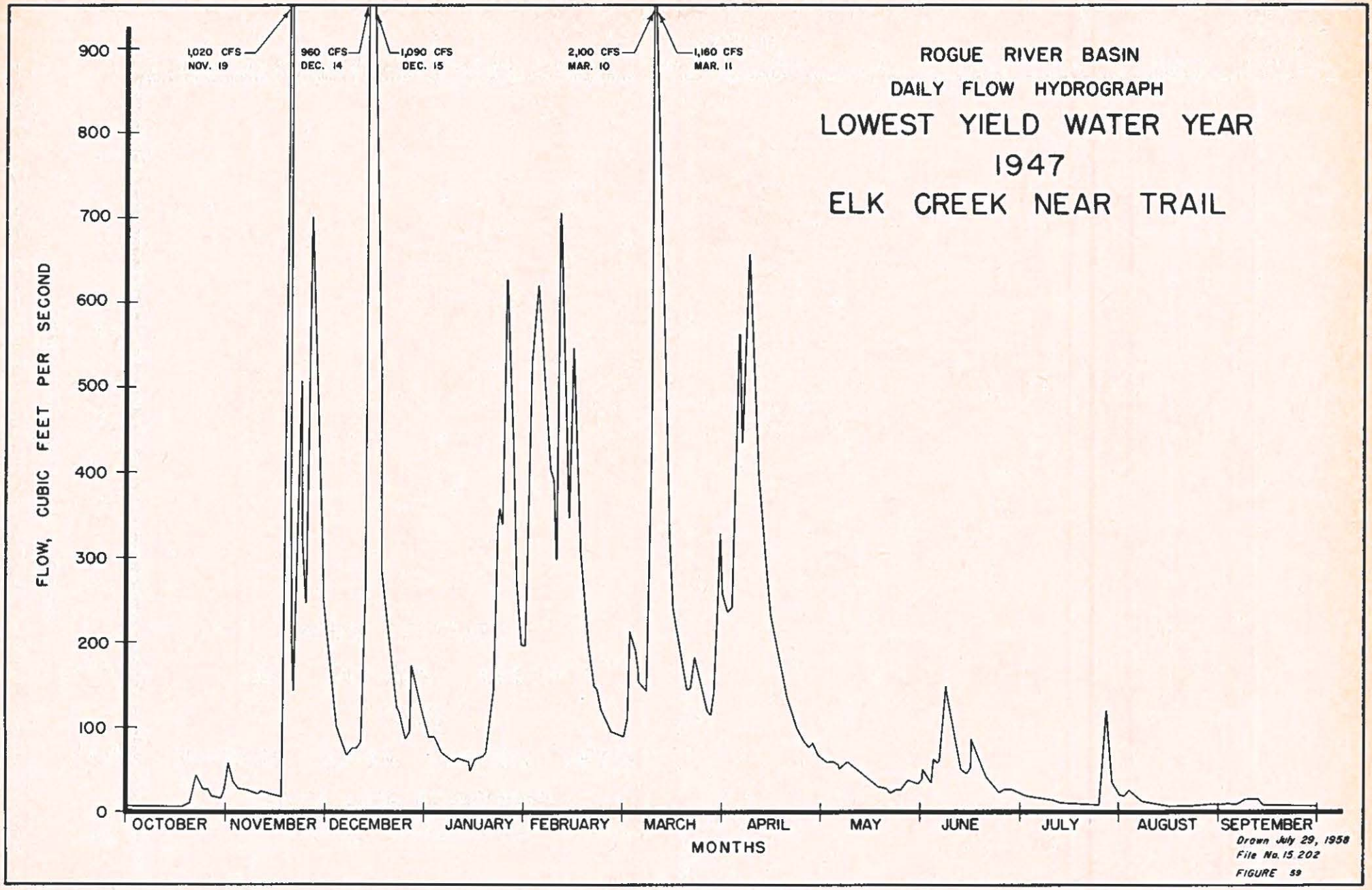


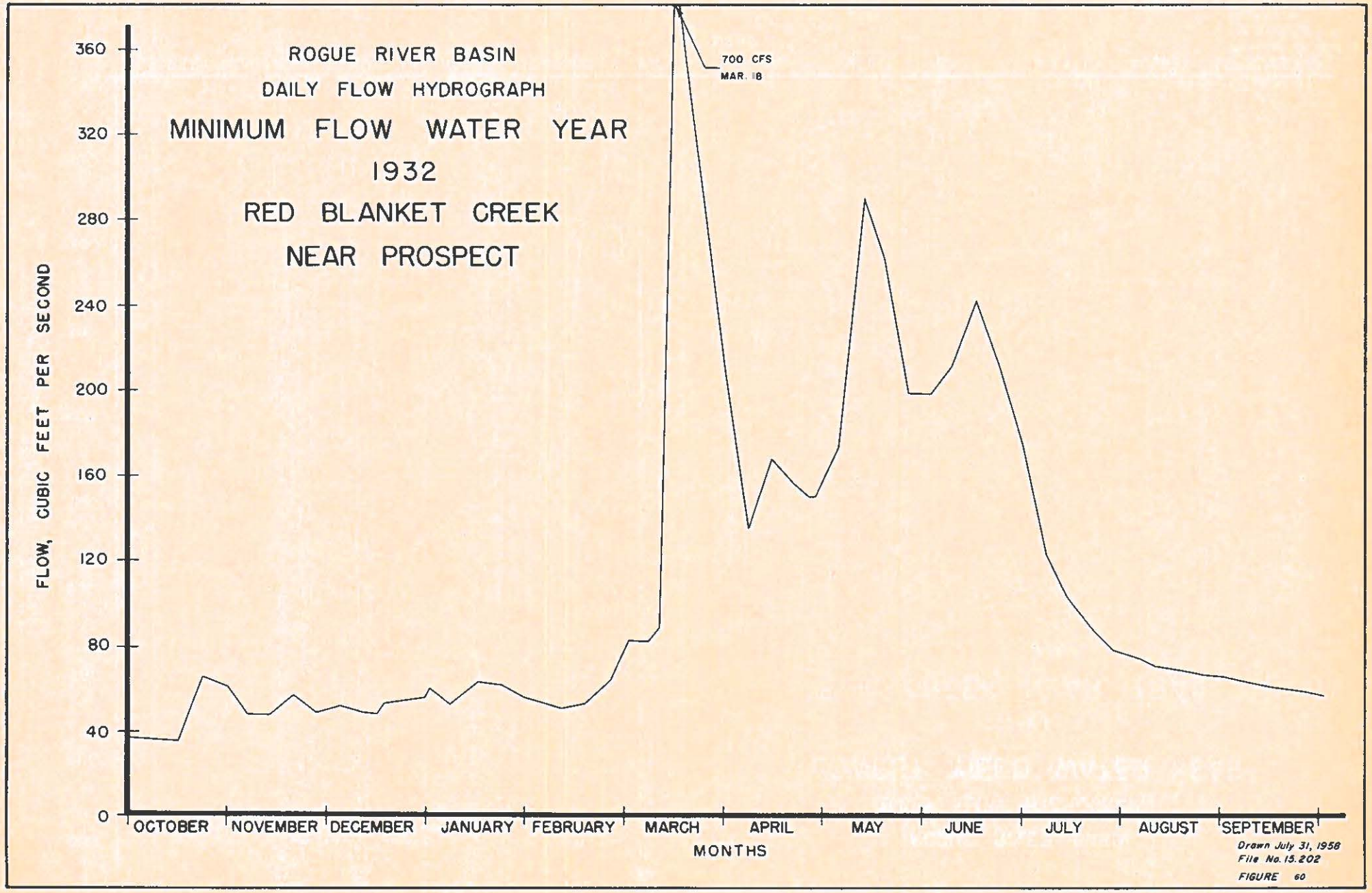
Drawn Aug. 18, 1958
File No. 15.202

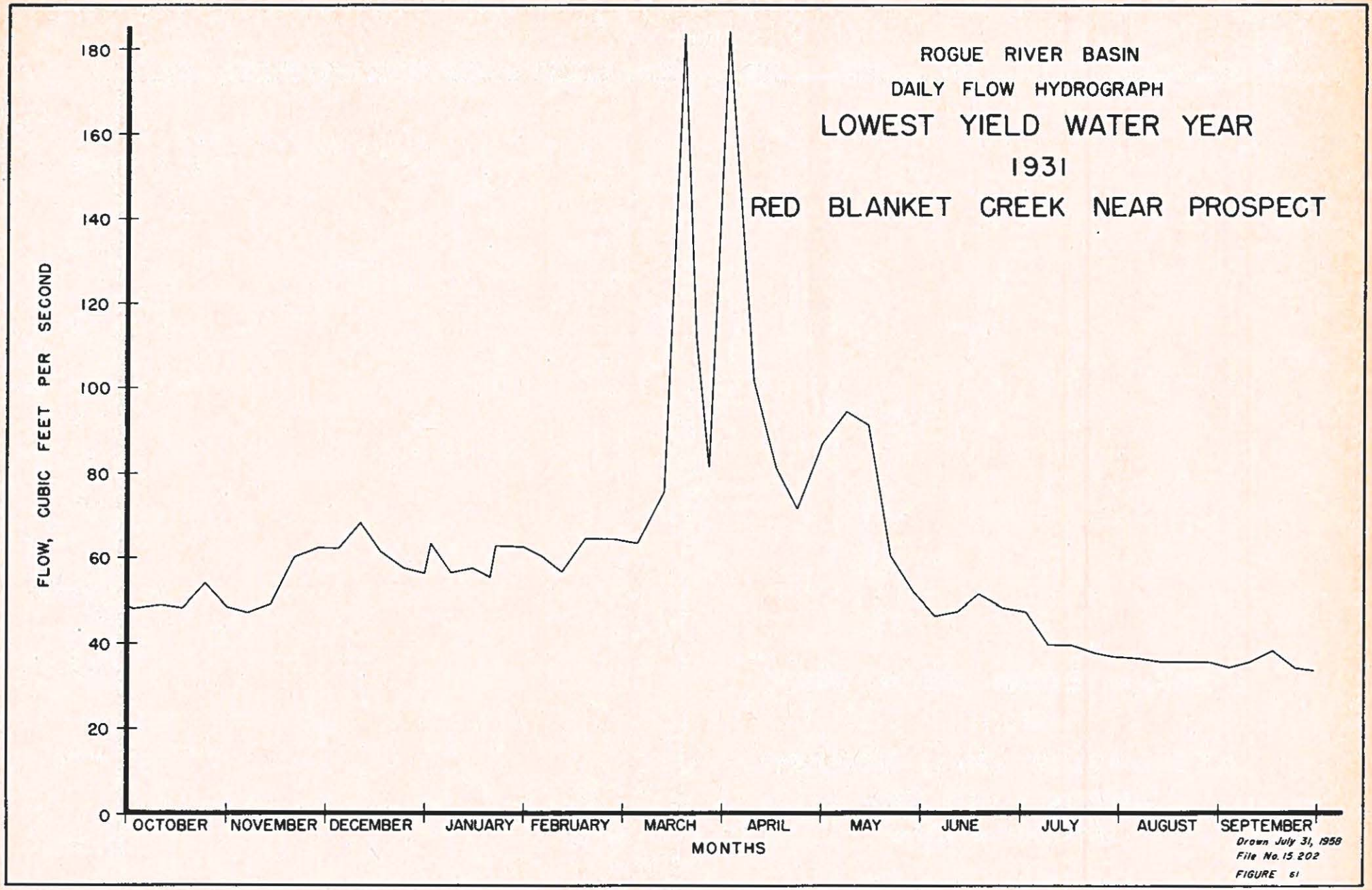
FIGURE 56

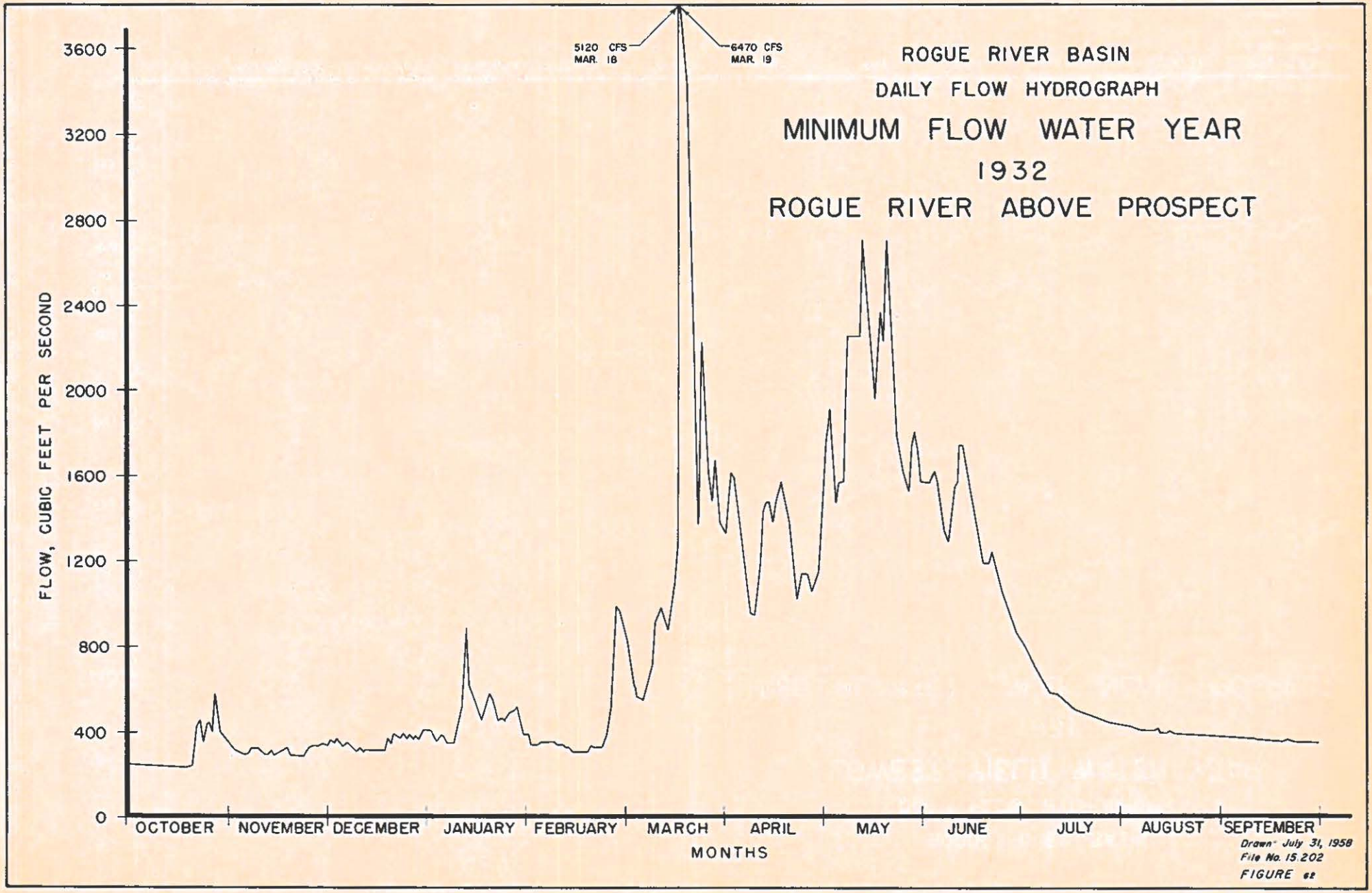

975 cfs Mar 29
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1955
BIG BUTTE CREEK NEAR McLEOD
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Oct 15, 1958
File No. 15.202
FIGURE 57

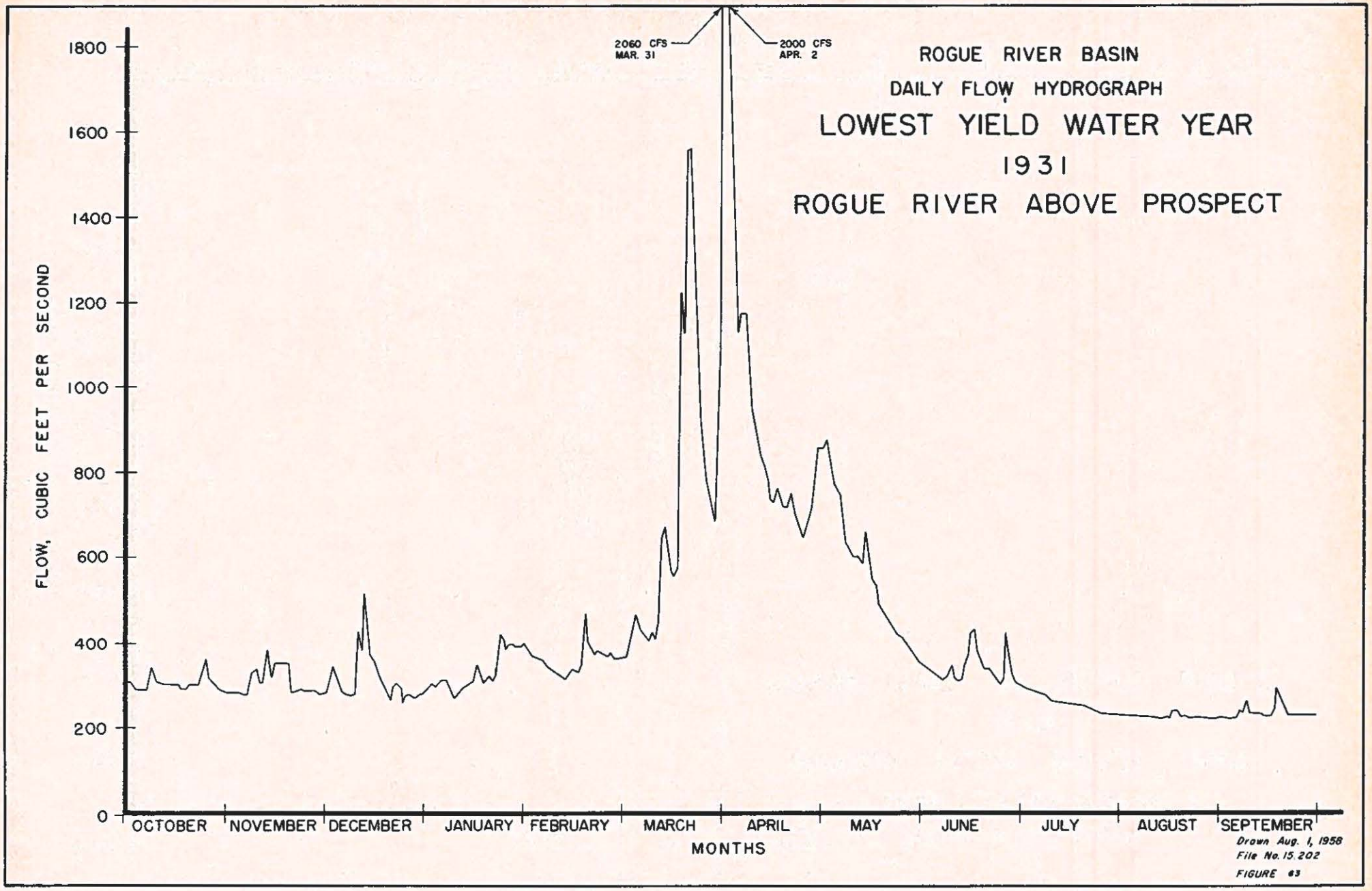

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1946
ELK CREEK NEAR TRAIL
2670 CFS
DEC. 29
FLOW, CUBIC FEET PER SECOND
1800
1600
1400
1200
1000
800
600
400
200
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 29, 1958
File No. 15.202
FIGURE 58

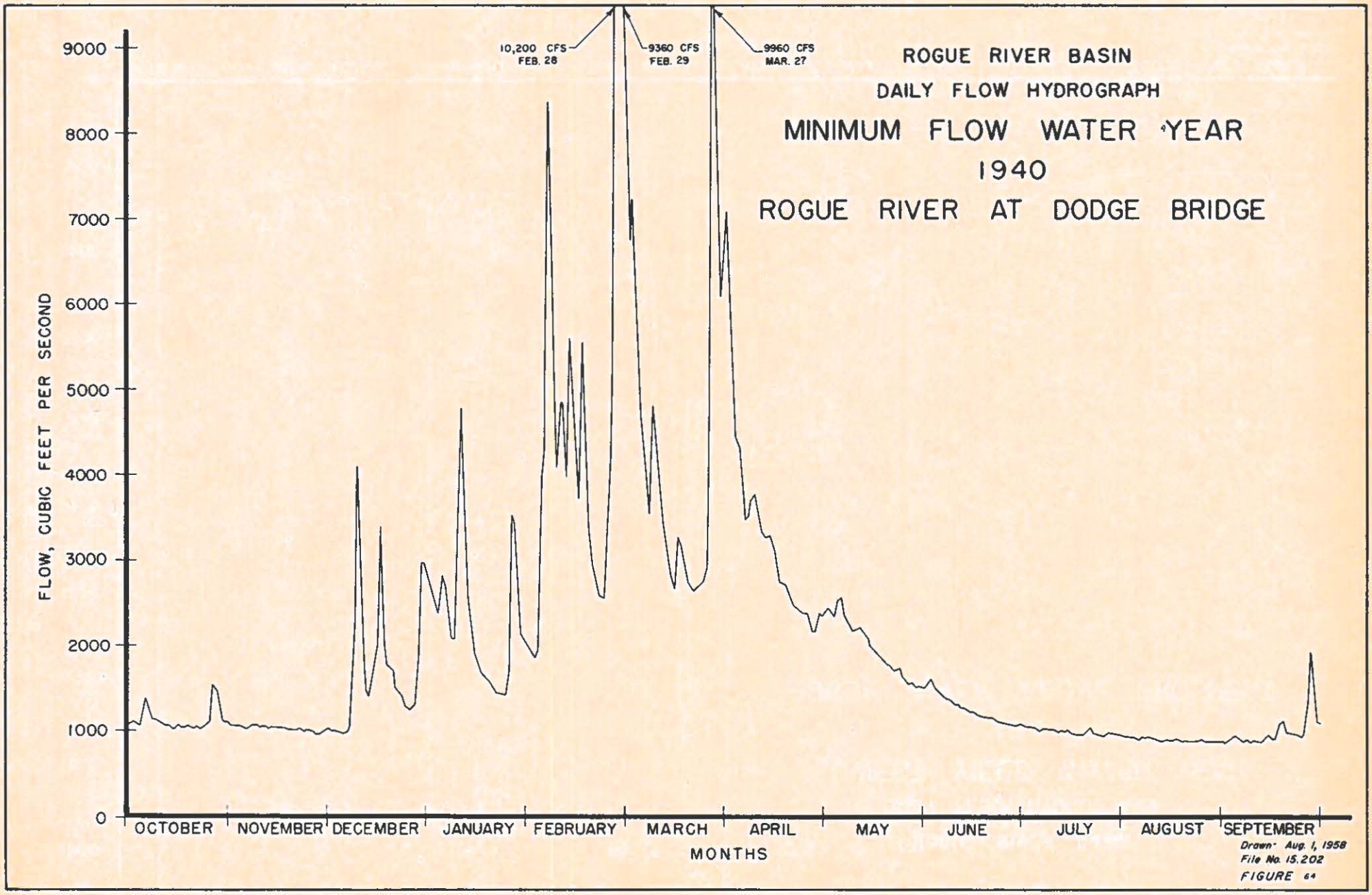

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1947
ELK CREEK NEAR TRAIL
1,020 CFS
NOV. 19
960 CFS
DEC. 14
1,090 CFS
DEC. 15
2,100 CFS
MAR. 10
1,160 CFS
MAR. 11
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 29, 1958
File No. 15.202
FIGURE 59

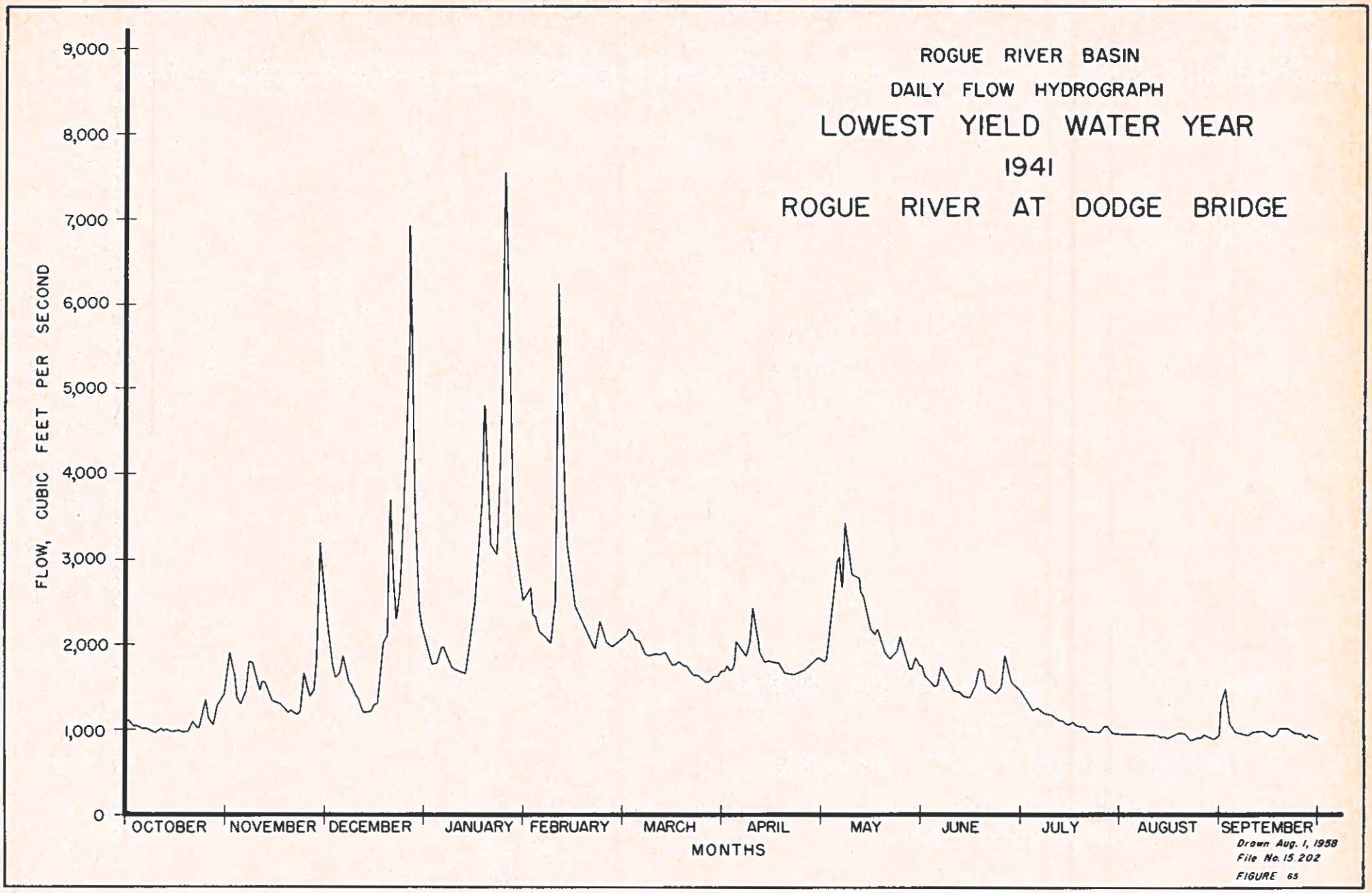

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1932
RED BLANKET CREEK
NEAR PROSPECT
700 CFS
MAR. 18
FLOW, CUBIC FEET PER SECOND
360
320
280
240
200
160
120
80
40
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 31, 1958
File No. 15.202
FIGURE 60

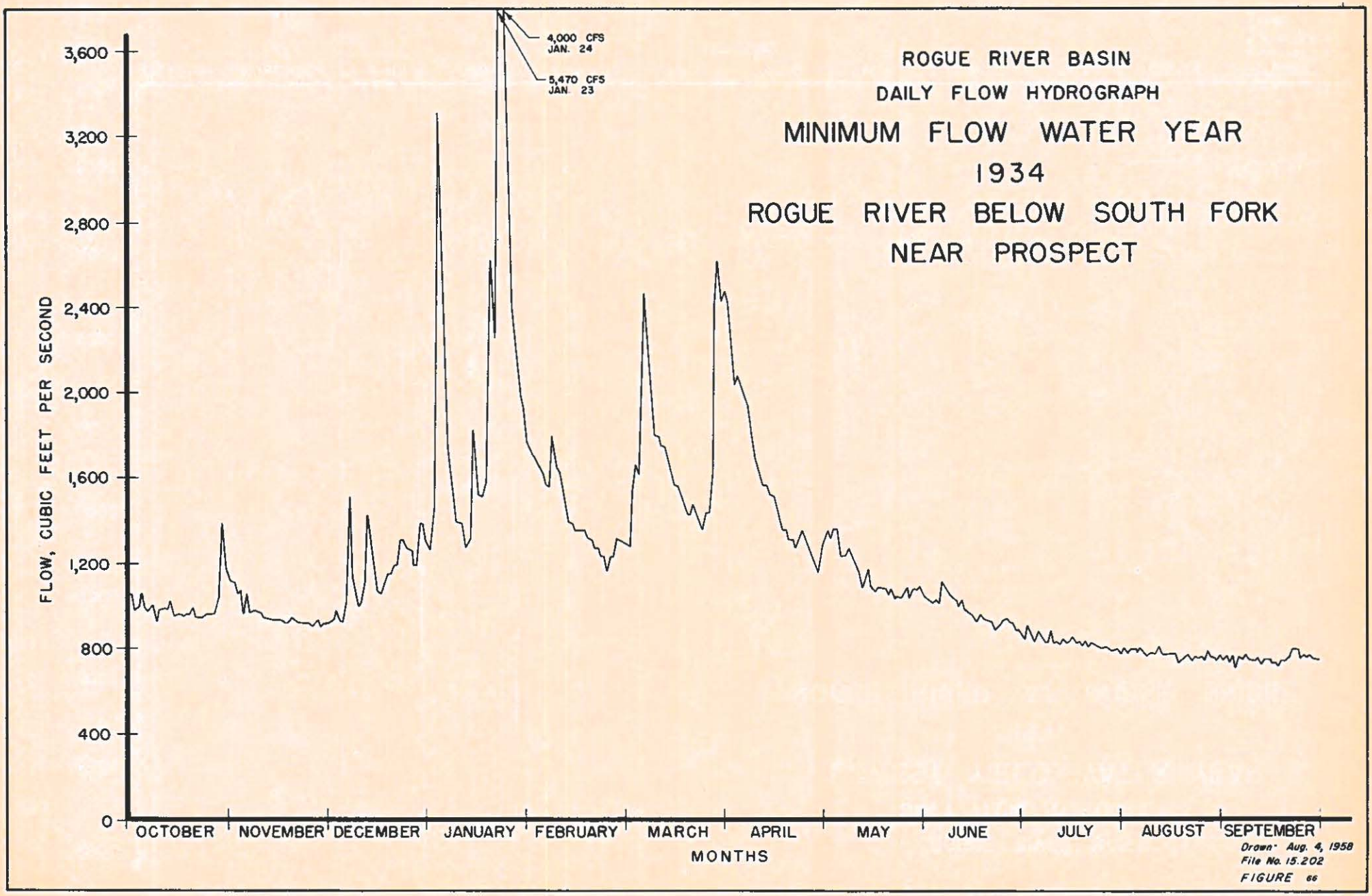

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1931
RED BLANKET CREEK NEAR PROSPECT
FLOW, CUBIC FEET PER SECOND
180
160
140
120
100
80
60
40
20
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 31, 1958
File No. 15 202
FIGURE 61

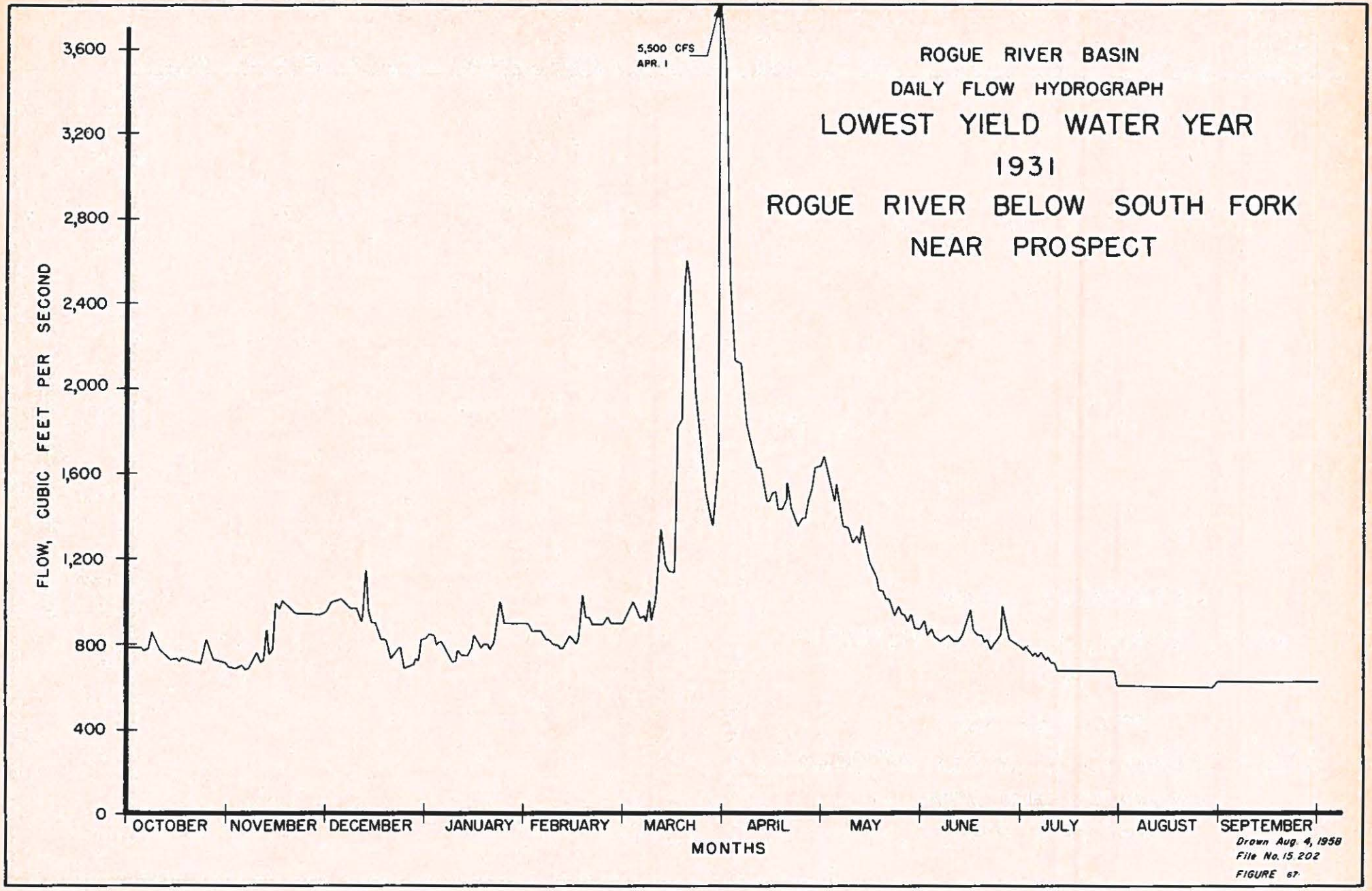

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1932
ROGUE RIVER ABOVE PROSPECT
5120 CFS
MAR. 18
6470 CFS
MAR. 19
FLOW, CUBIC FEET PER SECOND
3600
3200
2800
2400
2000
1600
1200
800
400
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 31, 1958
File No. 15.202
FIGURE 62

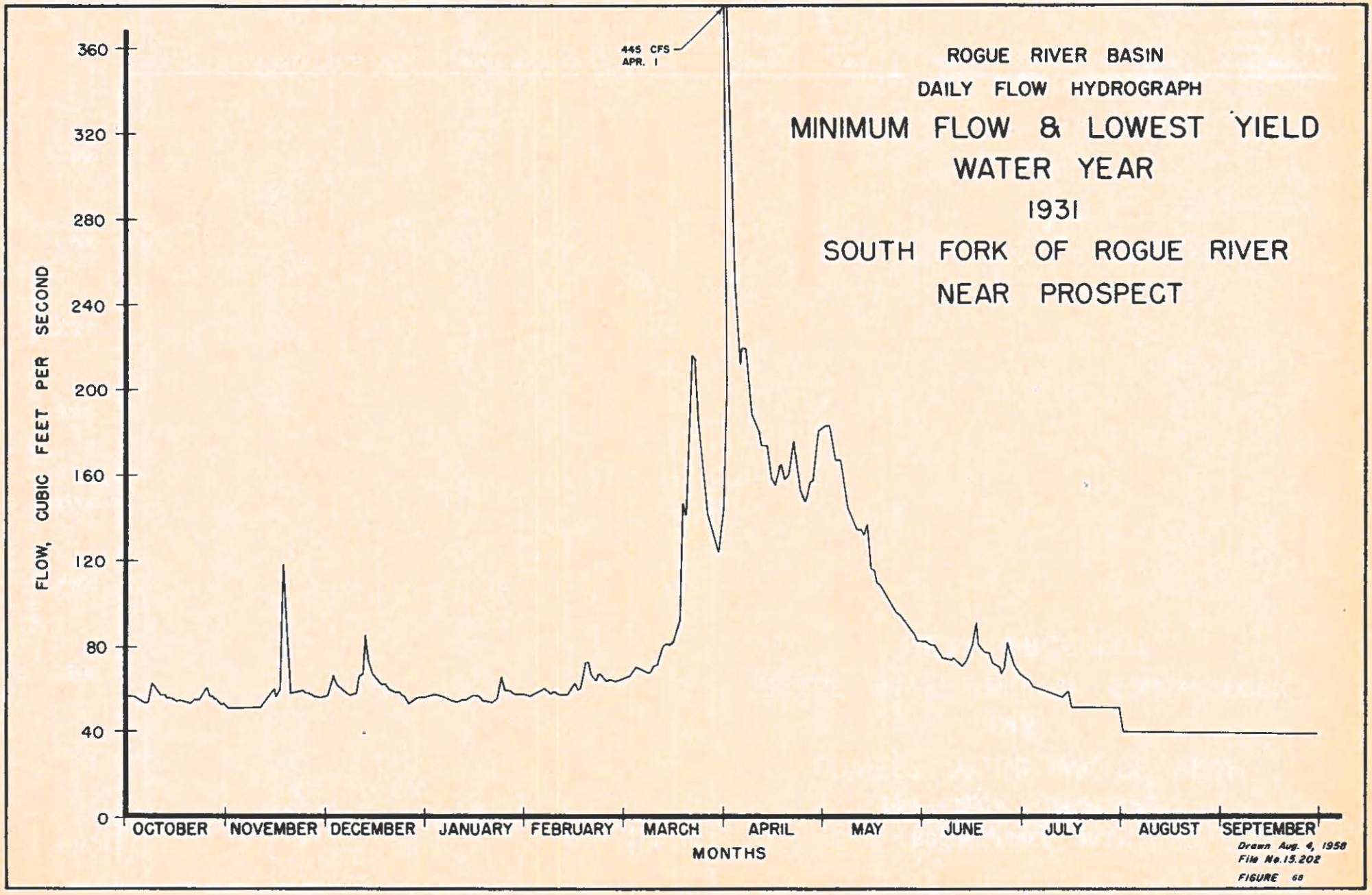

2060 CFS
MAR. 31
2000 CFS
APR. 2
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1931
ROGUE RIVER ABOVE PROSPECT
FLOW, CUBIC FEET PER SECOND
1800
1600
1400
1200
1000
800
600
400
200
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 1, 1958
File No. 15.202
FIGURE 63

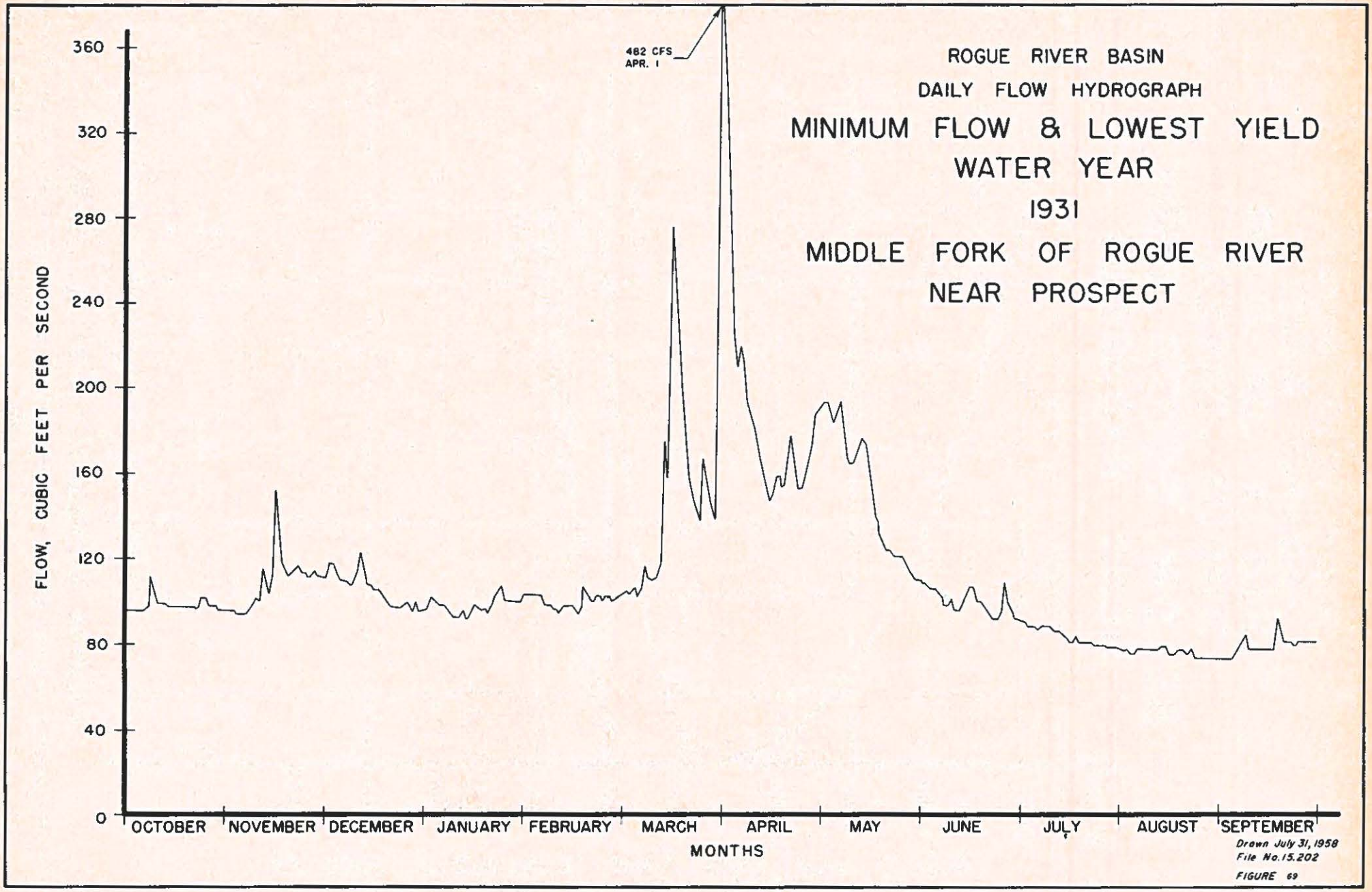

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1940
ROGUE RIVER AT DODGE BRIDGE
10,200 CFS
FEB. 28
9360 CFS
FEB. 29
9960 CFS
MAR. 27
FLOW, CUBIC FEET PER SECOND
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 1, 1958
File No. 15.202
FIGURE 64


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1941
ROGUE RIVER AT DODGE BRIDGE
FLOW, CUBIC FEET PER SECOND
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 1, 1958
File No. 15.202
FIGURE 65


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1934
ROGUE RIVER BELOW SOUTH FORK
NEAR PROSPECT
4,000 CFS
JAN. 24
5,470 CFS
JAN. 23
FLOW, CUBIC FEET PER SECOND
3,600
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 4, 1958
File No. 15.202
FIGURE 66


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1931
ROGUE RIVER BELOW SOUTH FORK
NEAR PROSPECT
5,500 CFS
APR. 1
FLOW, CUBIC FEET PER SECOND
3,600
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 4, 1958
File No. 15 202
FIGURE 67


445 CFS
APR. 1
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1931
SOUTH FORK OF ROGUE RIVER
NEAR PROSPECT
FLOW, CUBIC FEET PER SECOND
360
320
280
240
200
160
120
80
40
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 4, 1958
File No. 15.202
FIGURE 68


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1931
MIDDLE FORK OF ROGUE RIVER
NEAR PROSPECT
482 CFS
APR. 1
FLOW, CUBIC FEET PER SECOND
360
320
280
240
200
160
120
80
40
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 31, 1958
File No. 15.202
FIGURE 69

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
ROGUE RIVER
BELOW SOUTH FORK
NEAR PROSPECT

(DRAINAGE AREA = 643 SQ. MILES)

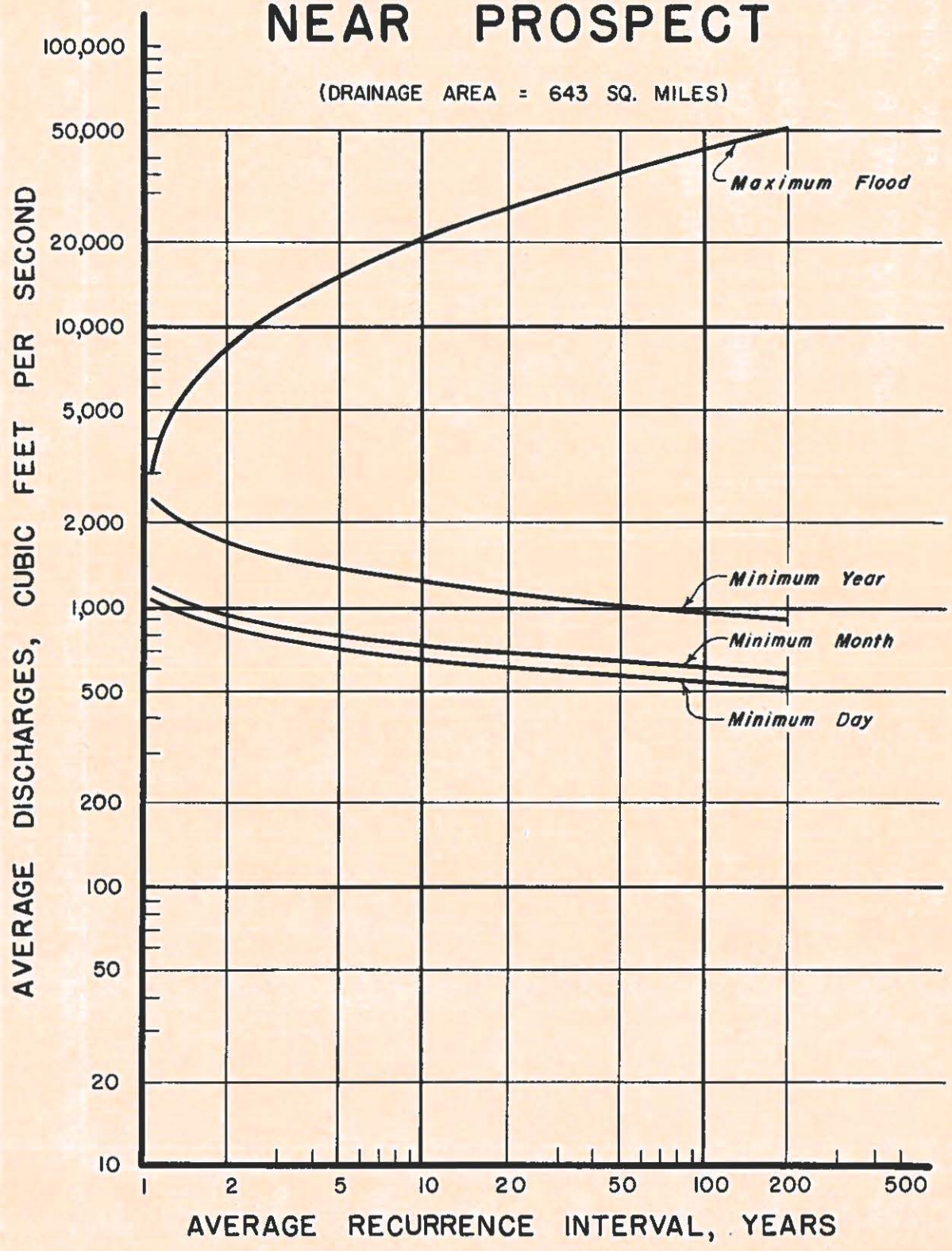


FIGURE 70

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
ROGUE RIVER
AT
DODGE BRIDGE

(DRAINAGE AREA = 1,210 SQ. MILES)

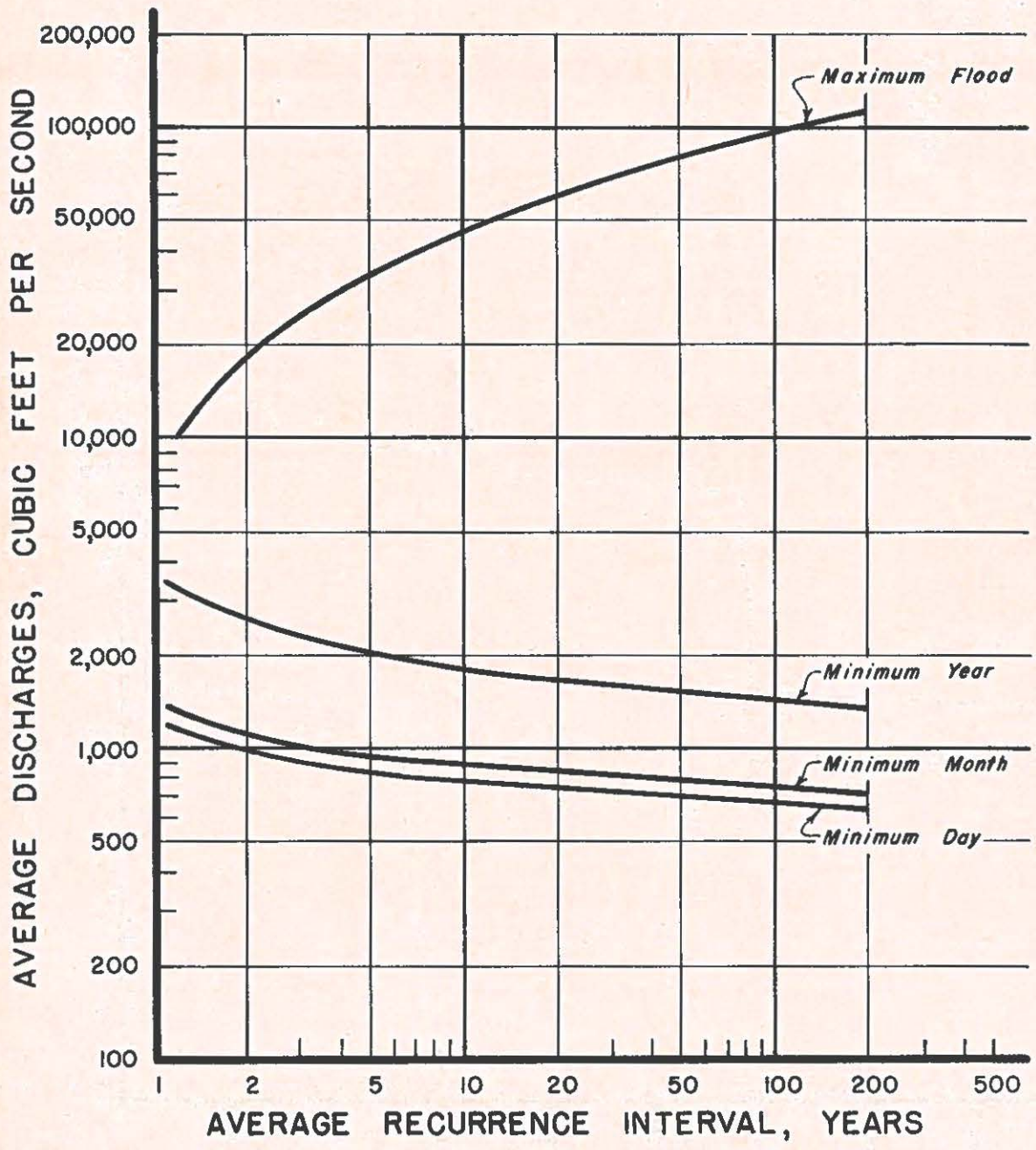
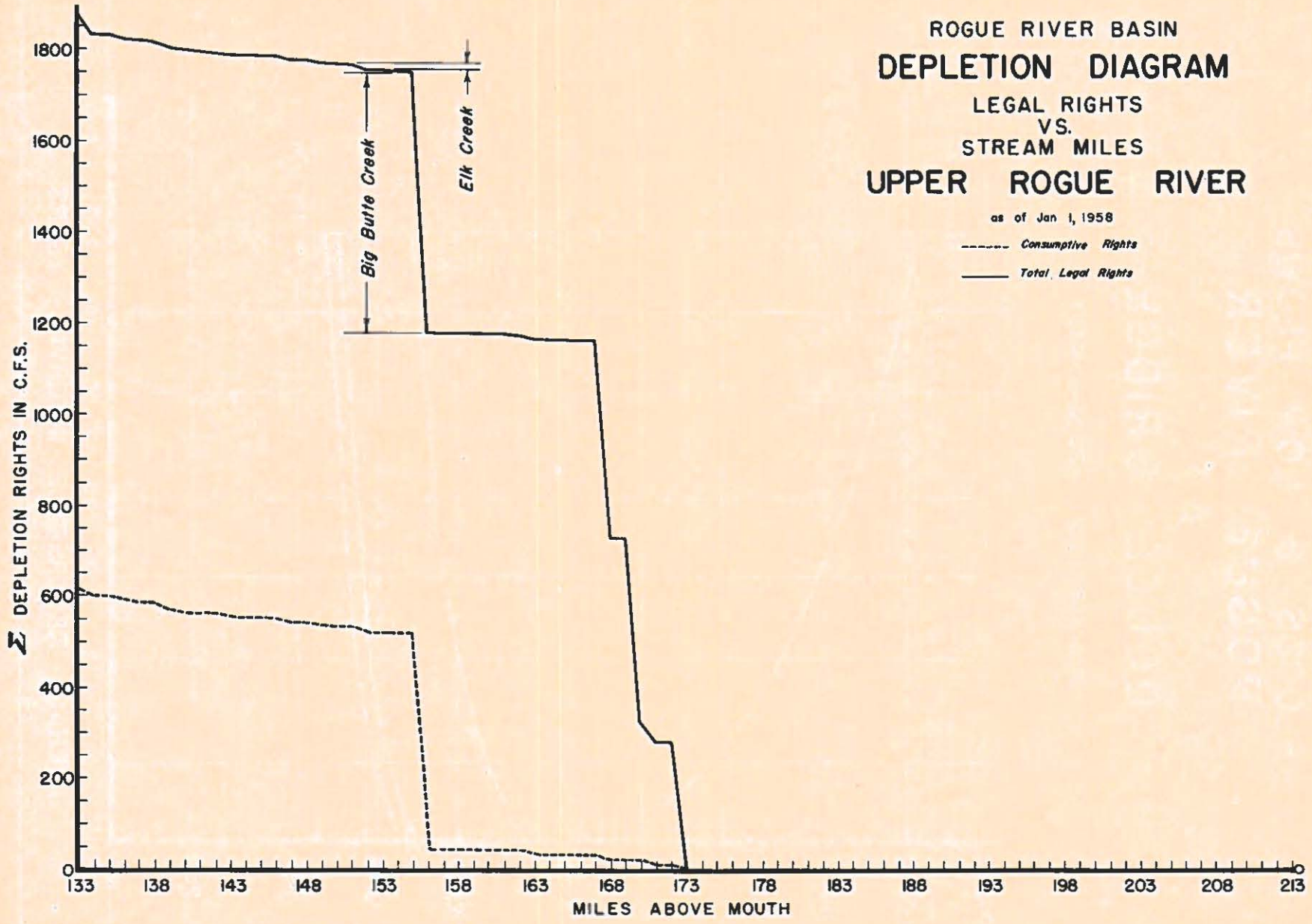


FIGURE 71



ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS
VS.
STREAM MILES

UPPER ROGUE RIVER

as of Jan 1, 1958

------ Consumptive Rights

——— Total Legal Rights

Drawn Oct. 26, 1958
File No. 15.302
FIGURE 72

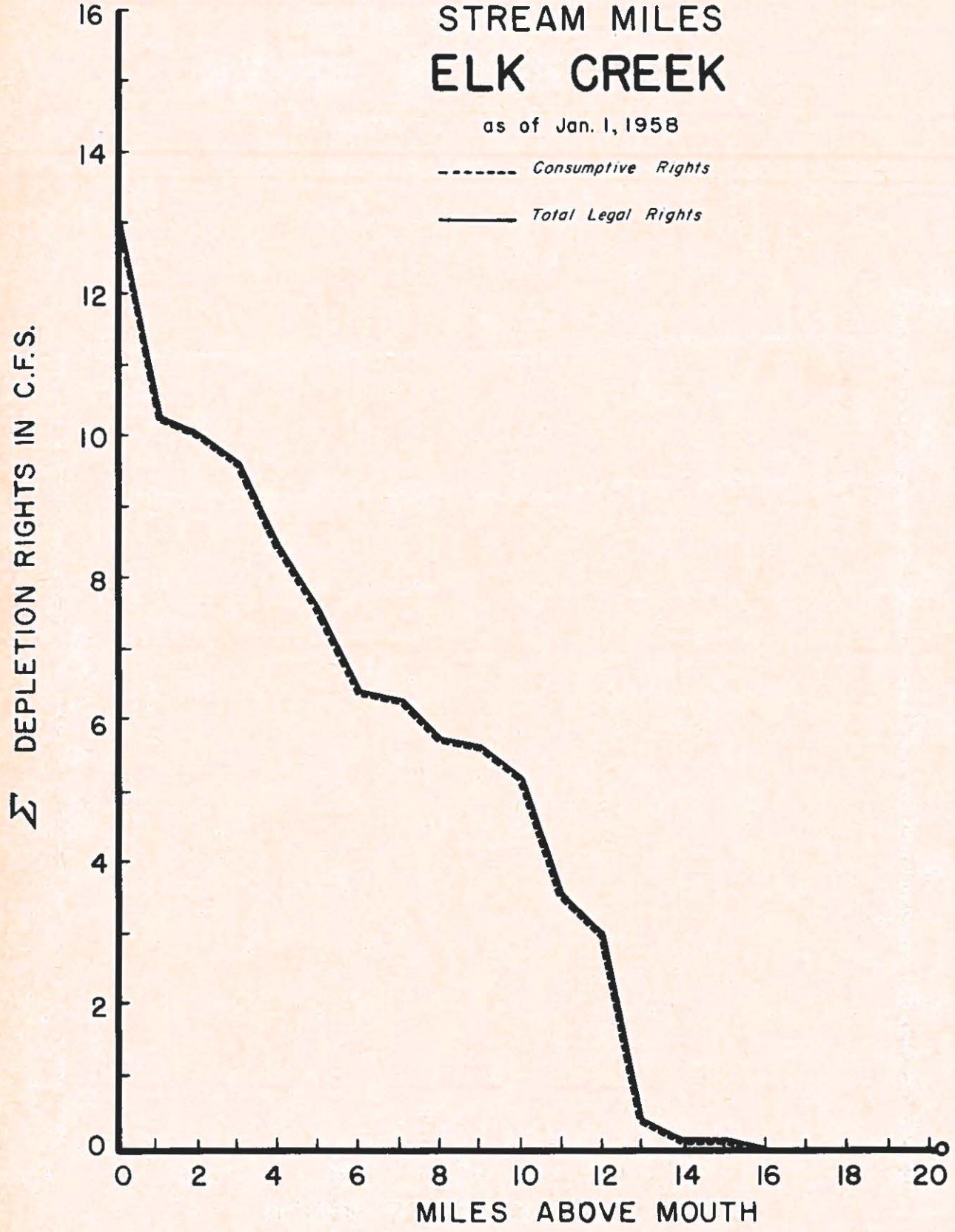
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

ELK CREEK

as of Jan. 1, 1958



Drawn - Oct. 30, 1958
File No. 15 302

FIGURE 73

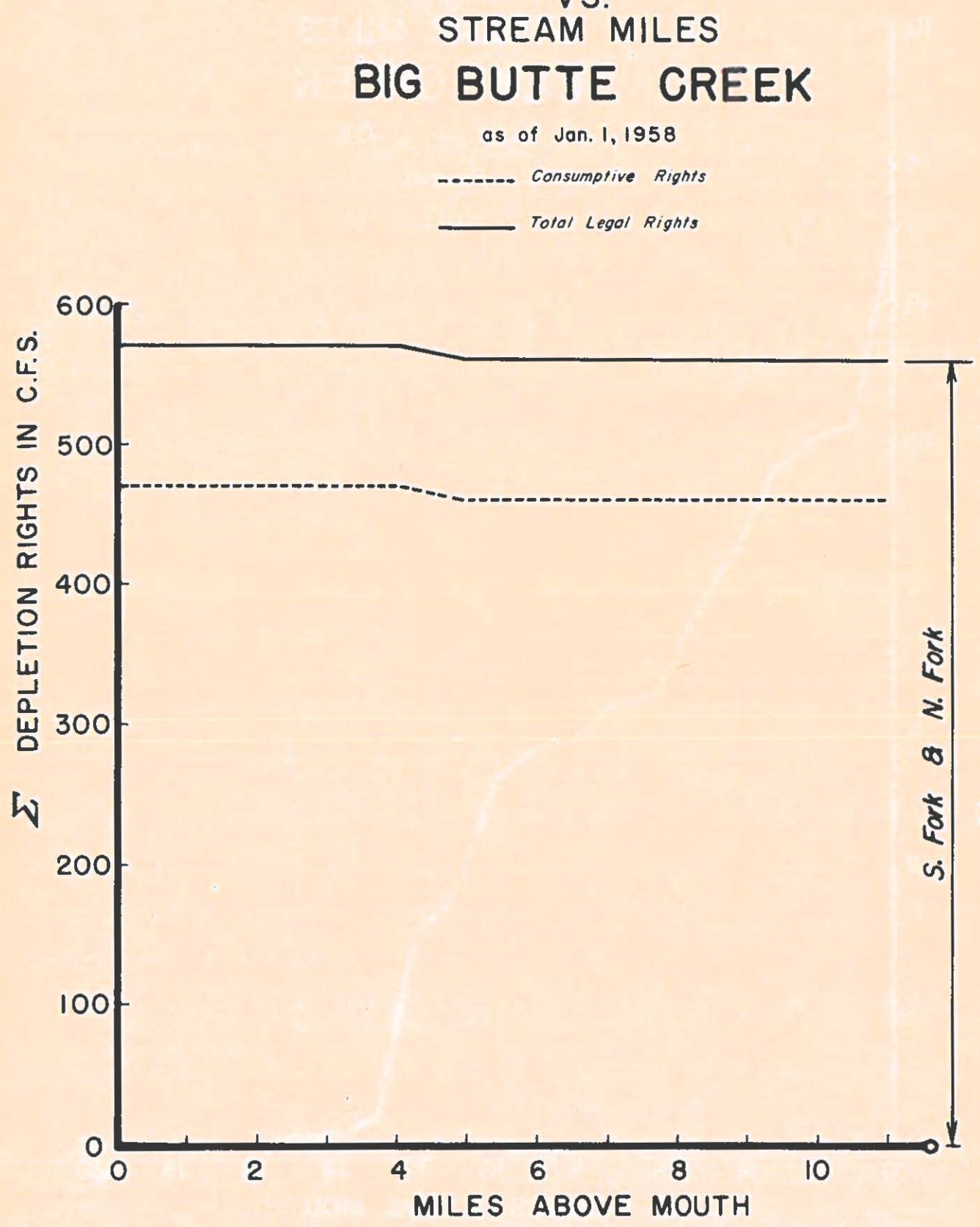
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

BIG BUTTE CREEK

as of Jan. 1, 1958



Drawn - June 6, 1958
File No. 15.302

FIGURE 74

ROGUE RIVER BASIN

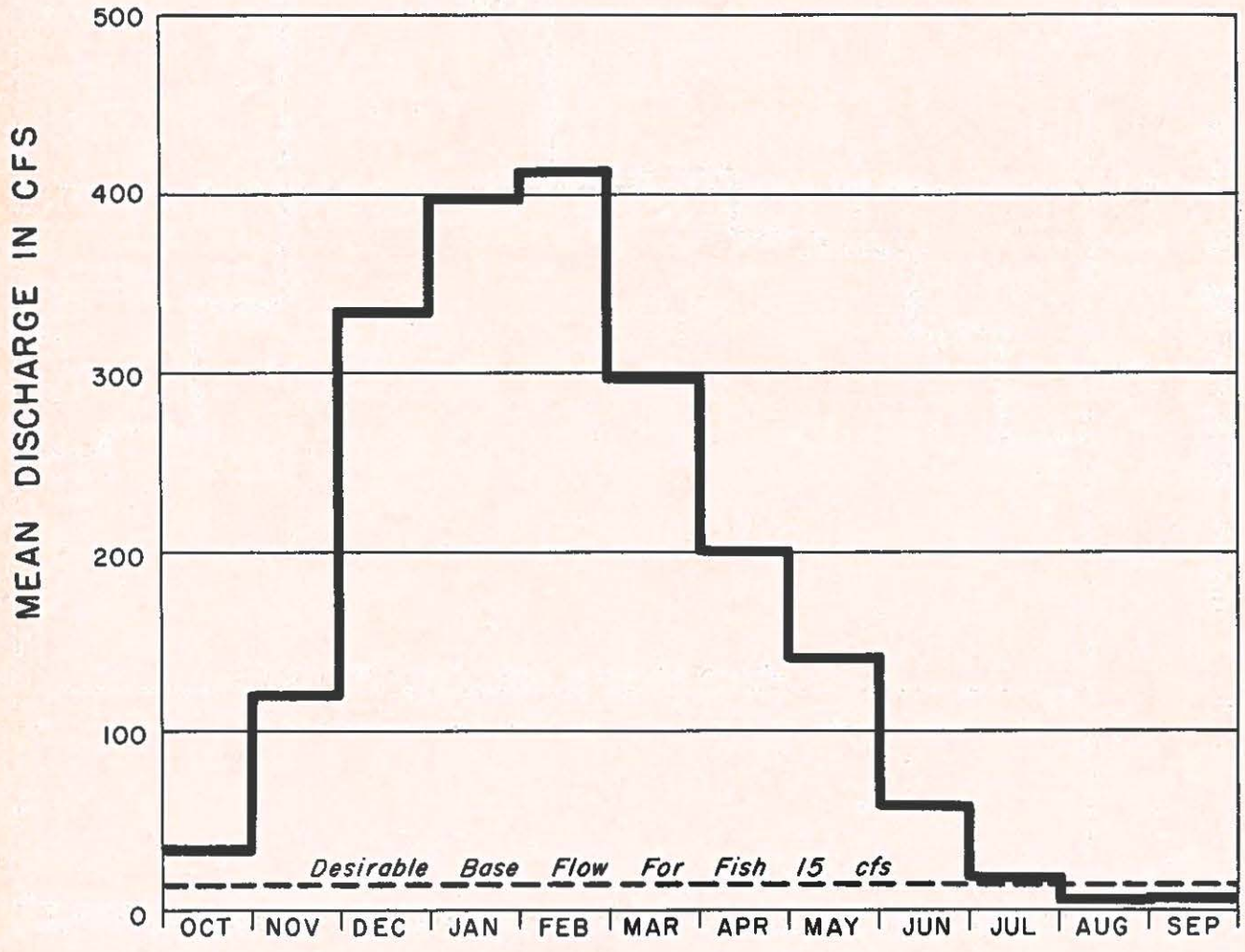
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

ELK CREEK AT MOUTH

1929 - 1956



Drawn Sept. 9, 1958
File No. 15.202

FIGURE 75

ROGUE RIVER BASIN

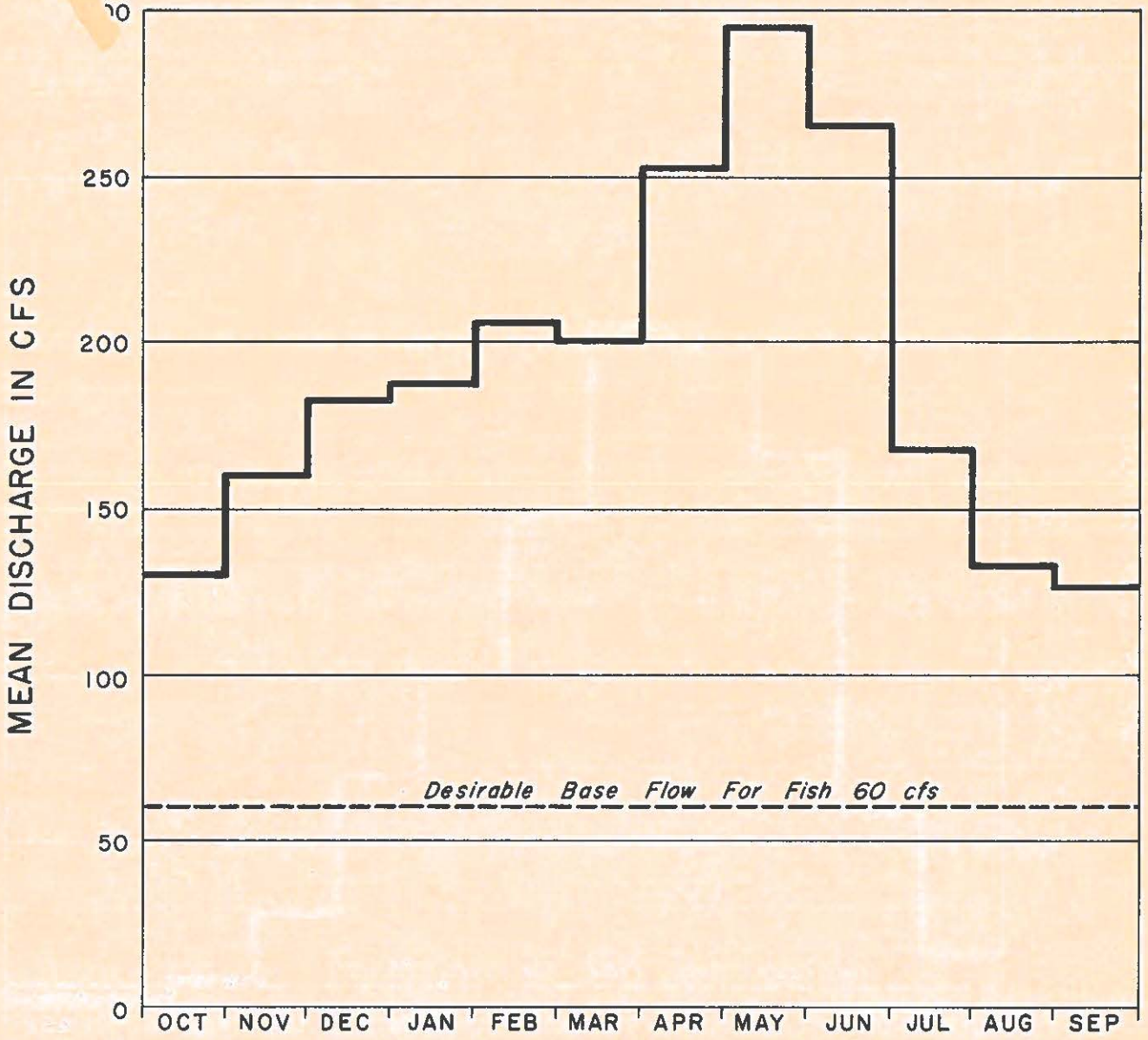
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

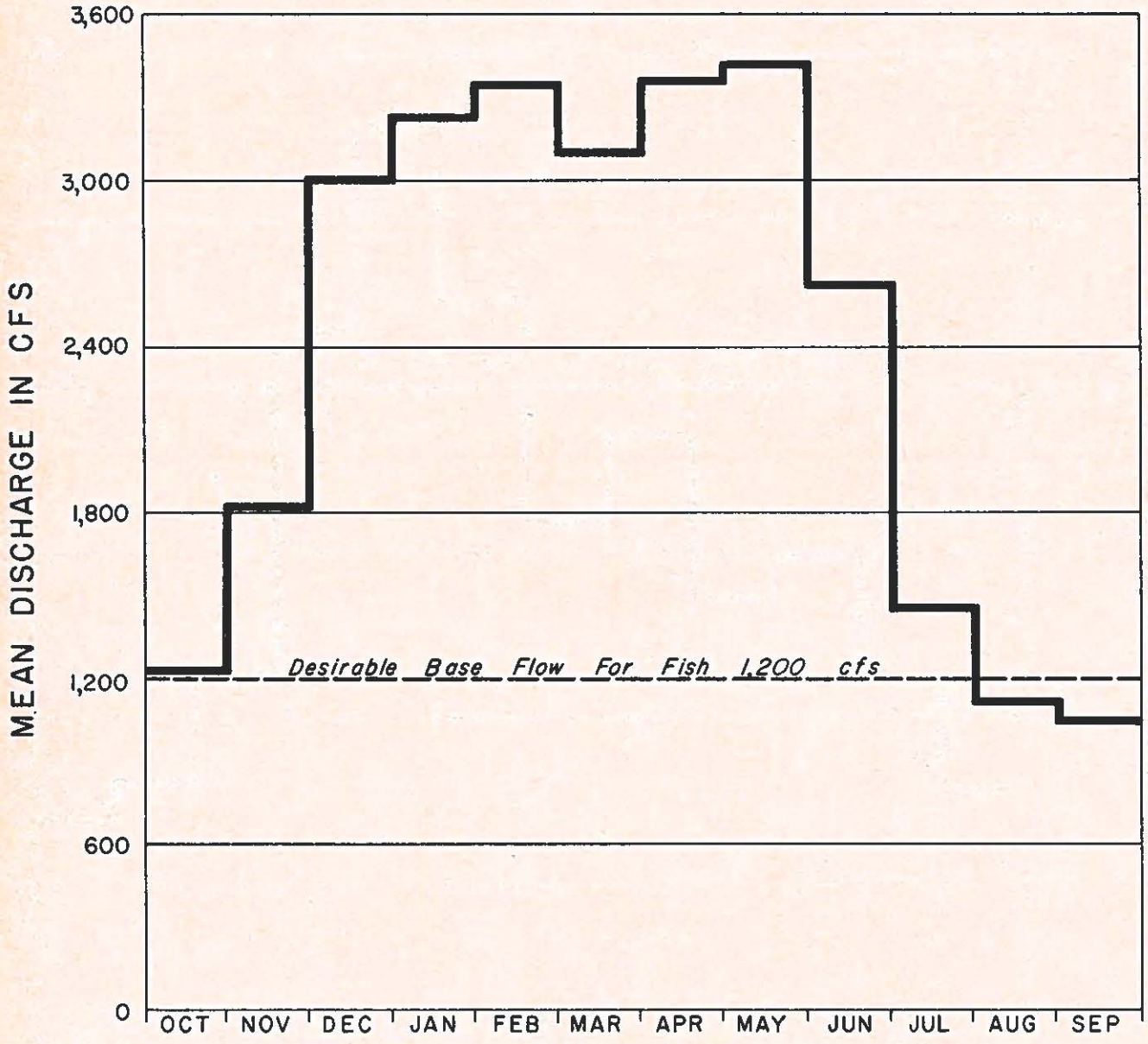
MIDDLE FORK ROGUE RIVER - MILE 4.2

1926-1955



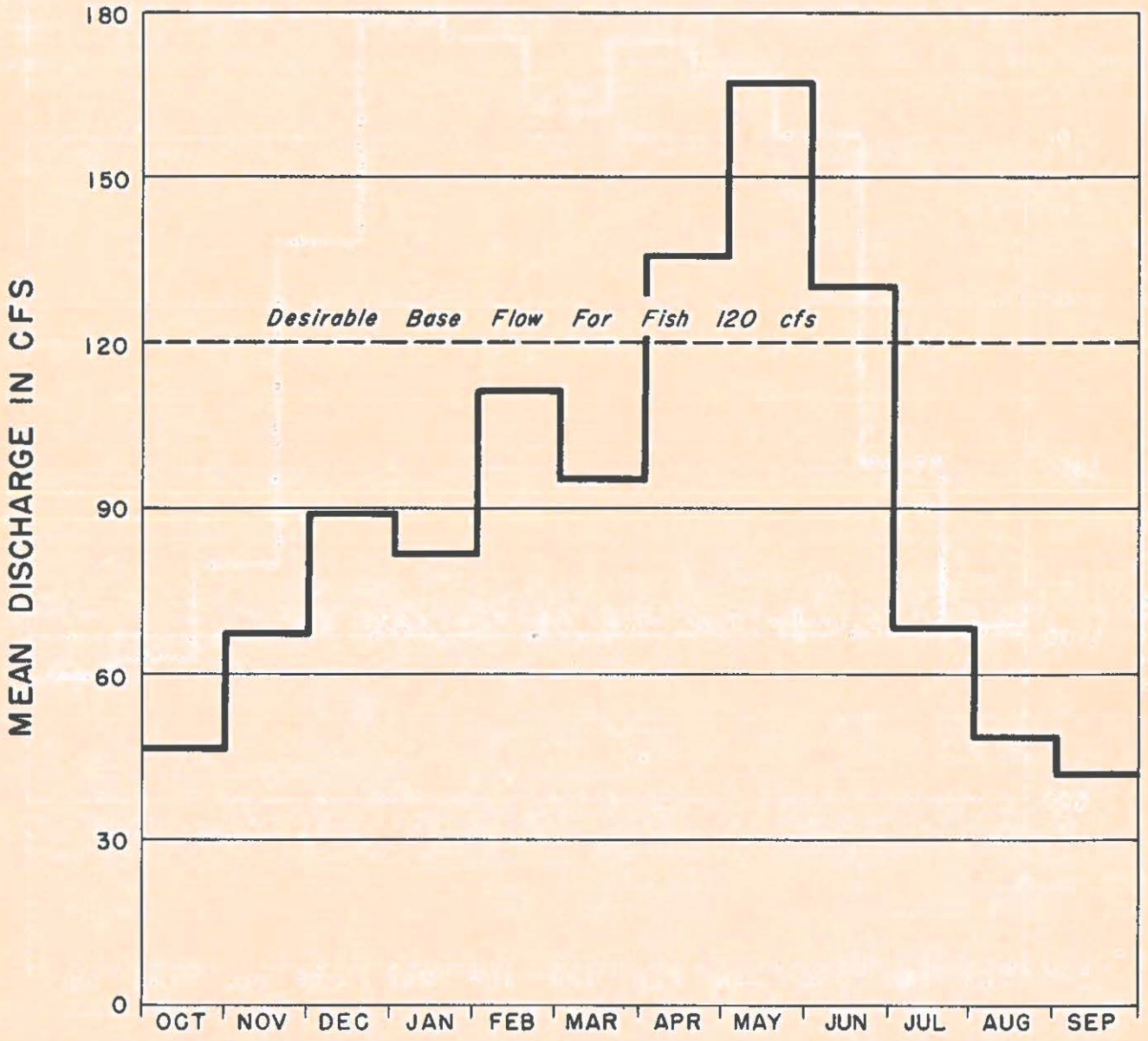
Drawn Aug. 28, 1958
File No. 15.202
FIGURE 76

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
ROGUE RIVER - MILE 138.5
1929-1956



Drawn Sept. 9, 1958
File No. 15.202
FIGURE 77

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
SOUTH FORK ROGUE RIVER - MILE 15.9
1926-1931 & 1950-1955



Drawn Aug 29, 1958
File No. 15.202

FIGURE 78

ROGUE RIVER BASIN

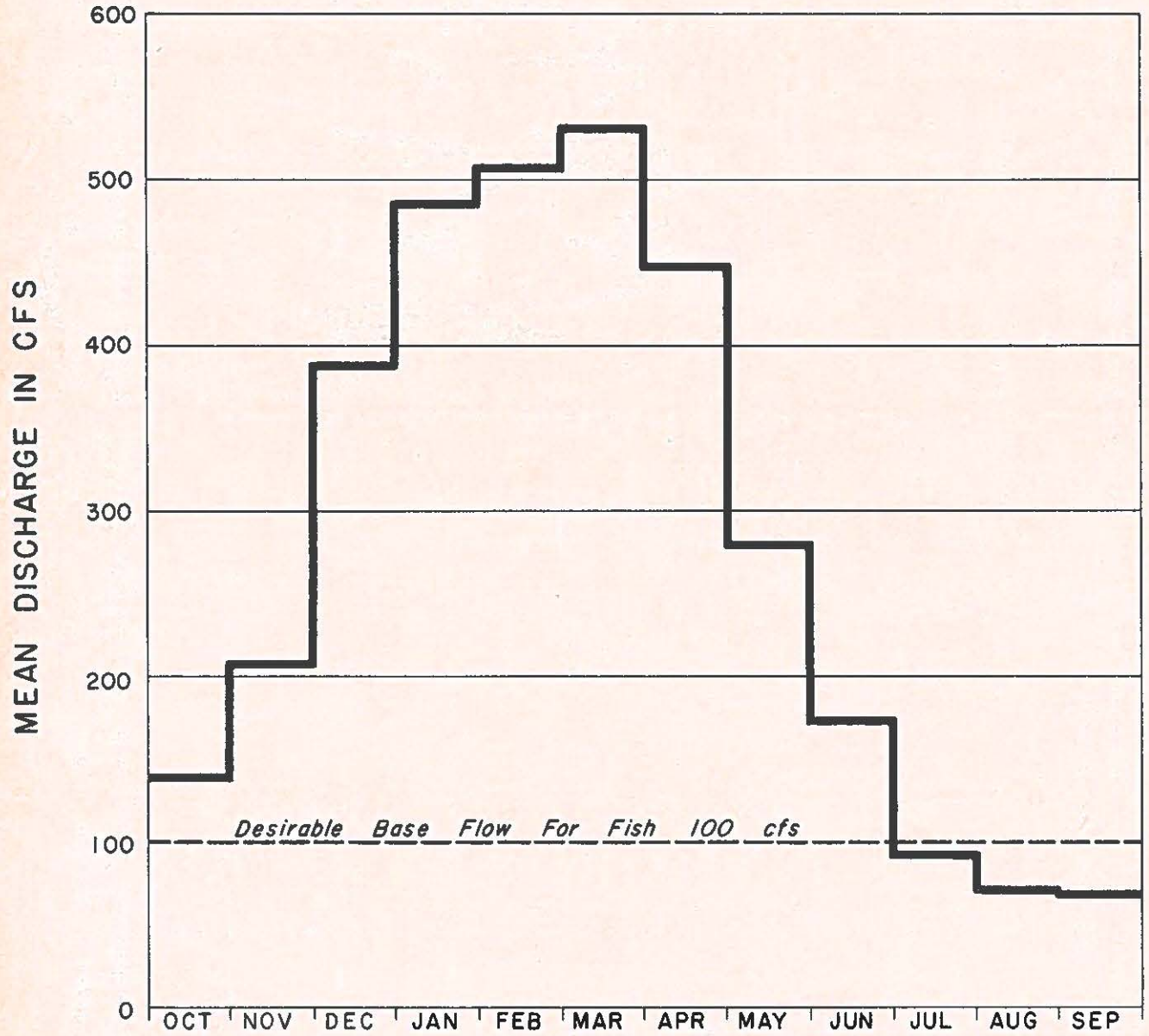
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

BIG BUTTE CREEK AT MOUTH

1929-1956



Drawn Sept. 9, 1958
File No. 15.202

FIGURE 79

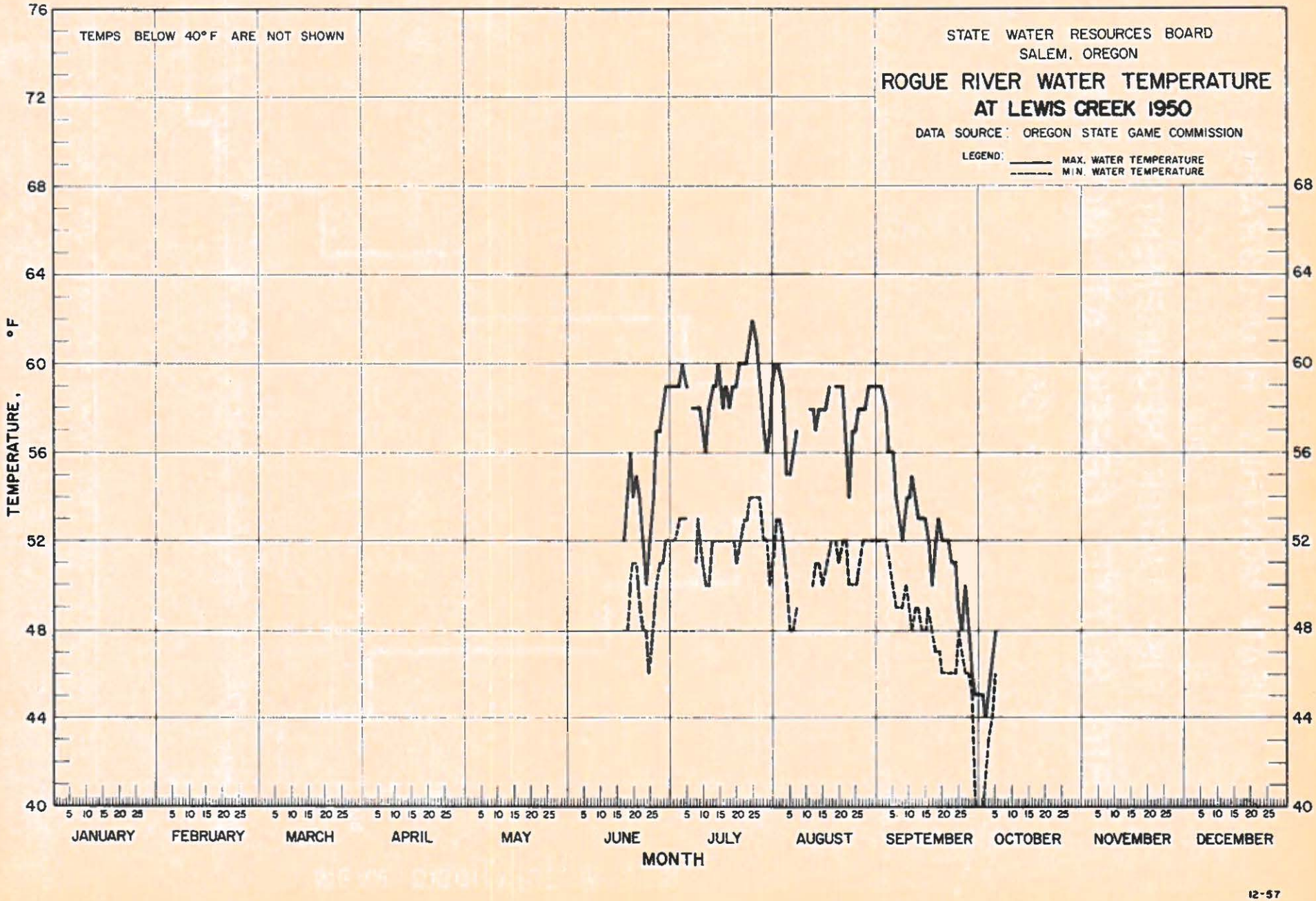
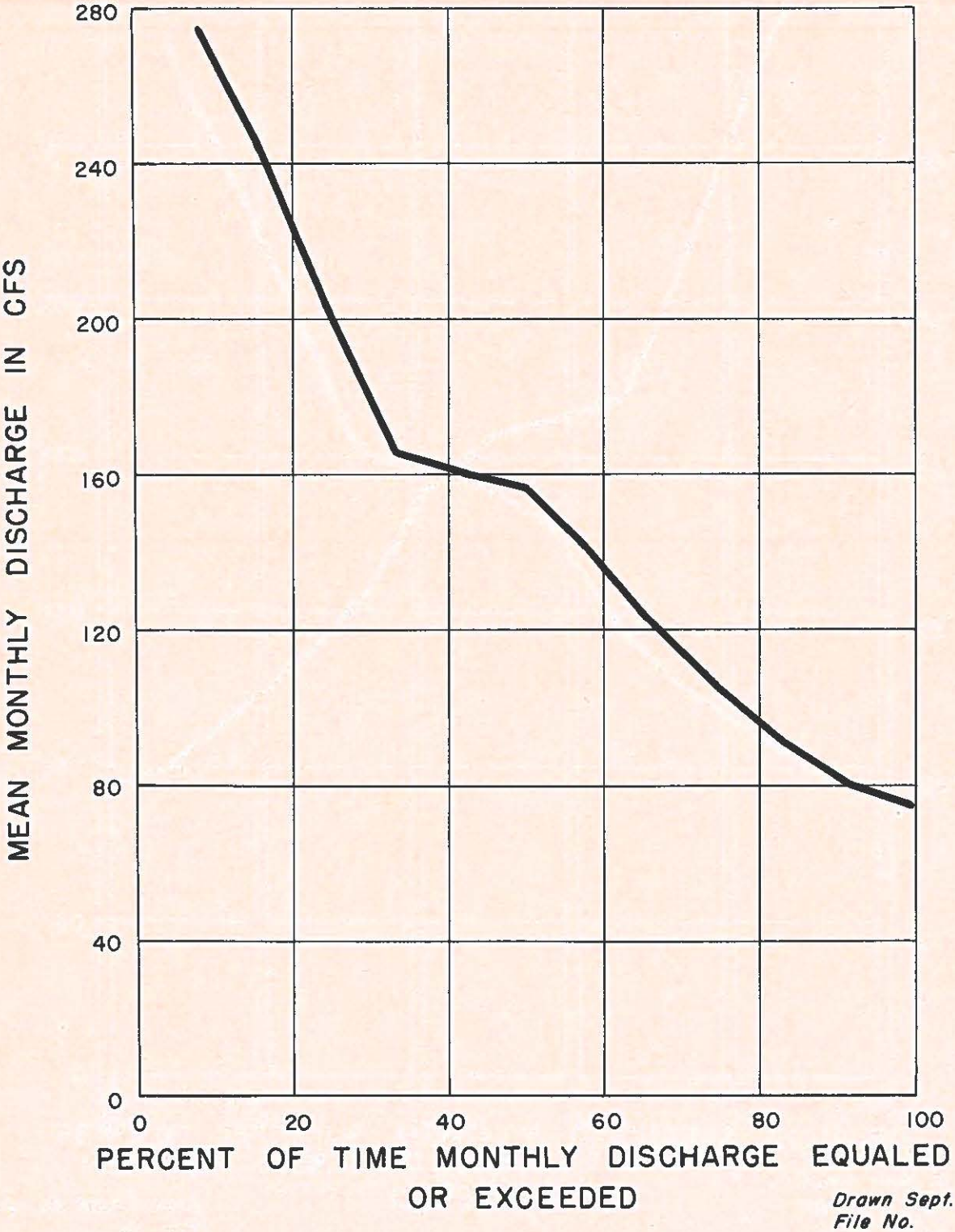

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AT LEWIS CREEK 1950
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 80

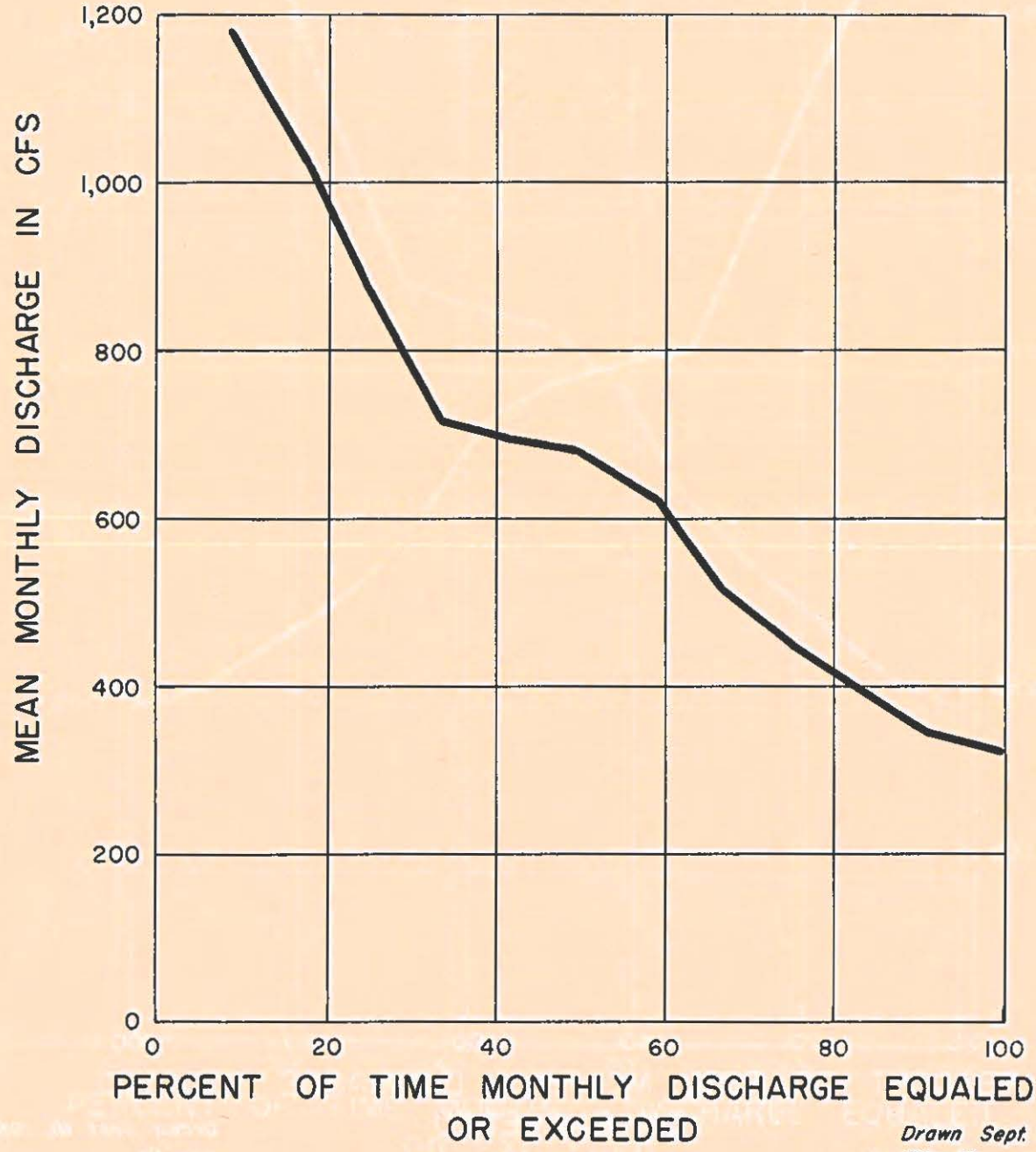
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
HAMAKER SITE



Drawn Sept. 19, 1958
File No.

FIGURE 81

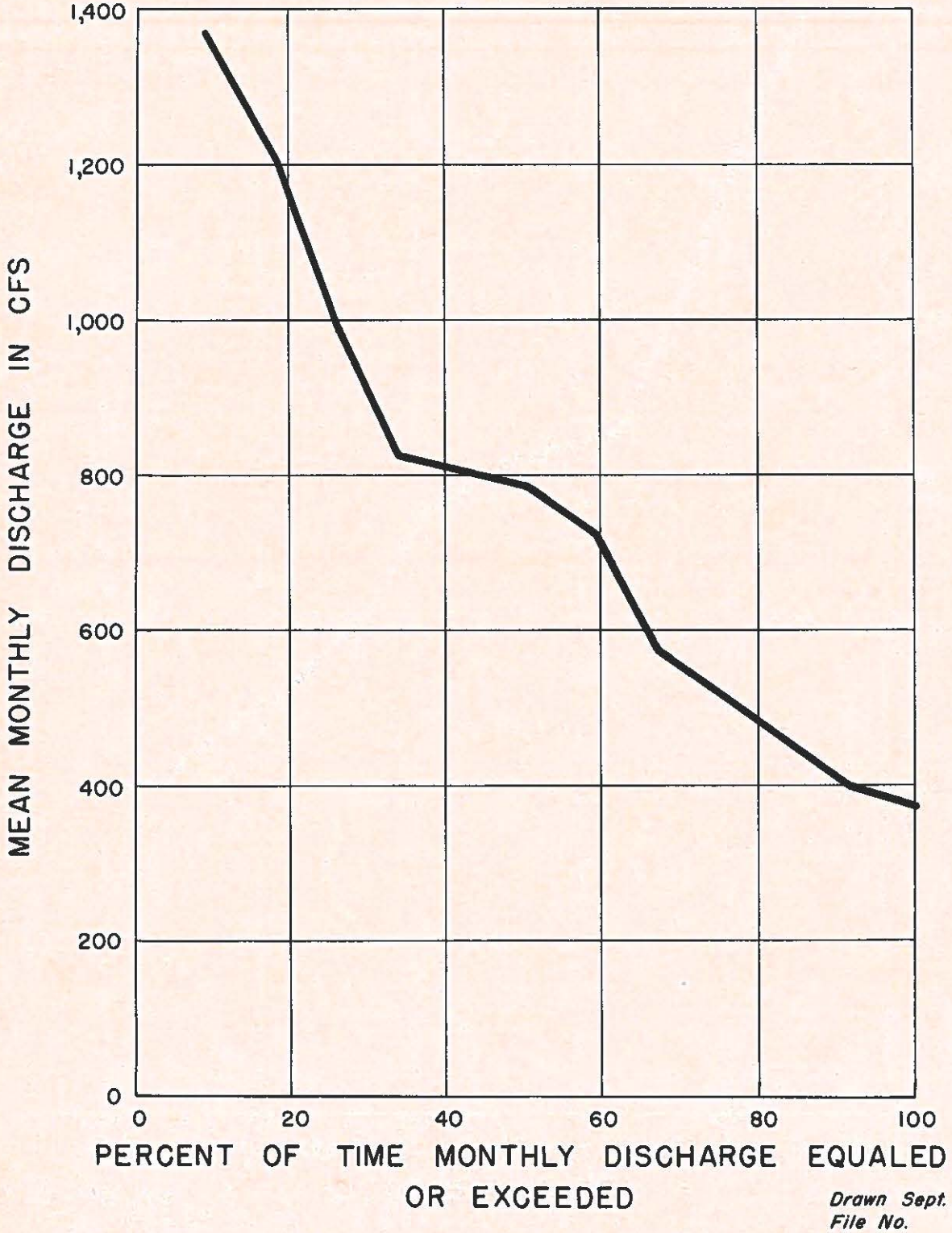
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
UNION CREEK SITE



Drawn Sept. 18, 1958
File No.

FIGURE 84

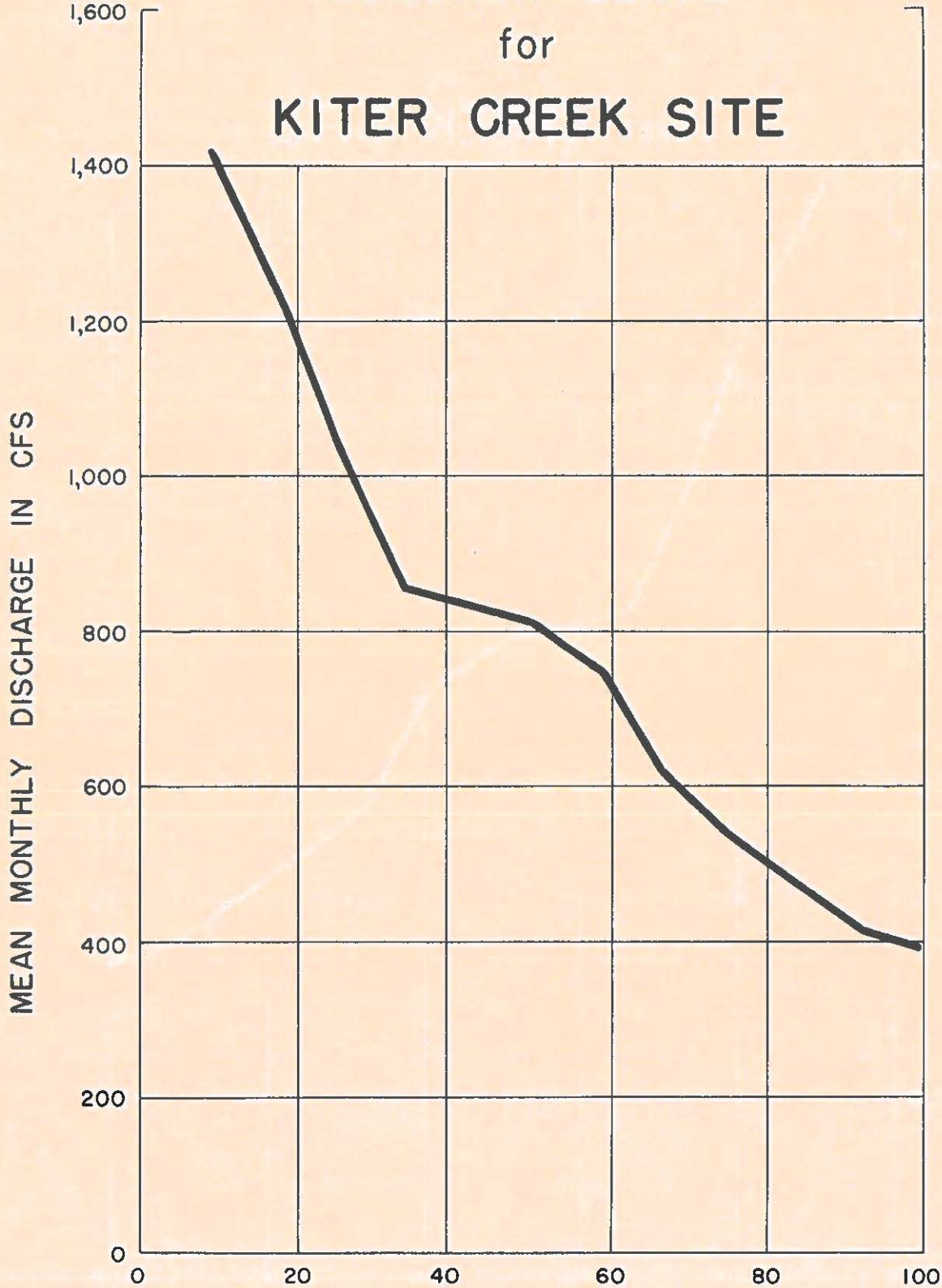
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
TOP CREEK SITE



Drawn Sept. 22, 1958
File No.

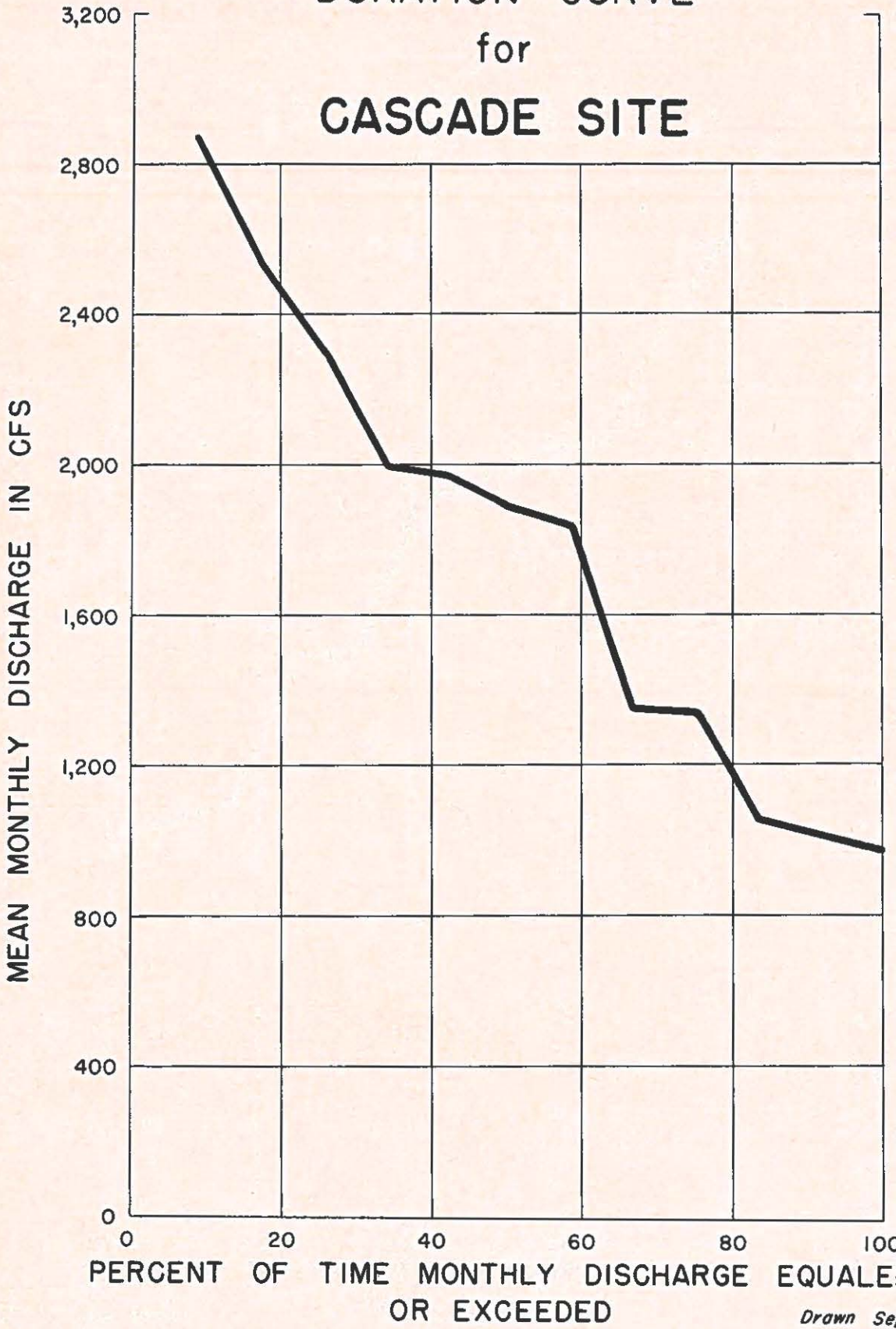
FIGURE 85

ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
KITER CREEK SITE



Drawn Sept. 22, 1958
File No.
FIGURE 86

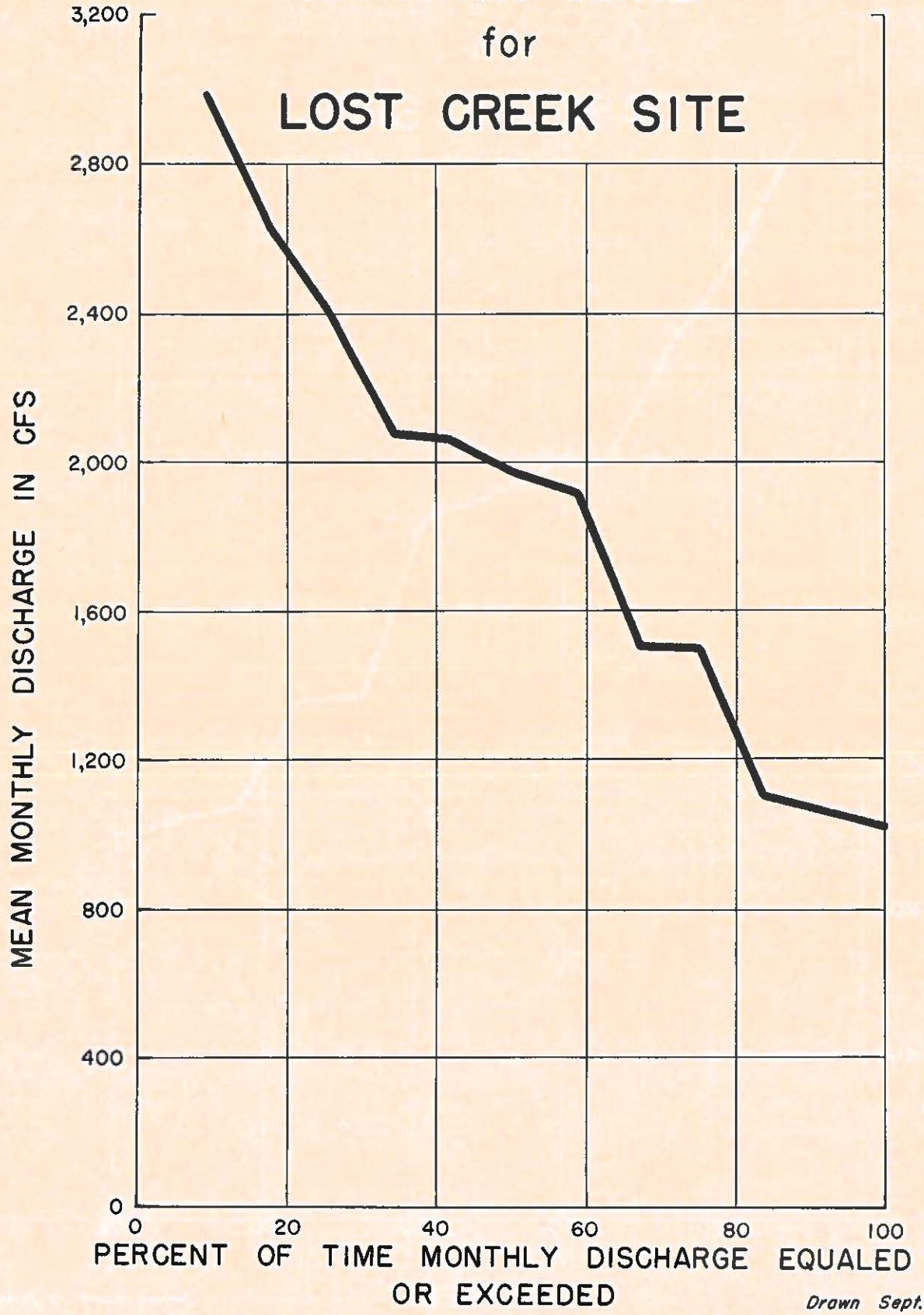
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
CASCADE SITE



Drawn Sept. 17, 1958
File No.

FIGURE 87

ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
LOST CREEK SITE



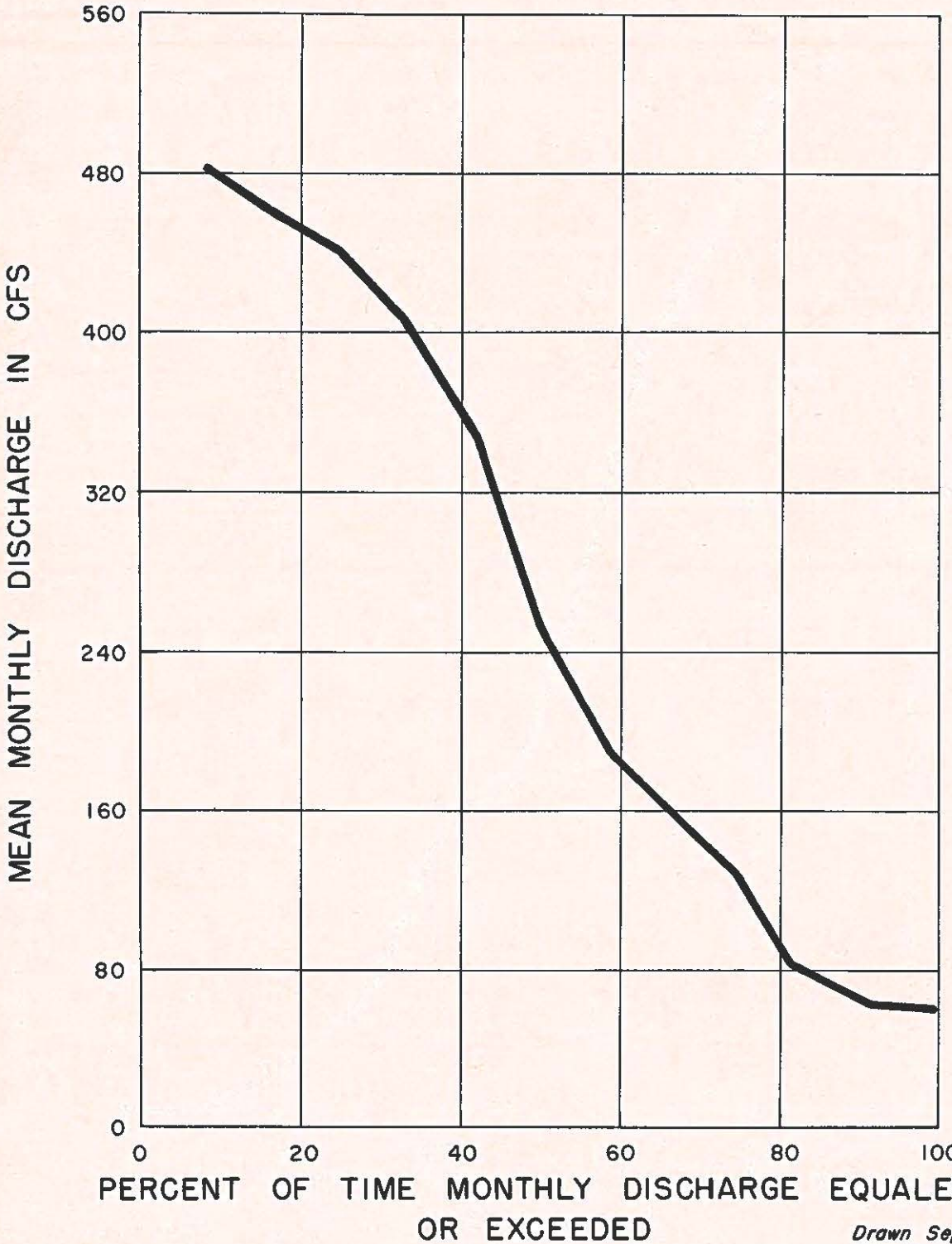
Drawn Sept. 17, 1958
File No.
FIGURE 88

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

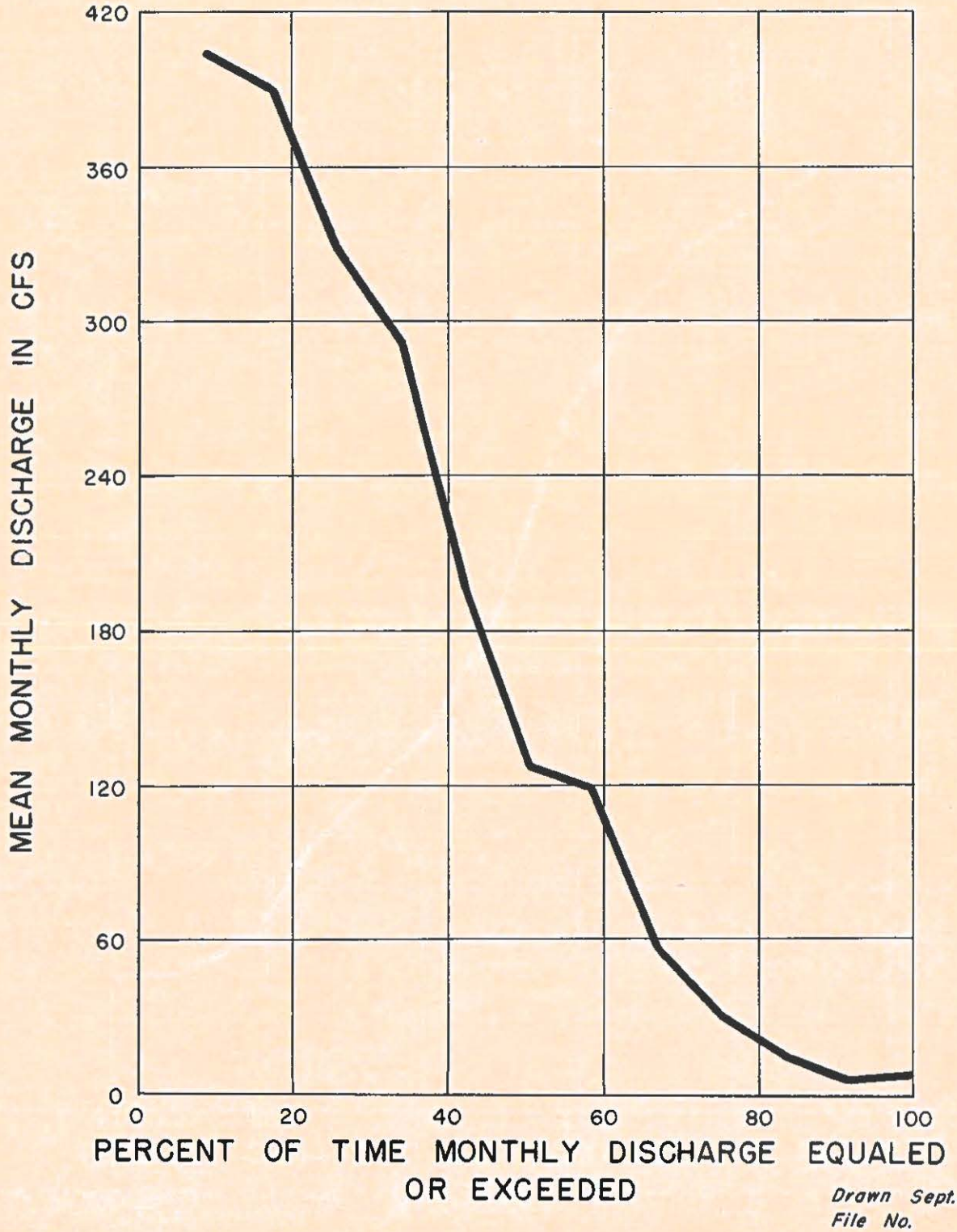
McNEIL SITE



Drawn Sept. 22, 1958
File No.

FIGURE 89

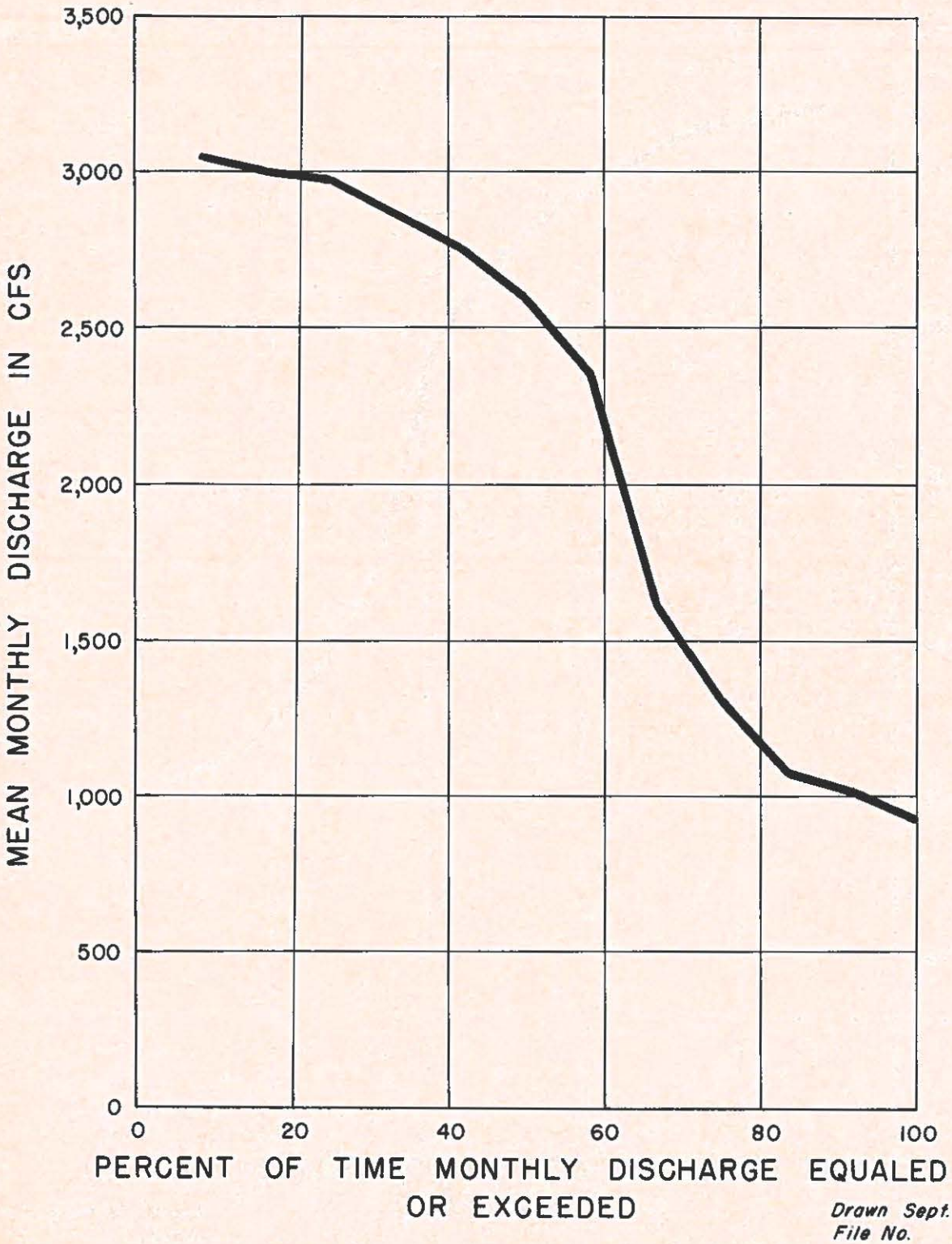
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
ELK CREEK SITE



Drawn Sept. 17, 1958
File No.

FIGURE 90

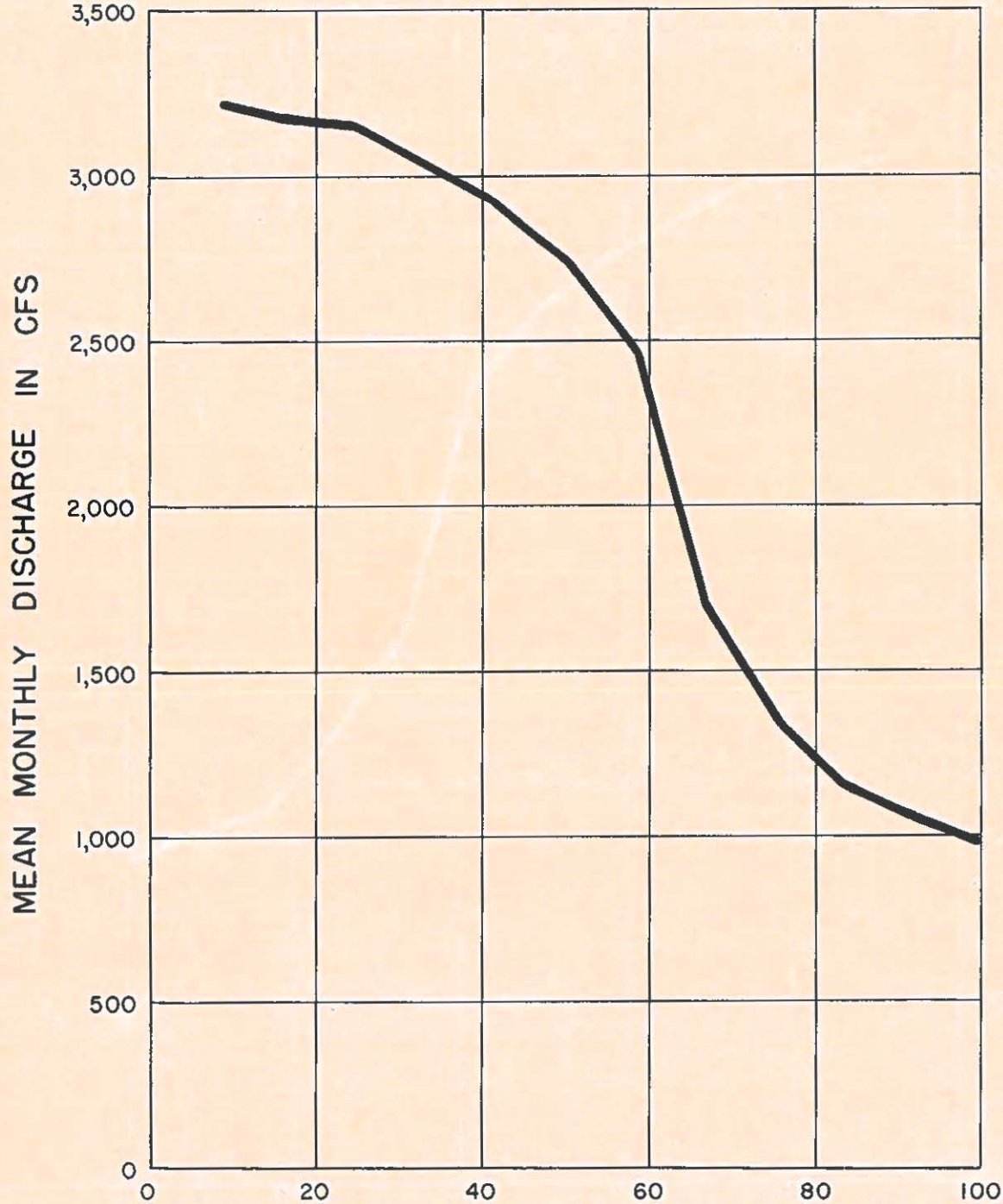
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
LEWIS CREEK SITE



Drawn Sept. 22, 1958
File No.

FIGURE 91

ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
TRAIL CREEK SITE



Drawn Sept. 22, 1958
File No.

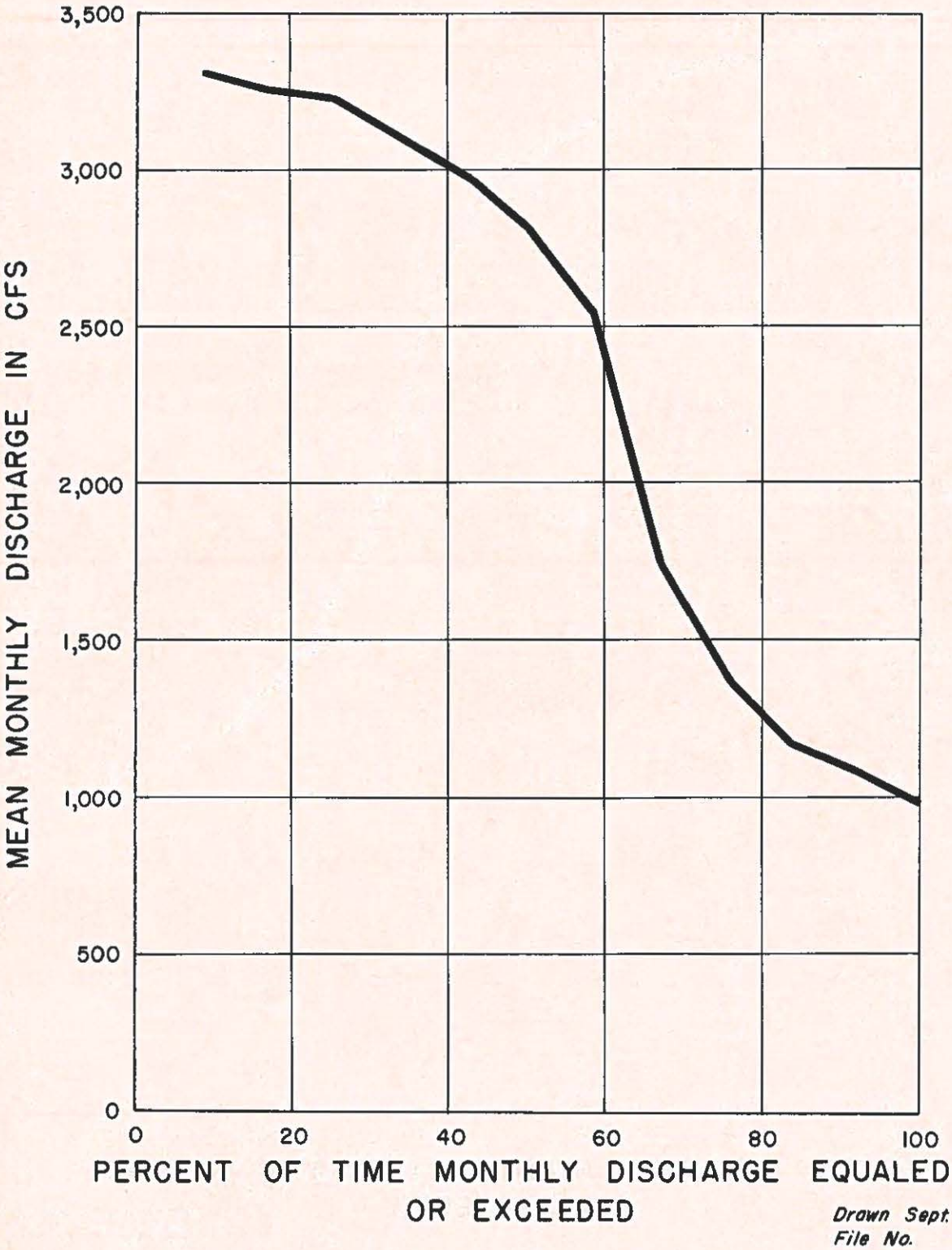
FIGURE 92

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

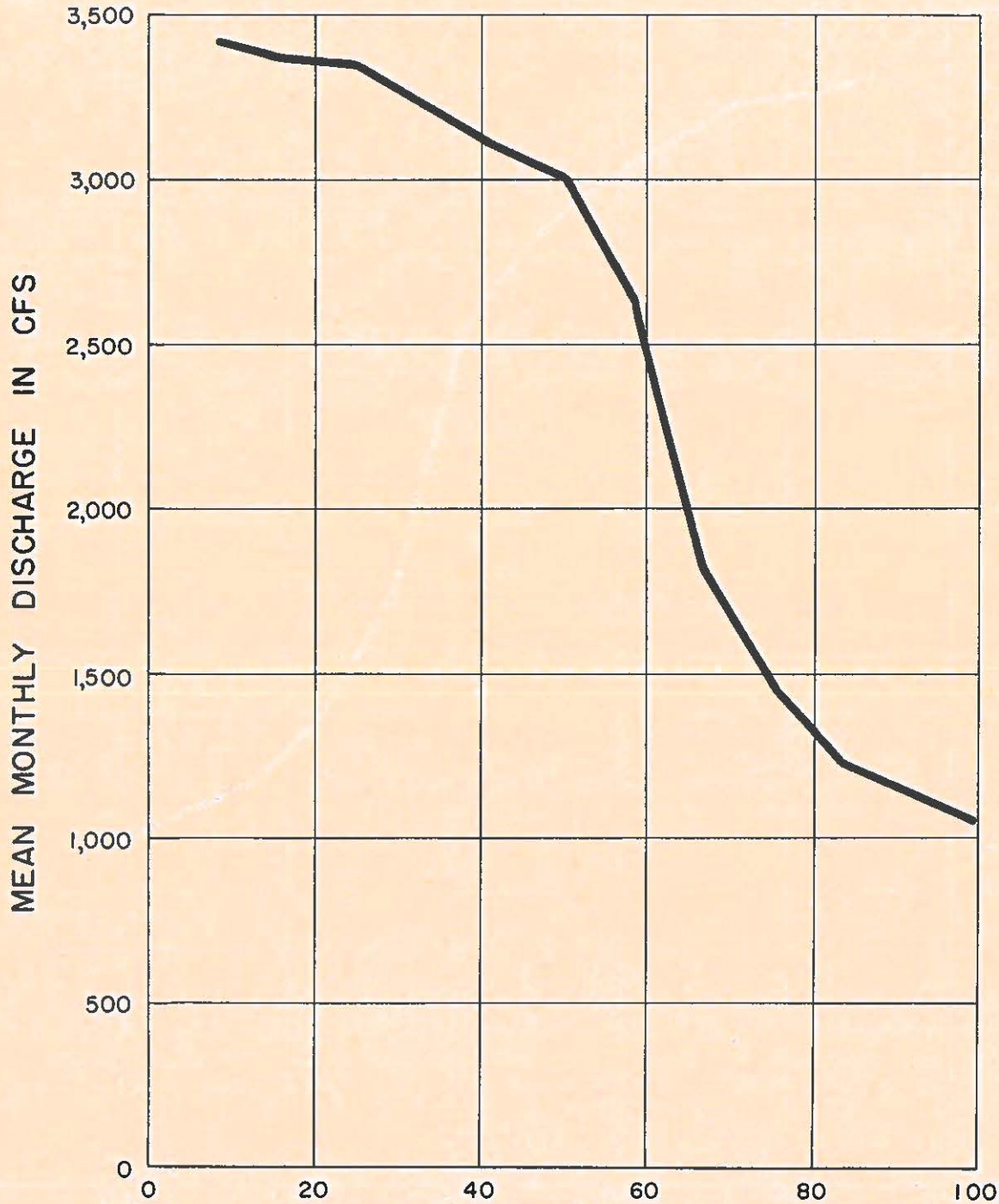
LONG CREEK SITE



Drawn Sept. 22, 1958
File No.

FIGURE 93

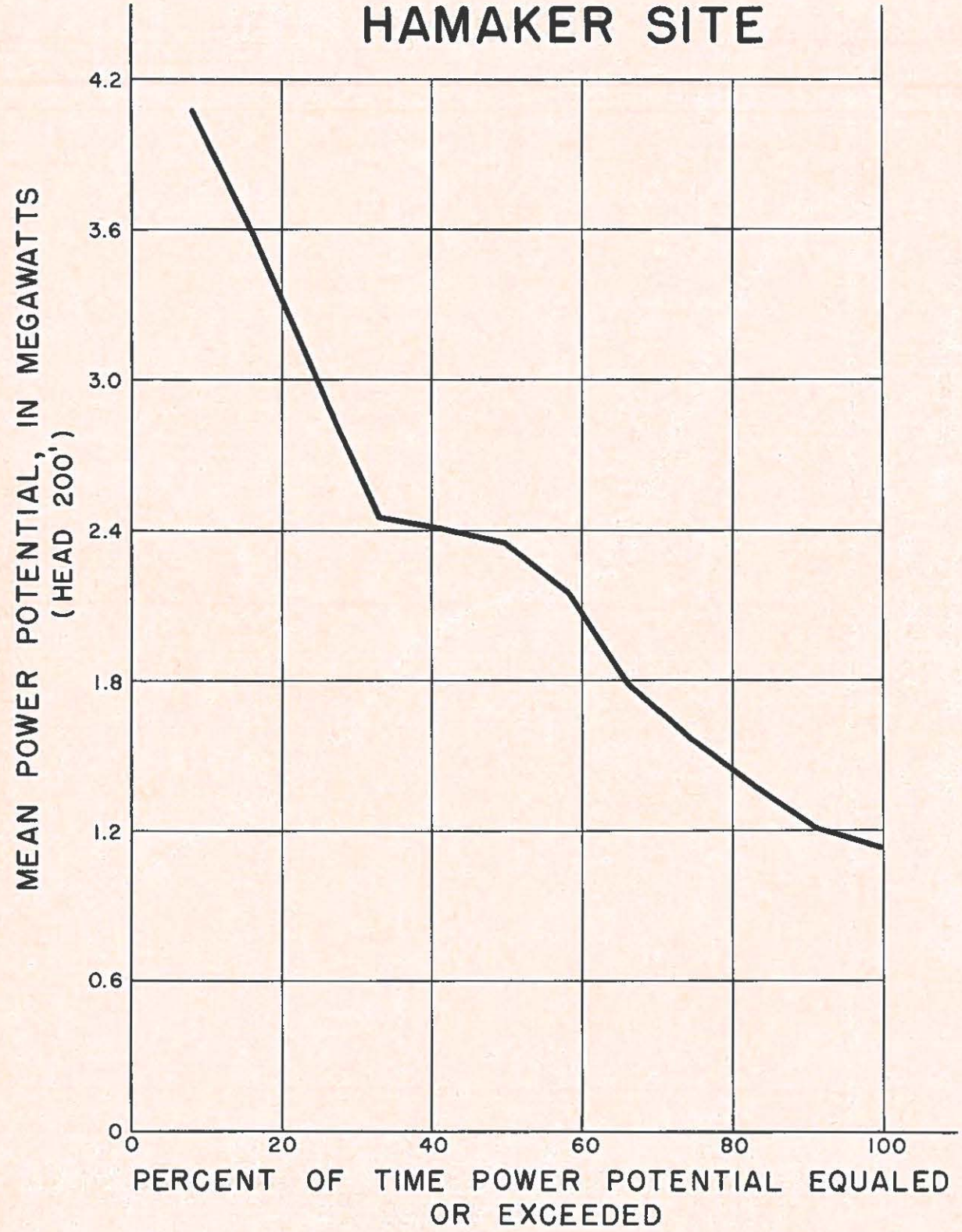
ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
REESE CREEK SITE



Drawn Sept. 22, 1958
File No.
FIGURE 94

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for HAMAKER SITE

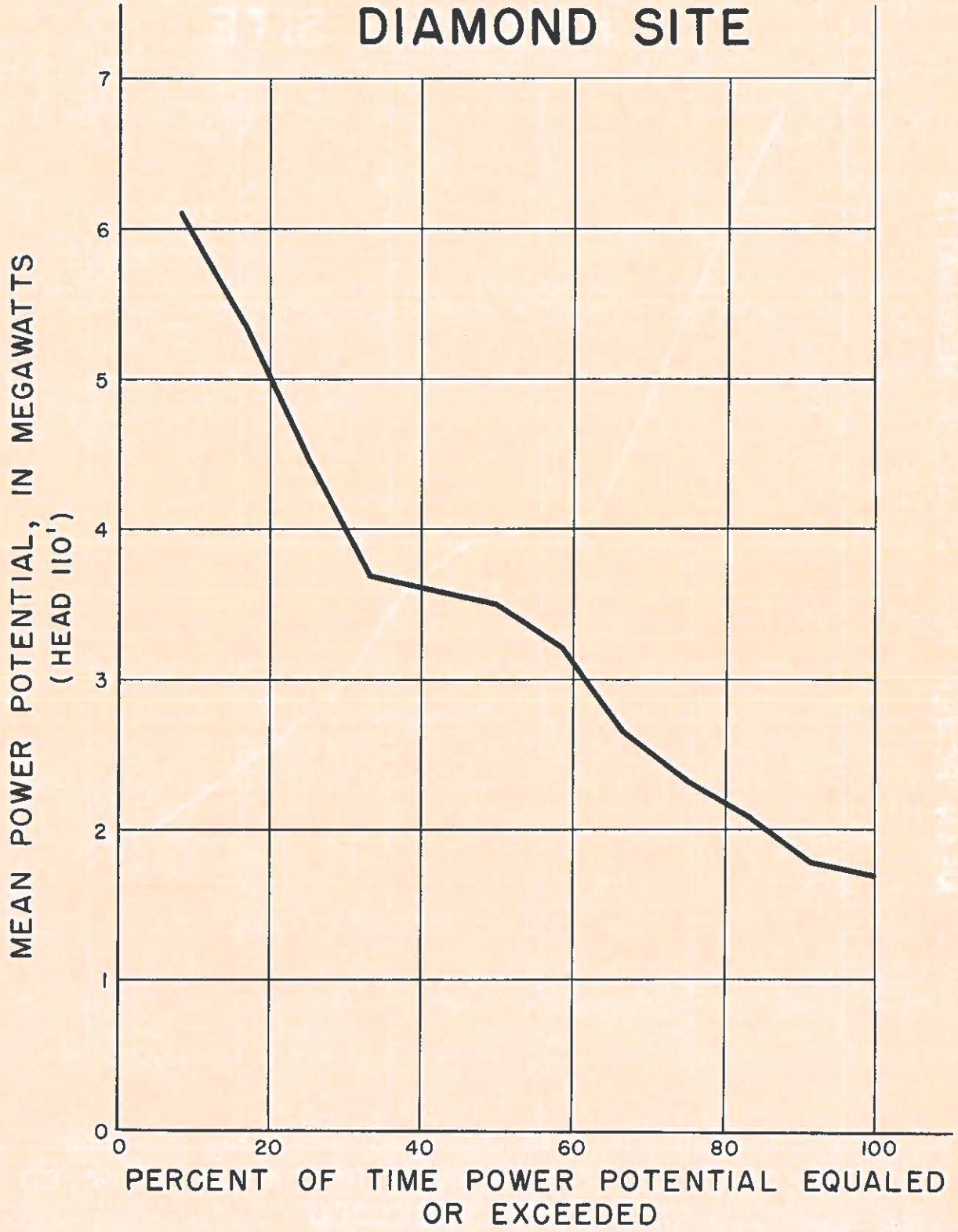


Drawn Sept 2, 1958
File No.

FIGURE 95

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for DIAMOND SITE

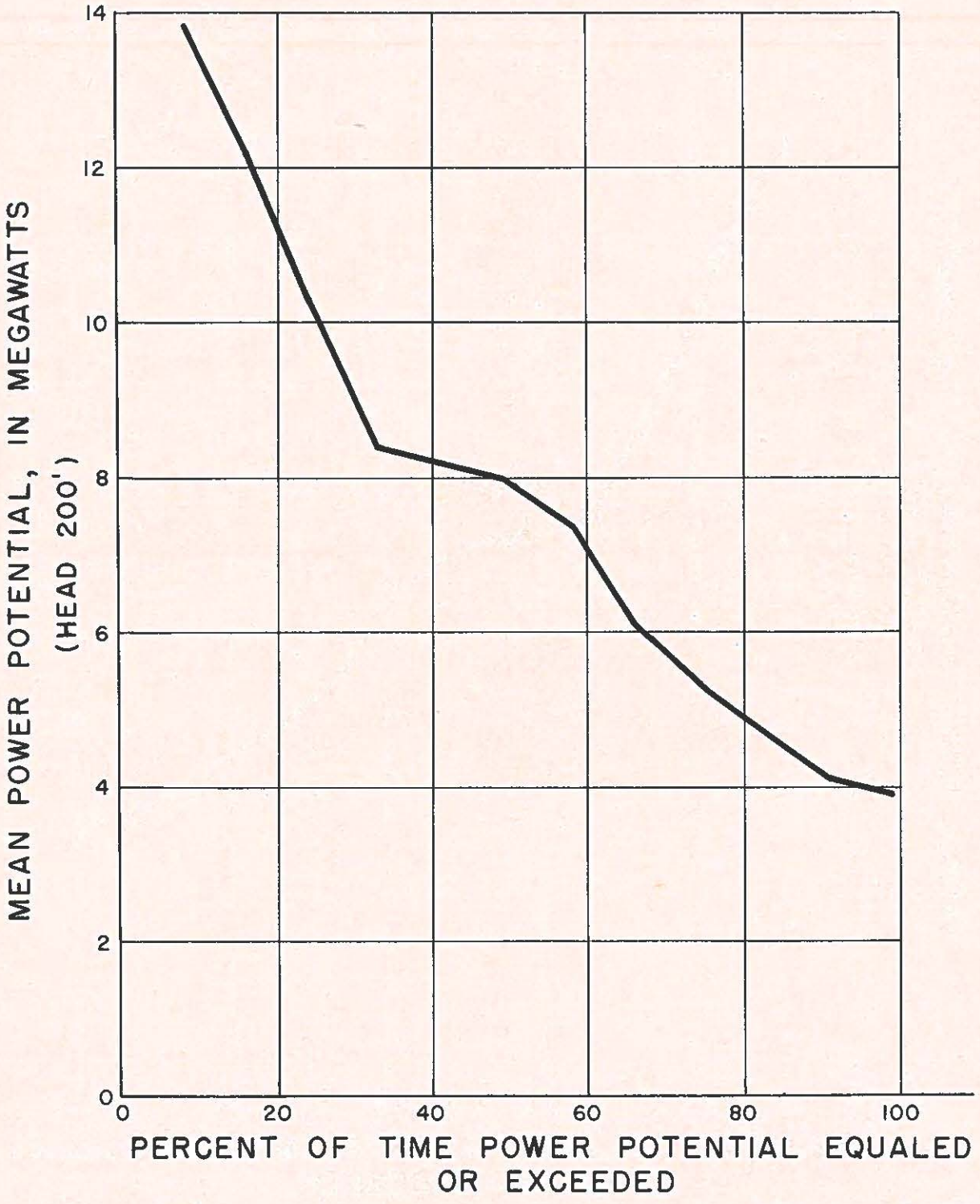


Drawn Sept 2, 1958
File No.

FIGURE 96

ROGUE RIVER BASIN

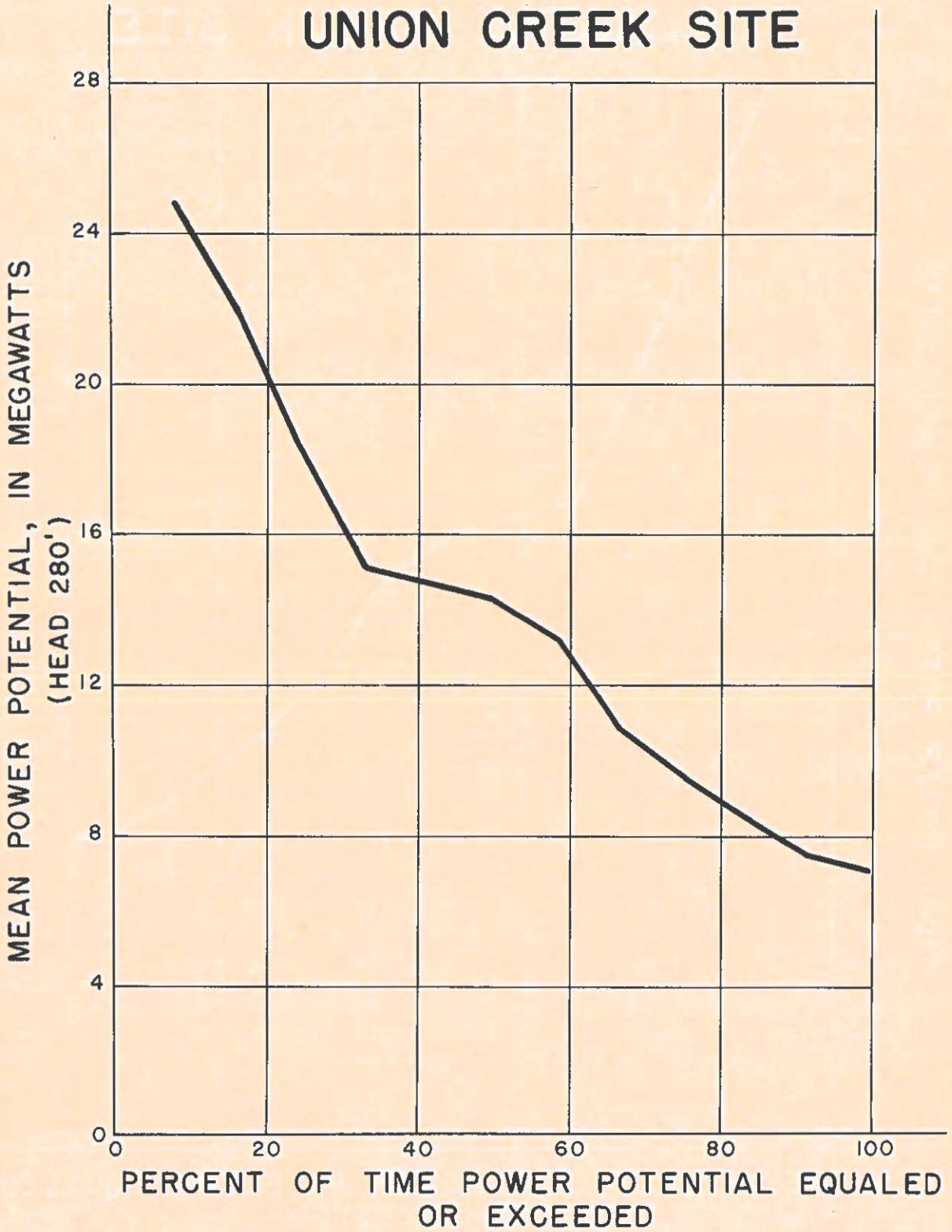
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for CASTLE CREEK SITE



Drawn: Sept. 8, 1958
File No.
FIGURE 97

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for UNION CREEK SITE

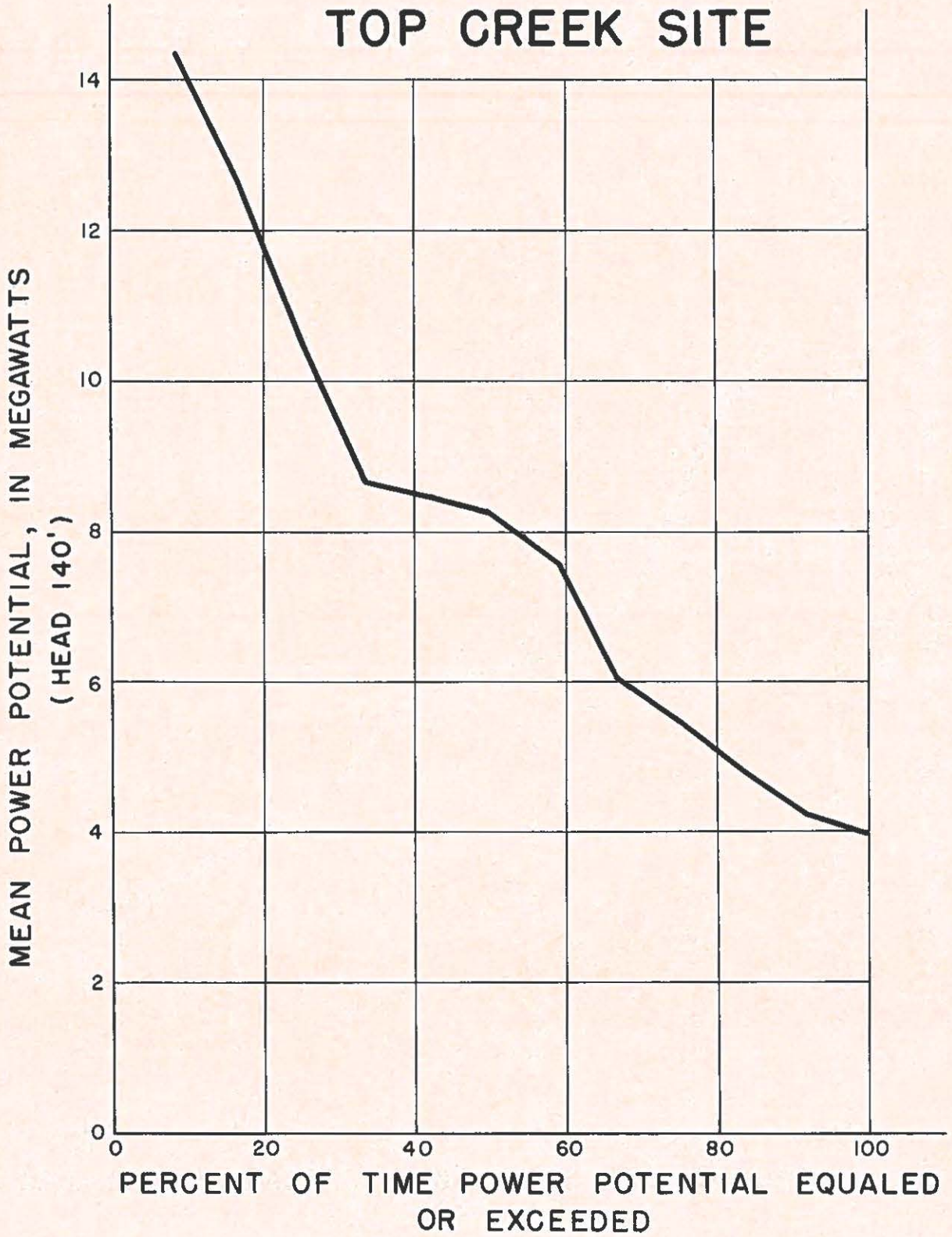


Drawn Sept 3, 1958
File No.

FIGURE 98

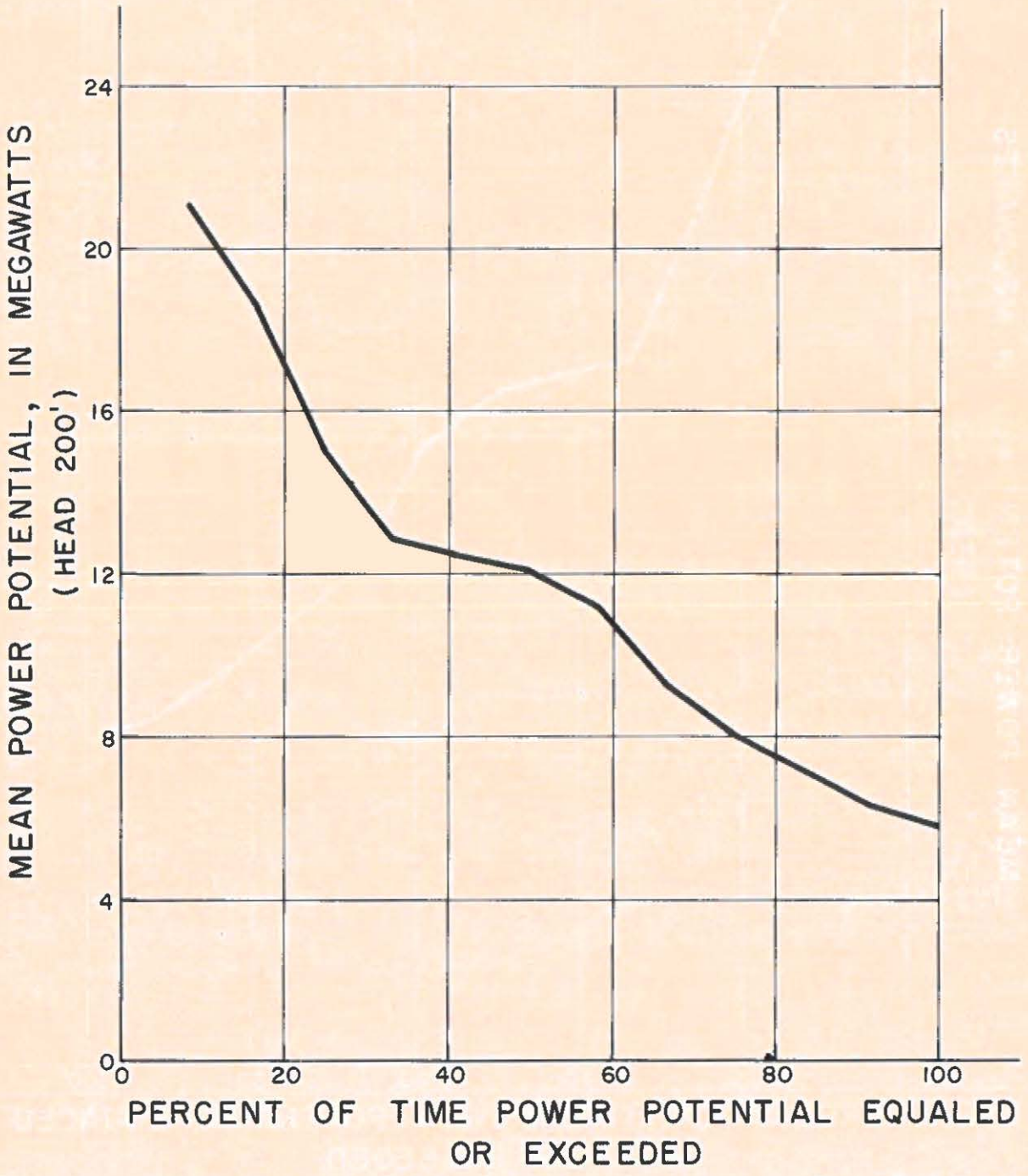
ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for TOP CREEK SITE



Drawn Sept. 3, 1958
File No.
FIGURE 99

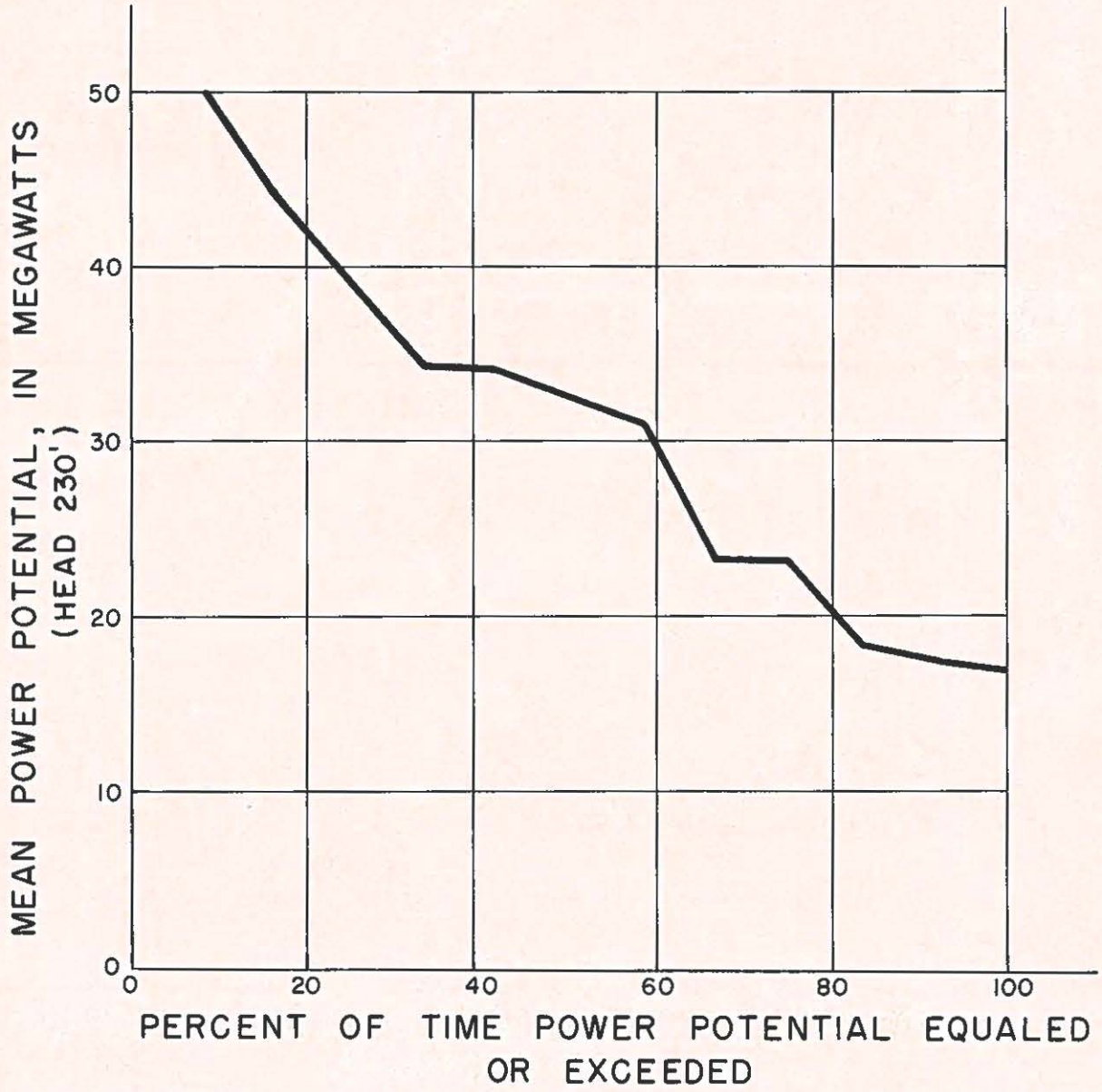
ROGUE RIVER BASIN
MEAN MONTHLY POTENTIAL POWER DURATION CURVE
for
KITER CREEK SITE



Drawn Sept. 3, 1958
File No.
FIGURE 100

ROGUE RIVER BASIN

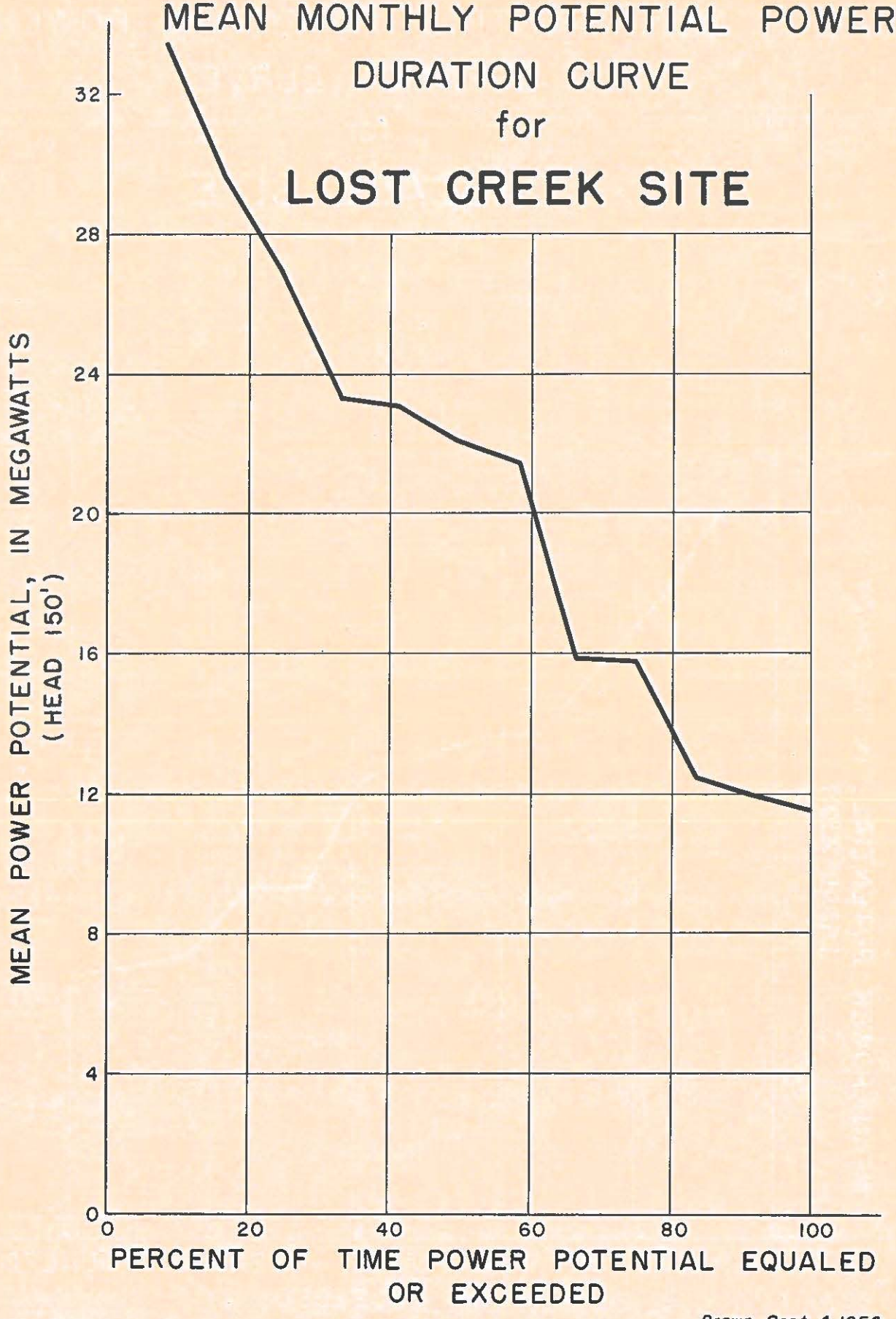
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for CASCADE SITE



Drawn Sept. 3, 1958
File No.
FIGURE 101

ROGUE RIVER BASIN

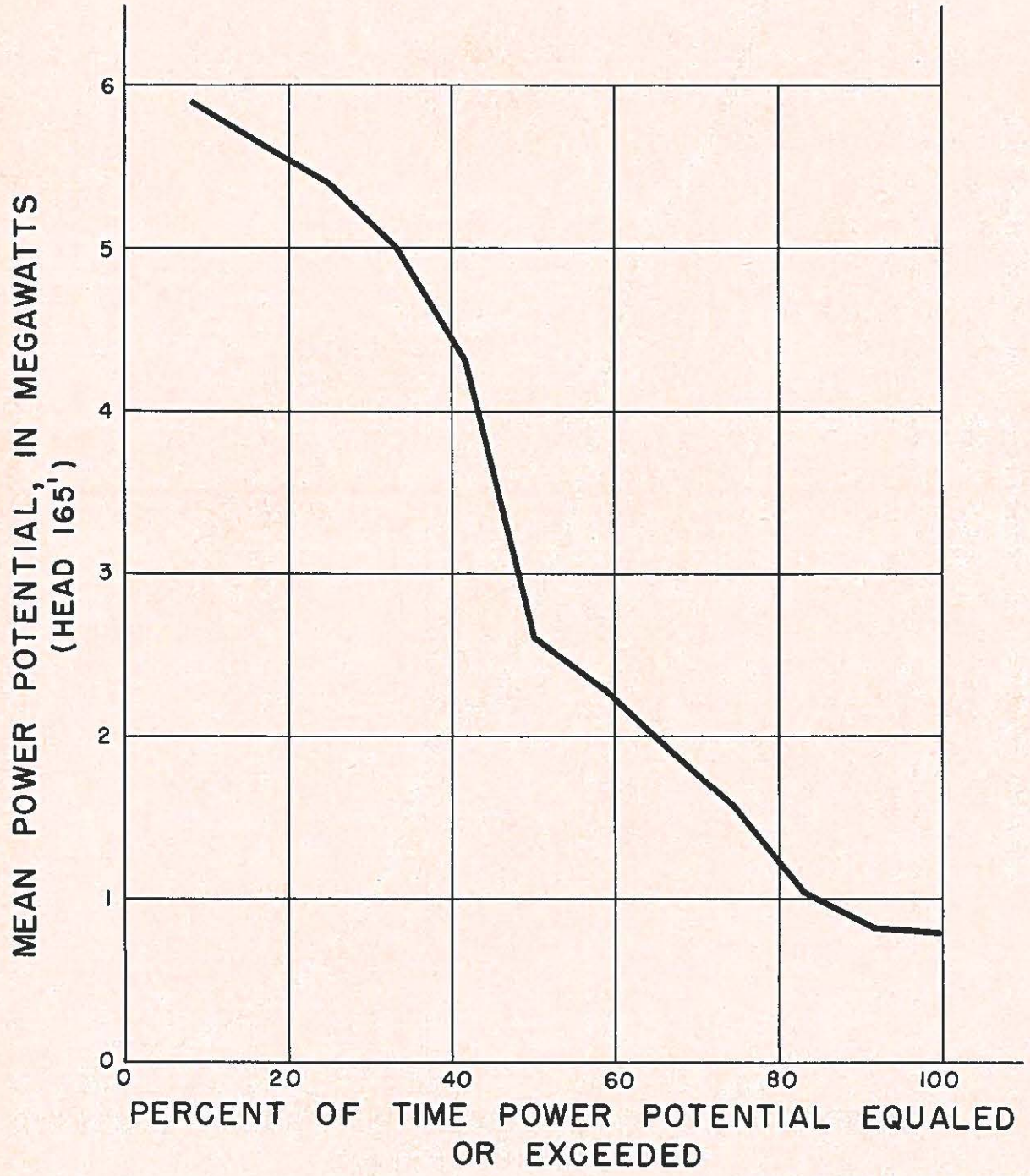
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for LOST CREEK SITE



Drawn Sept. 4, 1958
File No.
FIGURE 102

ROGUE RIVER BASIN

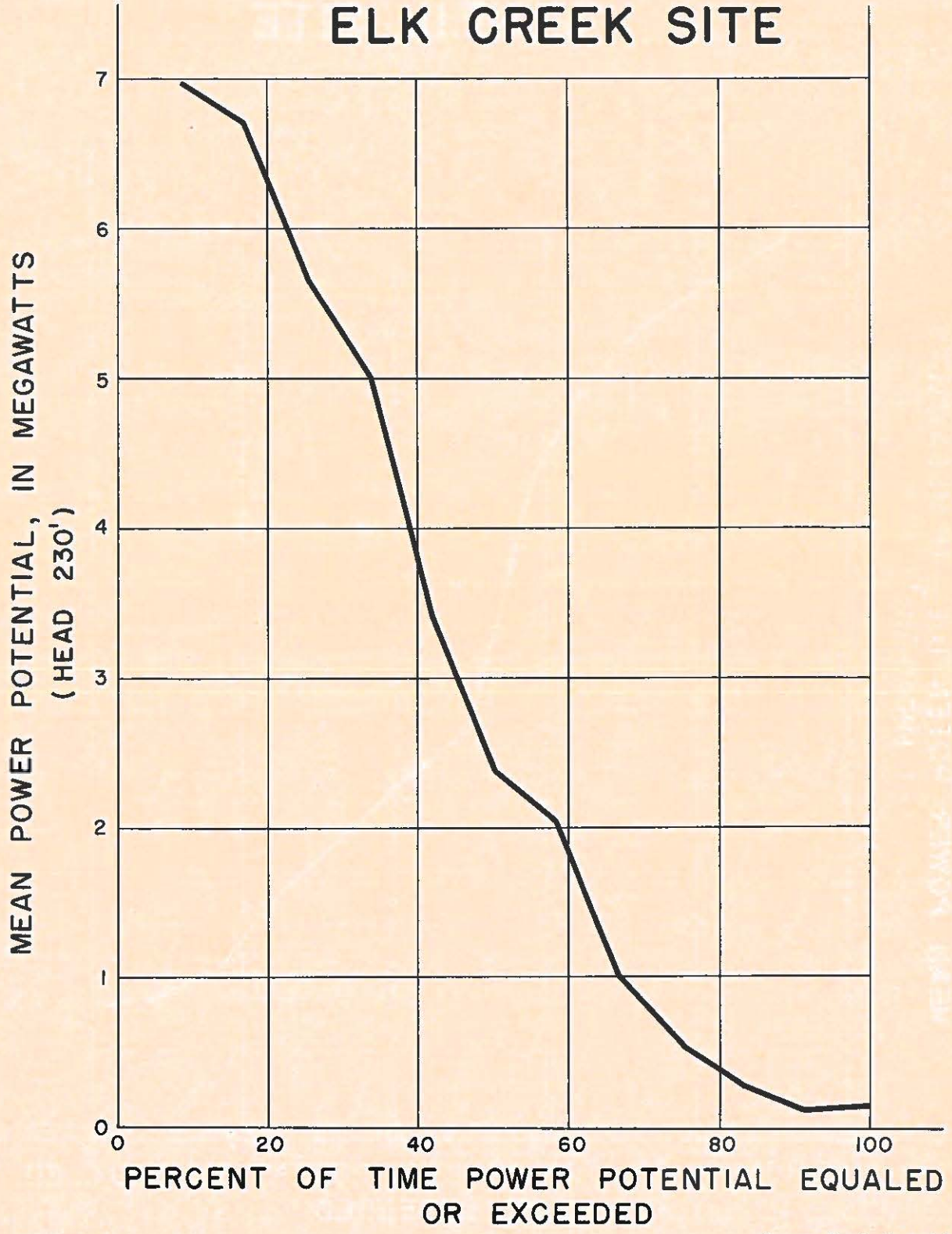
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for McNEIL SITE



Drawn Sept. 7, 1958
File No.
FIGURE 103

ROGUE RIVER BASIN

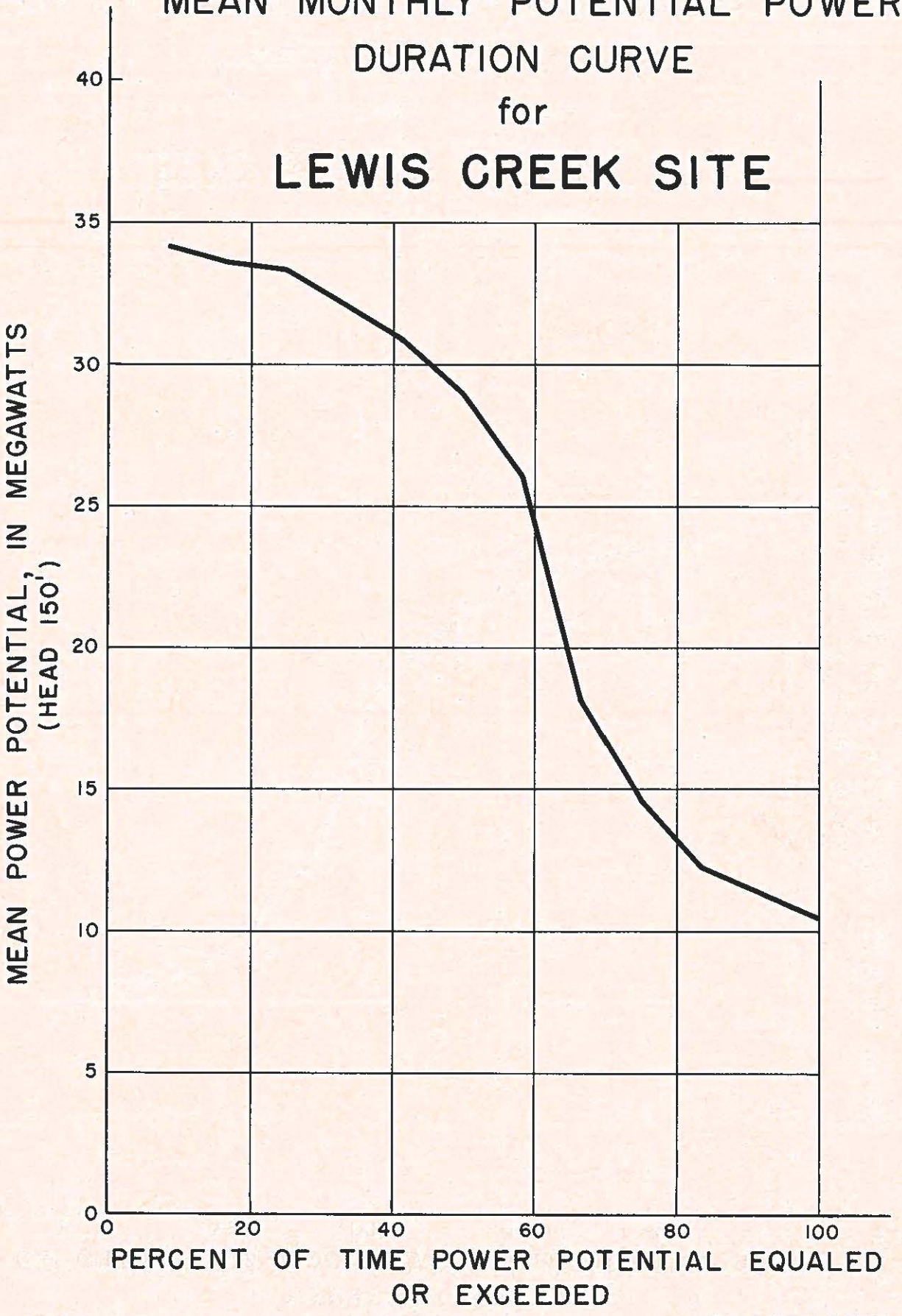
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for ELK CREEK SITE



Drawn Sept. 7, 1958
File No.
FIGURE 104

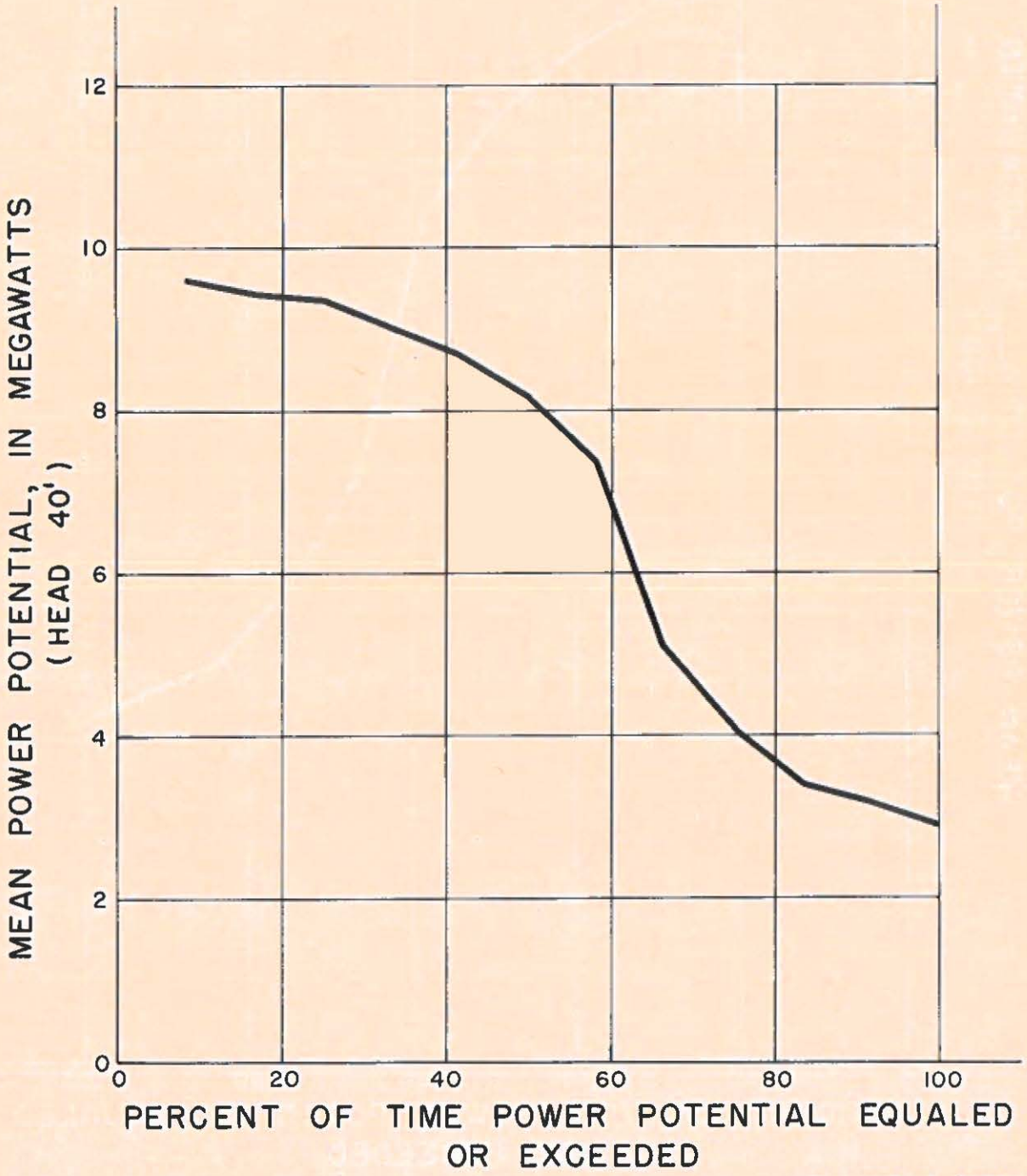
ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for LEWIS CREEK SITE



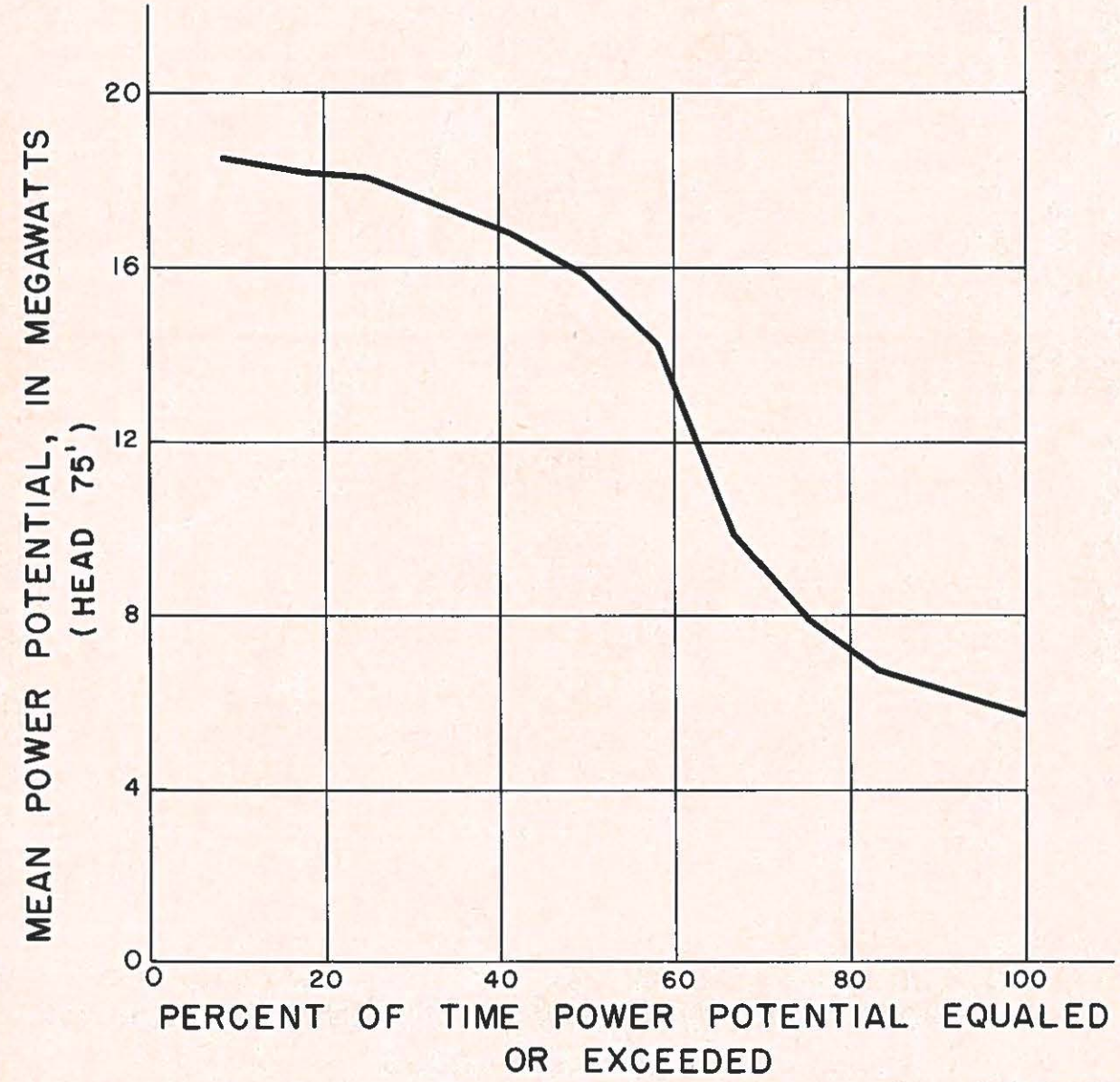
Drawn Sept. 4, 1958
File No.
FIGURE 105

ROGUE RIVER BASIN
MEAN MONTHLY POTENTIAL POWER DURATION CURVE
for
TRAIL CREEK SITE



Drawn Sept. 4, 1958
File No.
FIGURE 106

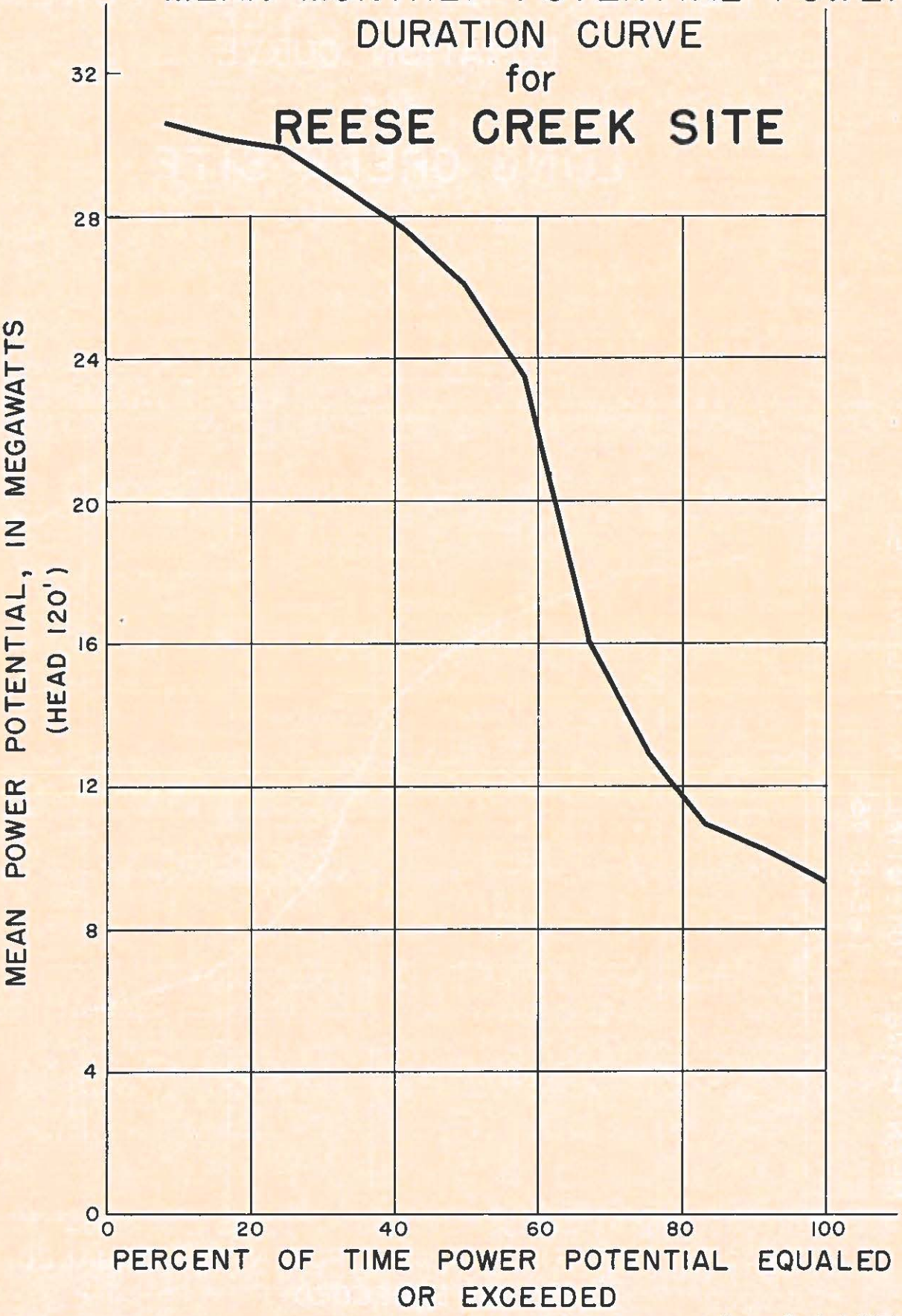
ROGUE RIVER BASIN
MEAN MONTHLY POTENTIAL POWER DURATION CURVE
for
LONG CREEK SITE



Drawn Sept. 4, 1958
File No.
FIGURE 107

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for REESE CREEK SITE



Drawn Sept. 4, 1958
File No.
FIGURE 108

SECTION 2 LITTLE BUTTE CREEK BASIN

GENERAL DATA

Location

Little Butte Creek extends from its confluence with the Rogue at mile 132 to its headwaters at Fish Lake reservoir on its North Fork and near the Cascade Divide on its South Fork. Part of the Little Butte Creek Basin, 18 percent, is in the Rogue River National Forest. This sub-basin is bounded on the north by Big Butte Creek drainage, on the south by Bear Creek drainage, on the west by the Rogue River and on the east by the Cascade Divide. Figure 109 shows the complete stream system of this section.

Size

This is the next to the smallest sub-basin with 95 percent of its 374 square miles in Jackson County and the remainder in Klamath County, the total being a little over seven percent of the Rogue Basin area. Little Butte Creek's South Fork drainage is 37 percent of the sub-basin area and the remainder is main stem or other tributary drainage. There are 331 miles of streams in this section with about 17 miles on the main stem, 21 on the South Fork, 14 on the North Fork, 19 on Antelope Creek, and the remainder on small tributaries.

Topography and Geology

About 15 percent of the sub-basin could be classed as agricultural land located along the main stem and a few miles of its North and South Forks, surrounding the town of Eagle Point, and along Antelope Creek. Most of the remaining land is unsuitable for agricultural use because of mountainous terrain while a small part is unsuitable because of climate.

The agricultural lands are approximately 1,400 feet in elevation above mean sea level. Brown Mountain, elevation 7,311 feet and located four miles southeast of Fish Lake, is the highest point in this section and there are several other peaks with elevations greater than 5,000 feet, nearly all of which are in or near the southeast corner of the Basin.

Headwater gradients of the streams are steep, above 184 feet per

mile in some cases while the main stem averages approximately 33 feet of drop per mile. The Rogue Basin stream system profile was shown in Figure 2.

Most of the land consists of tertiary volcanic rocks of the lava series and there is a little white tuff scattered throughout the sub-basin.

Little Butte Creek and its major tributaries flow in a generally northwest direction with the main stem dropping from an elevation of 5,000 feet to 1,200 feet at its mouth.

Climate

Average annual precipitation for the Rogue Basin was shown in Figure 3. Precipitation in the Lake Creek area, 17 miles above the mouth, averages from 25 to 30 inches annually; in the headwater areas around Fish Lake this increases to approximately 50 inches annually; and, near the mouth around Eagle Point, at a lower elevation, the average rainfall is near 20 inches annually. In all of these areas approximately 25 to 30 percent of the average annual precipitation occurs during the irrigation season, May 15 - October 15. Snowfall averages 164 inches at the higher elevations and 22 inches annually in the Lake Creek area.

Average temperature highs and lows at elevations near 4,800 feet range from 39 to 69 degrees Fahrenheit in the summer and 25 to 45 in the winter while at elevations near 1,900 feet averages in the summer are from 42 to 77 degrees Fahrenheit and in the winter from 31 to 53. The average annual growing season is 230 days at the lower elevations indicated by the Bureau of Reclamation's climatological map.

Population

Approximately 2,500 people inhabit this area and the town of Eagle Point, 1958 certified population 690, located five miles above the mouth of Little Butte Creek, is the population center. There are five other small communities in the sub-basin (Figure 109).

SUB-BASIN INVENTORY - LITTLE BUTTE CREEK

Land Ownership

Government timber lands comprise 40 percent of the sub-basin area, public domain lands 3 percent and most of the remainder is privately owned. The headwater areas of Little Butte Creek's South and North Forks are National Forest lands with Bureau of Land Management sections scattered throughout the rest of the sub-basin. Sixty percent of the South Fork drainage consists of timber land.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19. Crater Lake Highway, Oregon 62, is the link from the lower end of the sub-basin to other regions and passes through the northwest corner near the town of Eagle Point. The major transportation route within the sub-basin is a paved road from Eagle Point following Little Butte Creek to the town of Lake Creek. Other routes of importance are gravel roads up Antelope and Yankee Creeks, following the North Fork to Fish Lake, and following the South Fork to its confluence with Indian Creek. There are an additional 200 miles of unimproved dirt roads.

A logging railroad from Medford passes through White City and Eagle Point, then continues north into the Upper Rogue Basin. A Southern Pacific spur starting near Gold Ray serves the White City area.

There is no direct boat, airline or bus transportation service in this sub-basin and no freight truck routes are maintained.

Present Economy

Timber and agriculture are the primary industries in this region. There are several sawmills located around White City while farming consists primarily of dairying and raising beef cattle.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

Rogue Basin climatological stations were shown in Figure 30. Climatological stations in this sub-basin are located at Modoc Orchard, Lakecreek,

and Fish Lake, none being recording stations. Both precipitation and temperature data is collected at Modoc Orchard; precipitation data only at Lakecreek; and precipitation and storage data at Fish Lake during the irrigation season.

Average annual precipitation for the Rogue Basin was shown in Figure 3 and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

The location of stream gaging stations, both active and inactive, in the Rogue Basin was shown in Figure 29. Three of these are in the Little Butte Creek sub-basin, the one at the outlet of Fish Lake being maintained during the irrigation season. Records from these stations are published in U. S. G. S. water-supply papers, Part 14.

Yields

Figure 110 shows the annual yield of Little Butte Creek at its mouth for the years 1929 through 1956. The average annual yield at this location for all years of record is 164,000 acre-feet.

Average monthly discharges for the same years of record are shown in Figure 111. This plot shows the distribution of the average annual yield with respect to time. Peak runoff in this sub-basin occurs in the month of April as the result of early snow melt.

Minimum flow and minimum yield data are not available for this sub-basin. Table 7 summarizes the critical flow and yield conditions which have occurred in the Rogue Basin.

Flood and drought frequency curves for Little Butte Creek at Lakecreek, Figure 112 give an indication of critical conditions in this area. The maximum flood curve was prepared from work by the Corps of Engineers and minimum curves were computed independently by the State Water Resources Board using data from water-supply papers. The curves show that for a 10-year average recurrence interval a flood of 3,500 cubic feet per second at Lakecreek could be expected or low flows averaging 100 cfs for 365 consecutive days, 36 cfs for 30 consecutive days, and 29 cfs for 1 day. This does not mean that flows of this magnitude will occur once every 10

years but rather that over a long-term period, say 100 years, such flows will probably occur 10 times at irregular intervals which average once every 10 years.

Completion of the Talent Project with its interbasin diversions from Little Butte Creek drainage will change the pattern of winter flows and the frequency of occurrences.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin was shown in Figure 20 and Table 15 is a summary of the water rights by classification existing at present in the Little Butte Creek sub-basin. Irrigation rights represent 89 percent of the total and power rights 10 percent. Total rights are 2,340 cfs of which 2,115 are consumptive in nature.

Depletions

Distribution of the rights to deplete the natural flow of the sub-basin stream system is shown in Figures 113 and 114. The plots show the total of all rights but do not indicate the actual water use for the following reasons:

1. Irrigation rights are seasonal in nature with the legal irrigation season usually being from May 15 to October 15 and actual use depends upon the pattern of rainfall occurring during the specific season in question.

2. Some irrigation rights are filed with the knowledge that low flows of the streams are fully appropriated and the right can only be exercised during higher flows occurring during the first and last parts of the season.

3. Return flows from irrigation, particularly from the flooding type, means that all water diverted for this purpose is not used.

4. Power production is a nonconsumptive use so that water for

TABLE 15

WATER RIGHTS SUMMARY

LITTLE BUTTE CREEK BASIN

USE	STREAM		TOTAL RIGHTS CFS
Domestic	Little Butte Creek	0.1	
	South Fork Little Butte Creek	0.6	
	Others	0.6	
	Total - Domestic		1.3
Municipal	All		10.0
Irrigation	Little Butte Creek	97.1	
	South Fork Little Butte Creek	1,020.2	
	Others	965.5	
	Total - Irrigation		2,082.8
Power	Little Butte Creek	46.0	
	South Fork Little Butte Creek	161.0	
	Others	15.5	
	Total - Power		222.5
Industrial	Little Butte Creek	0.1	
	Others	20.0	
	Total - Industrial		20.1
Mining	None		
Recreation	South Fork Little Butte Creek		0.5
Wildlife	None		
Fish Life	All		3.2
Pollution Abatement	None		
	TOTAL LITTLE BUTTE CREEK BASIN		2,340.4

this purpose becomes available for other use at downstream locations. A good illustration of this is the Green Springs power plant being constructed as part of the Talent Project which utilizes water diverted for irrigation purposes while the water is enroute to its ultimate irrigation destination.

Ordinate values on the plots do not include supplemental rights and these are not part of Table 15. Supplemental rights permit alternate sources of supply but do not add to original rights.

Nearly all of the water rights in the sub-basin are consumptive with about half of them located on the South Fork of Little Butte Creek as shown in Figure 114. Very few rights occur on the North Fork and most main stem usage occurs between miles 3 and 4, Figure 113.

EXISTING NEEDS

Domestic

Rights for domestic usage total a little more than one cfs for surface water from the streams.

Municipal

There is only one municipal right in this Basin and that is for 10 cfs in the name of the Rogue River Valley and Medford Irrigation Districts.

Irrigation

Two manmade reservoirs, Fourmile Lake and Fish Lake, were originally constructed by the Rogue River Valley Canal Company to be operated for irrigation purposes. Water from Fourmile Lake, in the Klamath Basin, reaches Fish Lake in the Rogue Basin by means of the Cascade canal and from there is discharged into Little Butte Creek to be picked up further downstream by irrigation canals. In 1929 the Rogue River Valley Canal Company assigned approximately a two-thirds share of its rights to the Medford Irrigation District and a one-third share to the Rogue River Valley Irrigation District. Nearly 80 percent of the total rights of 2,083 cfs for irrigation purposes in Little Butte Creek Basin are presently held by these two irrigation districts.

The Talent Irrigation District holds a right for 500 cfs from South Fork Little Butte Creek. In addition, water from the smaller tributaries in the headwaters of the Basin is to be diverted into the Howard Prairie reservoir as part of the Talent Project.

Canals, reservoirs, and features of the Talent Project appear on the Basin Irrigation Development map, Figure 16.

The Bureau of Reclamation report of 1950 indicates that presently irrigated lands as well as potentially irrigable areas are located mostly in the lower end of the sub-basin around Eagle Point and along Antelope Creek. The present status of irrigation plus potentially irrigable lands for the Rogue Basin was shown in Figure 15.

Power

Power rights in this Basin total 256.5 cfs of which a right for 12.5 cfs has expired. One hundred and sixty cfs from the South Fork of Little Butte Creek is in the name of the United States of America and is the amount to be diverted from the headwater tributaries of the South Fork for the Talent Project and will be utilized to produce power at the Green Springs plant prior to being discharged into Emigrant Reservoir for ultimate use for irrigation purposes. These features were shown in Figure 21.

Industrial

Ninety-nine percent of the industrial rights are held by Rogue River Valley and Medford Irrigation Districts with a priority date of 1910. Other very small industrial rights are for use by a railroad and a tallow company.

Mining

There are no water rights for mining in the Little Butte Creek drainage basin. The location of mineral deposits and active mining operations in the Rogue Basin were shown in Figure 17.

Recreation

There is an application for one-half cfs for water to be used for

recreational purposes in the Basin. Fish Lake Reservoir, 515 acres before drawdown for irrigation, is heavily used primarily by local population, and has recreation facilities including a resort. There are no other lakes or reservoirs within the sub-basin. Streams in this section are fished each year, mostly by the local populace. There are five forest camps but no parks in this area. Recreational facilities for the Rogue Basin were shown in Figure 18.

Wildlife

Blacktail deer, upland game, and waterfowl needs for water are small in this area and easily satisfied due to the low level of development by man.

Fish Life

The stream system above the town of Lake Creek is one of the primary spawning areas in the Basin for silver salmon and the entire stream system is used to a small degree for spawning by the anadromous specie of steelhead trout (Figures 22-24).

As with many other areas in the Rogue Basin, the stream system in Little Butte Creek Basin is subject to low flows and high temperatures during dry summer months which are detrimental to fish life.

Sufficient water to adequately cover the spawning gravel in some of the smaller tributaries is not always available. Mean monthly discharge hydrographs with desirable base flows for fish as recommended by the State Game Commission for critical points in the Little Butte Creek drainage system are shown in Figures 115 and 116. These indicate that, for average flow conditions, there is insufficient water to satisfy requirements for proper management of the fishery resources during the month of October on the South Fork of Little Butte Creek and during the winter months of October through March on the North Fork at Fish Lake Reservoir. Winter discharges are low at Fish Lake Reservoir because the water is being stored for irrigation use during the following season.

Fish water requirements for the Rogue Basin stream system were shown in Figure 42.

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Fish water requirements for the Rogue Basin stream system were shown in Figure 42.

Water temperatures above 65 degrees Fahrenheit, which sometimes accompany the low flows occurring during warm, dry summers, are detrimental to fish life. Water temperature data relative to this sub-basin is being gathered for the first time through the cooperation and efforts of the Medford, Talent, and Rogue River Valley Irrigation Districts. This data, which covers the 1958 irrigation season, is available from the files of the State Water Resources Board.

It is estimated by the Jackson County Water Resources Committee that there are 21 miles of stream with 120,000 square yards of spawning gravel available for use by migratory fish in this sub-basin.

Pollution Abatement

There are no sewage treatment plants in the sub-basin and pollution abatement is not serious at present but some concern has been voiced by people along the South Fork of Little Butte Creek regarding the diversions for the Talent Project which they feel will reduce the summer stream flow to an intolerable level. Correspondence to those people from the Bureau of Reclamation has offered assurance that no water would be diverted from June through September although, as pointed out by the State Engineer in a letter answering the same people, the Talent Project has a 1915 priority to all water in excess of that needed to satisfy prior rights by virtue of Application No. 4496, which was discussed under "Extent of Board's Jurisdiction."

Flood Control

Streamflows in this sub-basin are affected by snow melt due to the high elevation of the headwaters, and peak discharges usually occur in the month of April during the spring freshet rather than earlier in the year following heavy rains as is the case with streams originating at lower elevations. The runoff pattern at the mouth of Little Butte Creek is shown in Figure 111 which was discussed in the section under Yields.

Flood damages occur primarily in the bottom land areas near the mouth of Little Butte Creek. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 listed damages which occurred during the 1955 flood. The amount for the Little Butte Creek

Basin was comparatively small and is included as part of the "Other tributaries" classification.

FUTURE NEEDS

Domestic

Population growth will occur primarily in the lower end of the Basin and future domestic needs will most likely be satisfied from surface water supplies.

Municipal

There should be no significant municipal requirements in the foreseeable future.

Irrigation

Potentially irrigable lands occur mainly around Eagle Point (Figure 15). A recent feasibility report of the Bureau of Reclamation contemplates a 460 acre-foot reservoir on Antelope Creek primarily for irrigation purposes. Irrigation water from this storage would not benefit the sub-basin but would be used to augment Medford and Rogue River Valley Irrigation Districts' supplies. The small acreage of farmland existing near and upstream from Lake Creek would benefit from additional irrigation water because the supply is insufficient at present but the cost of storage to meet these needs is not economically justifiable at present.

Power

There is little power potential in this area which could be developed economically.

Industrial

Industrial growth in the Little Butte Creek sub-basin will be negligible and will have little effect on the quantity, quality, or distribution of the water resources of this sub-basin.

Two factors dictate this conclusion:

First, industrial growth will be limited in scope and,

Second, lack of adequate water supplies will prevent the establishment of operations which create water problems of quantity or quality.

Growth of industry in the sub-basin would come primarily from utilization of timber resources in the surrounding supply area. Site selection factors such as transportation, site adequacy and personnel availability do not compare favorably with other areas in the Rogue Basin, greatly reducing the probability of significant expansion in the industrial field.

An even greater deterrent is the unavailability of suitable water supplies in this sub-basin. Utilization of water during the summer season approaches the supply capabilities of the stream. Industries supplied by water from this Basin would have to rely on the construction and operation of storage facilities to utilize excess winter flows. In view of the better water supply situation in other areas, and lacking any outstanding advantages, it seems probable that industrial operations requiring water will locate elsewhere.

There is some limited possibility that industrial development based on secondary timber utilization could take place in the lower section of the sub-basin around and downstream from Eagle Point. The industrial area at White City sits, in effect, on the divide between the Little Butte and the Middle Rogue sub-basin; therefore extension of activities and facilities in the White City area could actually fall within the former's watershed. Since the water supplies of the Little Butte Creek sub-basin cannot meet the needs of any major industry in the lower area, the only aspect relating the industrial operation to the Basin is one of land occupancy. The satisfaction of water needs for this area will be treated with the discussion of White City potentials covered in the Middle Rogue section. No other significant potentials for industrial have been identified.

Mining

According to the State Department of Geology and Mineral Industries, mineral deposits of significance in the Little Butte Creek Basin consist of gold, manganese, and bentonite. Development of these minerals would

require industrial water with the amount depending upon the size and type of such developments. The size and importance of the sub-basin's mineral deposits are not known. Mineral deposits and active mines and mills in the Rogue Basin were shown in Figure 17.

Recreation

The recreational potential of this Basin is slight under existing conditions. If a storage reservoir were built in the area, as at Antelope Creek, it would have major recreational significance due to its proximity to the relatively large population center at Medford. Lake-type fishing, boating, swimming, water skiing, picnicking, etc. would be within easy reach of many people which would make such a location heavily used during the week as well as on weekends.

Wildlife

Wildlife needs will not change significantly unless there is an appreciable change in the existing habitat which is not likely.

Fish Life

Maintaining the fishery resource at its present level will be extremely difficult if there is any appreciable increase in development in this area, but such an increase is unlikely. Improving the fishery resource will depend primarily upon increasing minimum flows. Reservoir storage would accomplish this but at the same time would inundate some of the spawning area presently available to anadromous fish.

Pollution Abatement

Pollution abatement requirements will not increase much over the present level in view of the small potential for expansion of the water use developments contributing to pollution.

Flood Control

Because of the limited increase in development anticipated for this area, future needs for flood control will not be much greater than present needs.

Flood control storage located at the Antelope Creek, Dry Creek, Brownsboro and Lakecreek sites was included as part of the optimum flood control study for the Rogue Basin. Such storage would have little local benefit but would provide downstream benefits as well as recreational and irrigation benefits to the locality. These sites were shown in Figure 43. The regulated outflows for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13.

The current study by the Corps of Engineers indicates that storage for flood control in the Little Butte Creek Basin cannot be justified economically at present.

LITTLE BUTTE CREEK

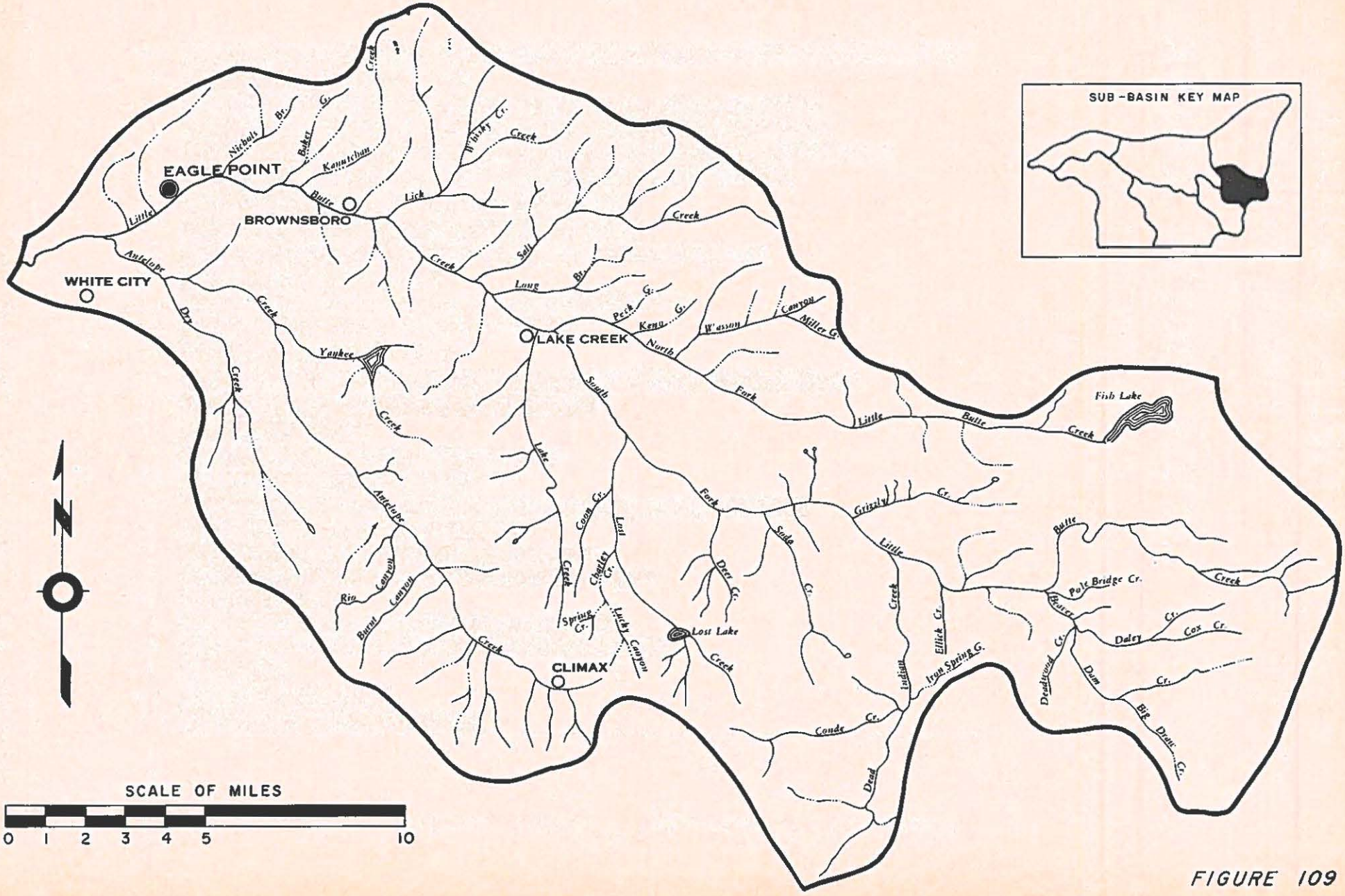
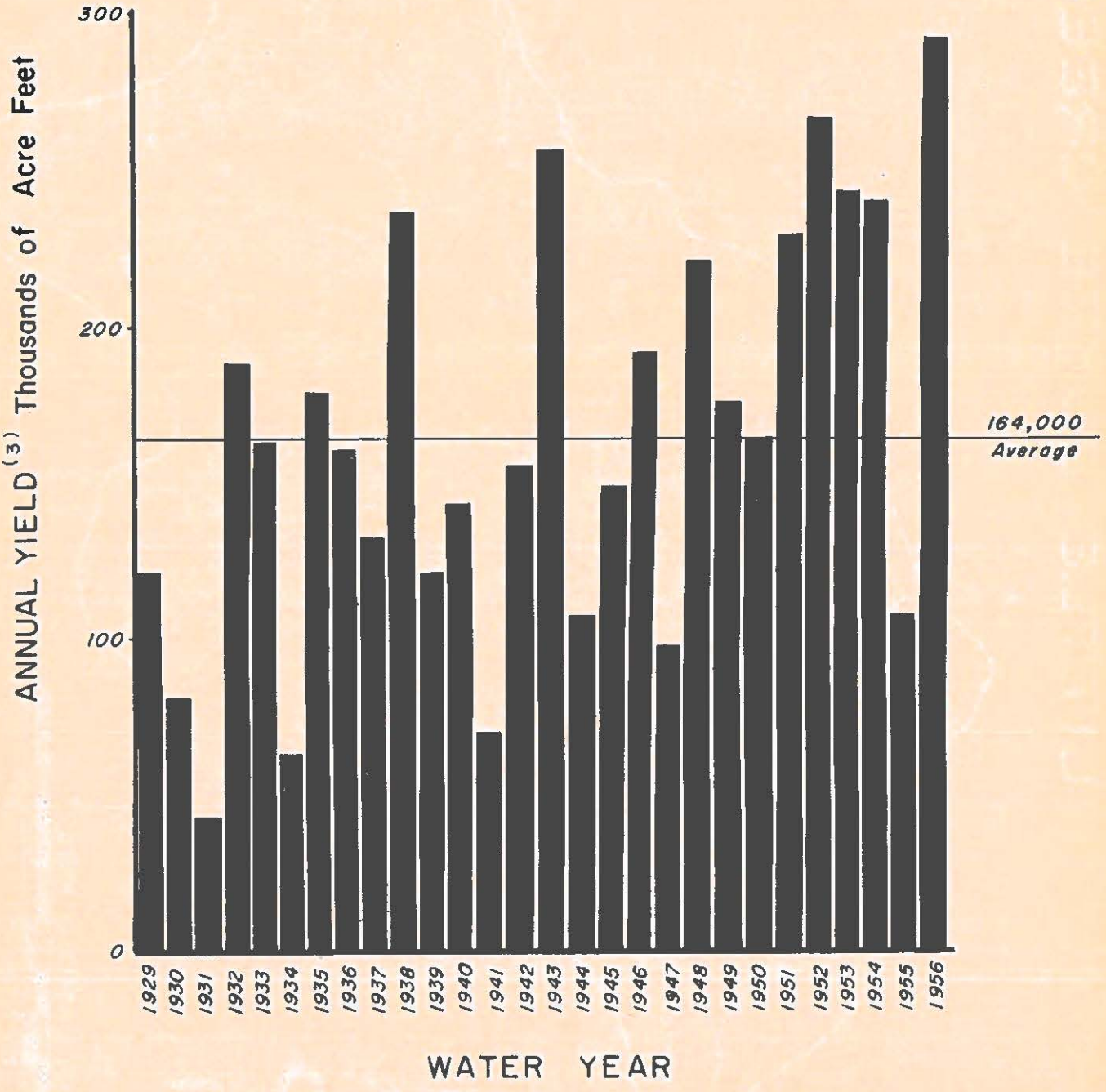


FIGURE 109

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
LITTLE BUTTE CREEK

Drainage Area 374 Sq. Mi.



(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

Drawn: 6-12-58
File No. 15.220

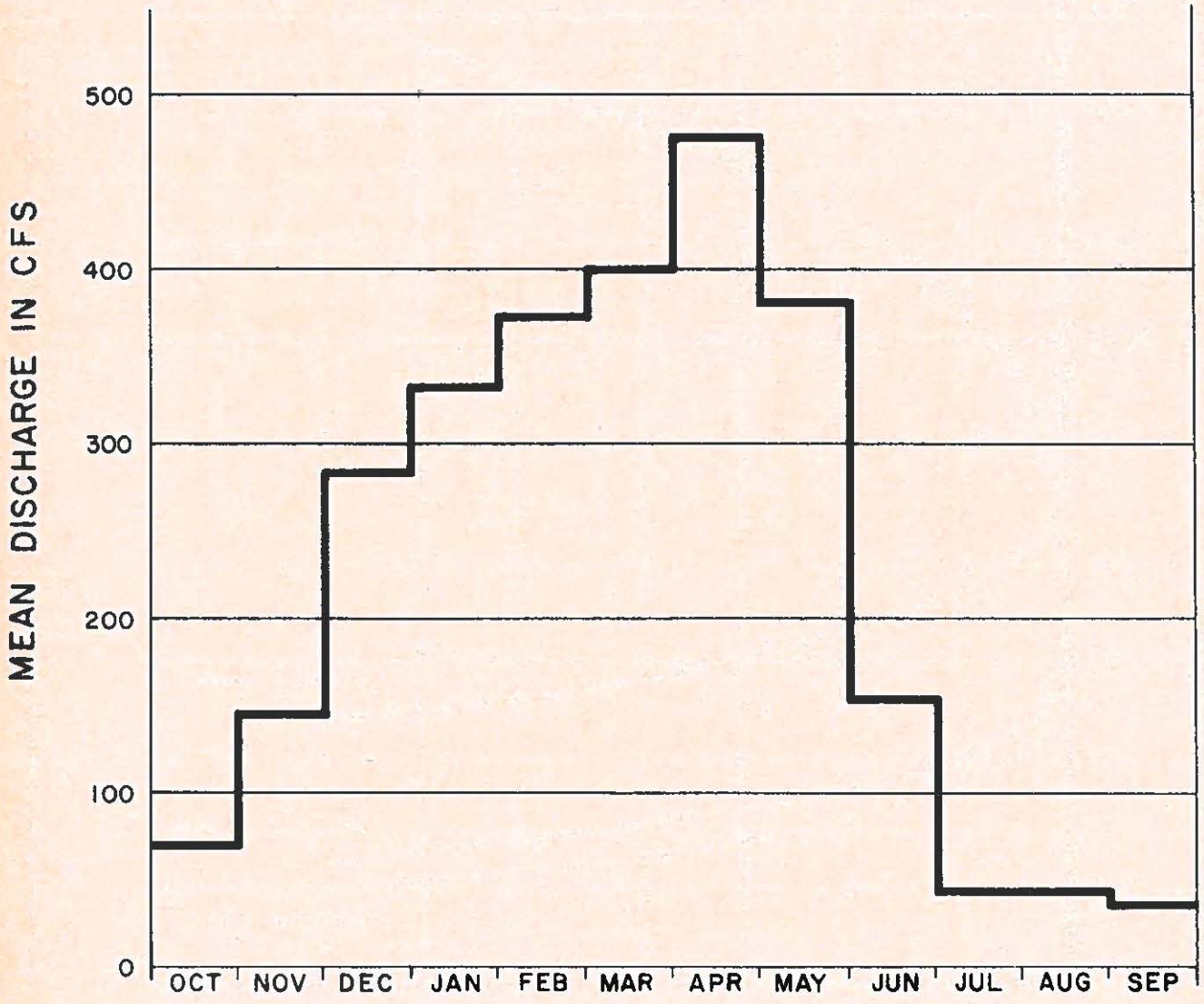
FIGURE 110

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

LITTLE BUTTE CREEK

1929 - 1956



Drawn Aug. 15, 1958
File No. 15.202

FIGURE 111

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
LITTLE BUTTE CREEK
AT
LAKE CREEK

(DRAINAGE AREA = 176 SQ. MILES)

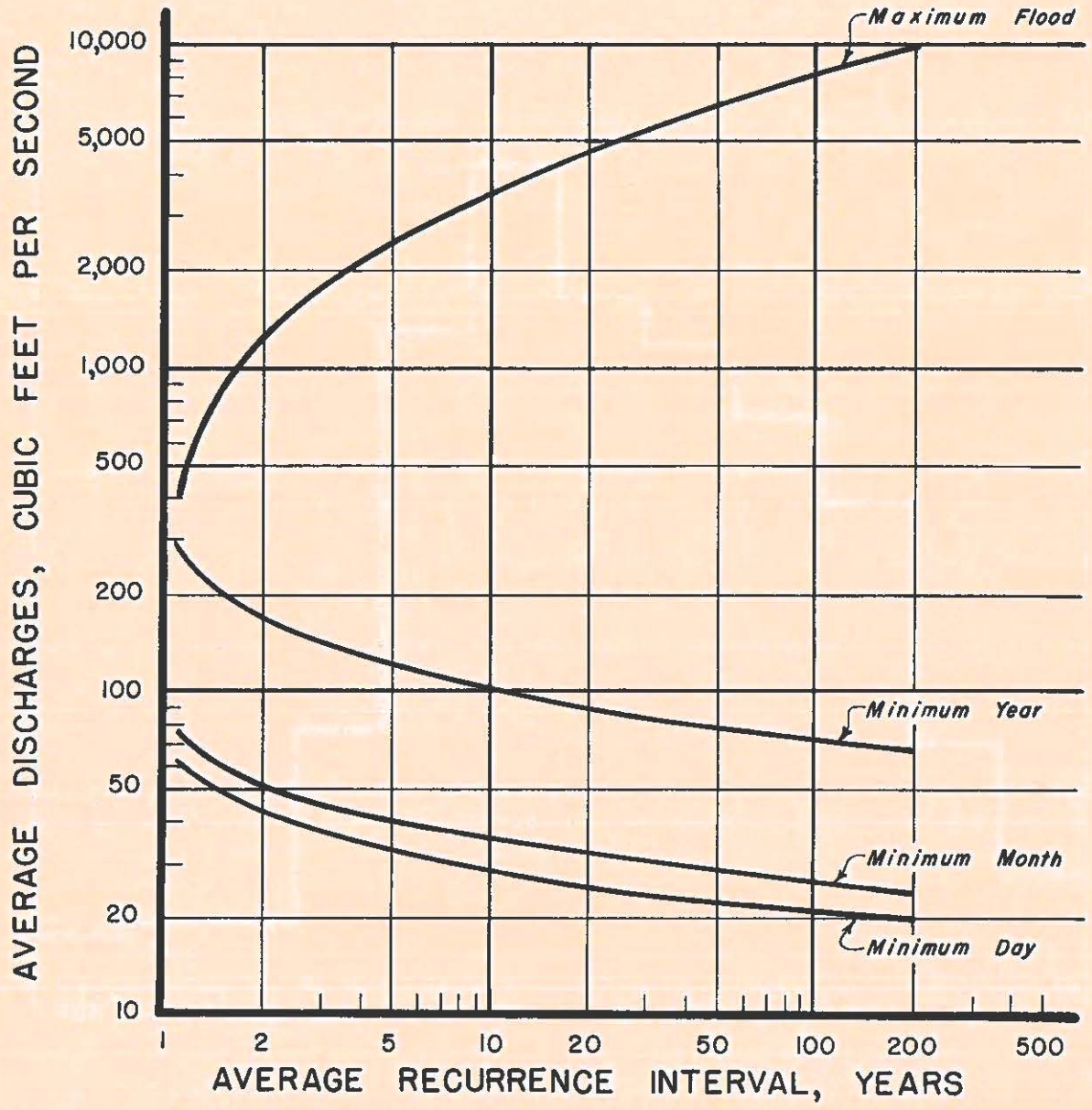


FIGURE 112

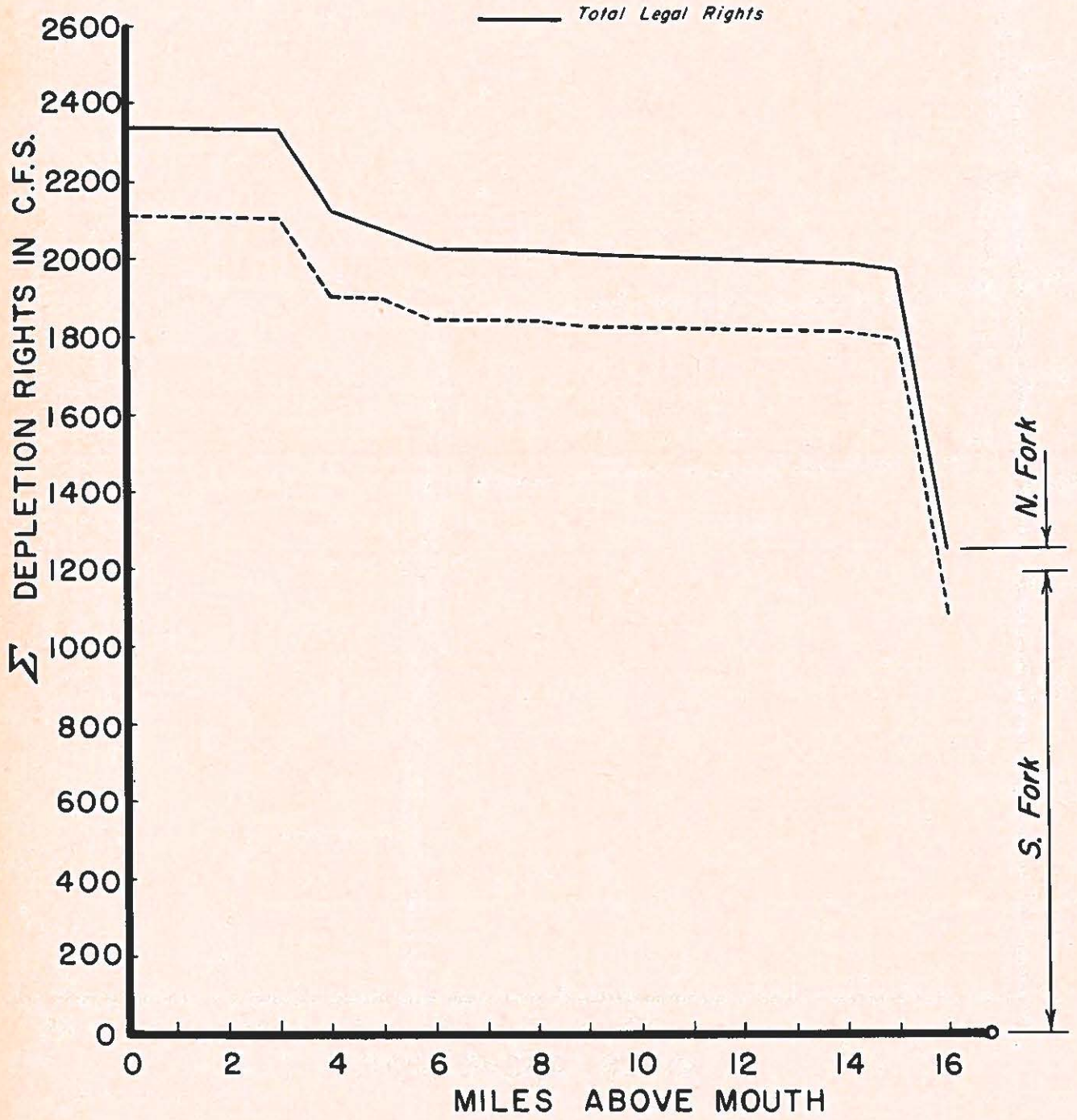
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

LITTLE BUTTE CREEK

as of Jan. 1, 1958



Drawn - Nov. 6, 1958
File No. 15.302

FIGURE 113

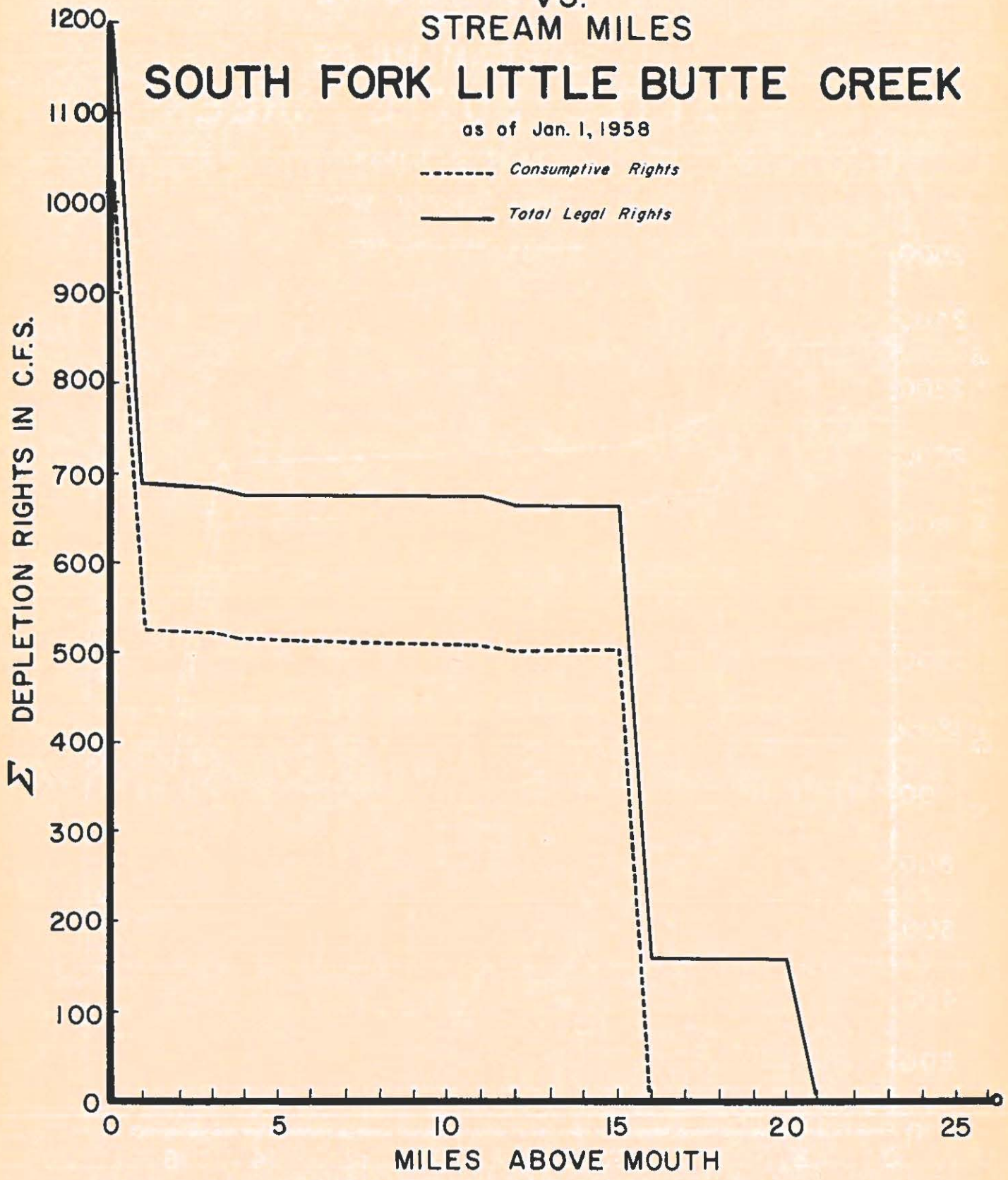
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

SOUTH FORK LITTLE BUTTE CREEK

as of Jan. 1, 1958



Drawn - Oct. 31, 1958
File No. 15.302

FIGURE 114

ROGUE RIVER BASIN

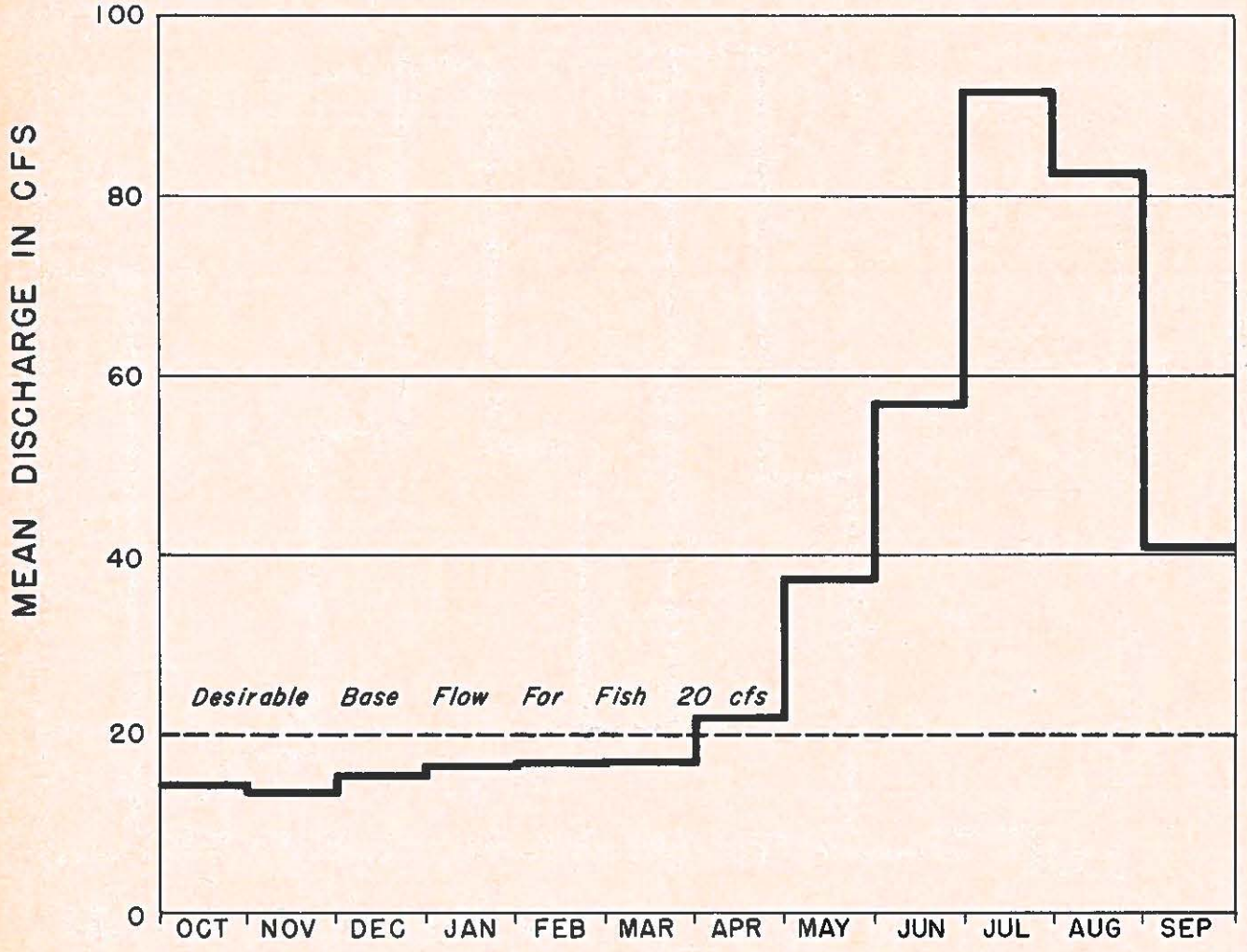
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

NORTH FORK LITTLE BUTTE CREEK AT FISH LAKE RESERVOIR

1918 - 1955



Drawn Sept. 2, 1958
File No. 15.202

FIGURE 115

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

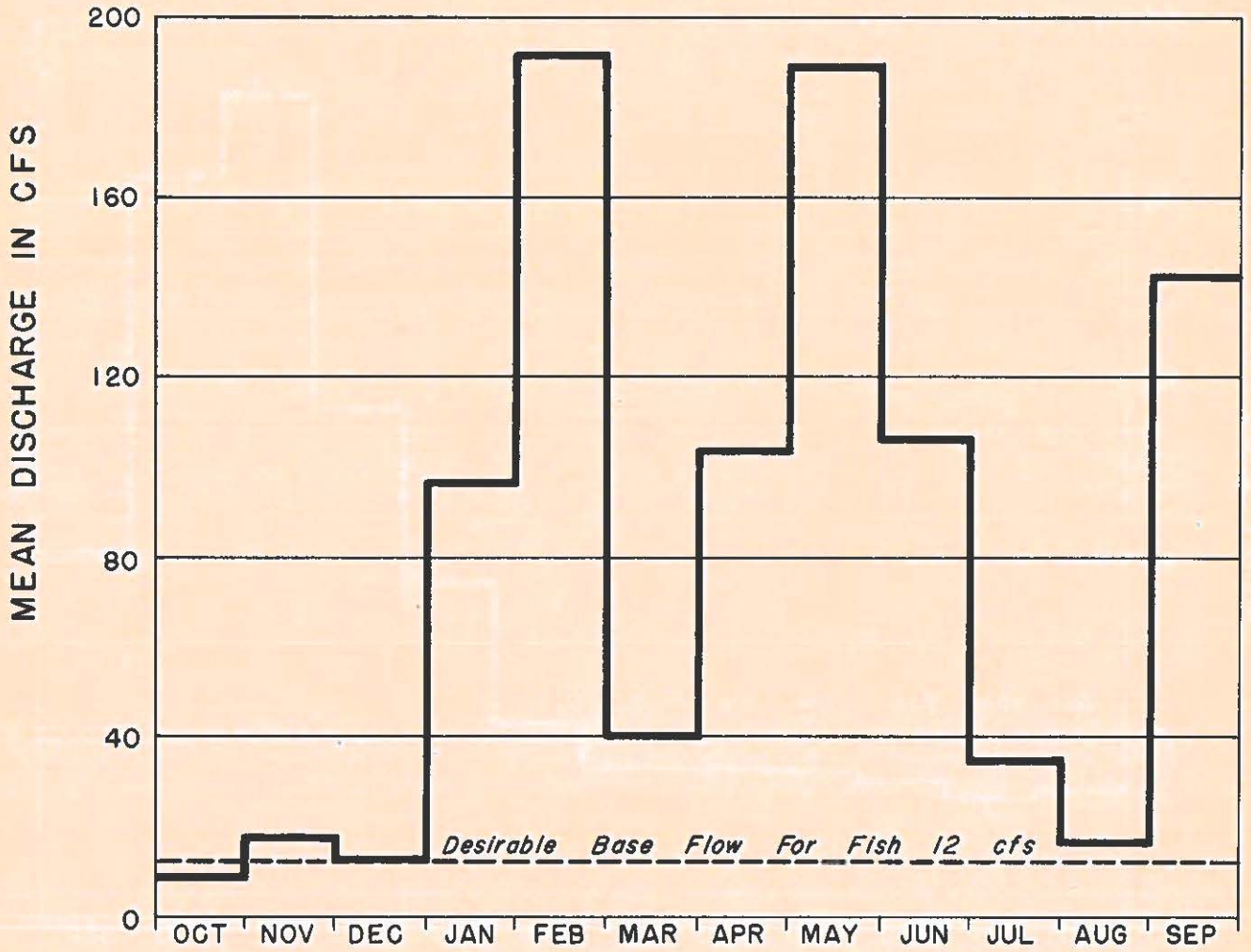
and

FISH WATER REQUIREMENTS

SOUTH FORK LITTLE BUTTE CREEK

MILE 11.9

1912



Drawn Sept. 3, 1958
File No. 15.202

FIGURE 116

SECTION 3 BEAR CREEK BASIN

GENERAL DATA

Location

This sub-basin covers the southeast section of the Rogue Basin. Bear Creek joins the Rogue at about mile 127 and its headwaters are in the extreme southeast corner of the Rogue Basin on the western slopes of the Cascade Divide. The western boundary of the sub-basin is the ridges separating Bear Creek drainage from that of the Applegate River while the separation on the east is from Little Butte Creek drainage. See Figure 117 for the complete stream system.

Size

This is the smallest of the seven sub-basins, 341 square miles, which is only six and one-half percent of the Rogue Basin but is treated separately because it has the heaviest concentration of population and the highest level of development of any region in the Rogue Basin. It lies entirely within Jackson County and is the center of Jackson County economy.

There are 290 miles of streams in the sub-basin; Bear Creek is 25 miles long, Emigrant Creek extends an additional 13 miles, and many tributaries of shorter length make up the remainder of the stream system.

Topography and Geology

Although Bear Creek valley has more expanse of agricultural lands than any other valley in the Basin, 60 percent of its area is unsuitable for farming because of mountainous terrain.

Valley elevations run from 1,140 feet above mean sea level near the mouth of Bear Creek to 2,000 feet in the vicinity of Ashland. Mt. Ashland, located in the southern part of the sub-basin near the headwaters of Ashland Creek, is the highest point in the sub-basin elevation 7,533, and there are four other peaks in the area above elevation 5,000.

The slope of Bear Creek main stem is relatively mild compared to other streams in the Basin, averaging 28 feet of drop per mile, but the slope of Ashland Creek, one of the major tributaries, is more than 400

feet per mile. The Rogue Basin stream system profile was shown in Figure 2.

Gently dipping, sedimentary, and volcanic rocks are found in the valleys and subdued highlands. Older lands, composed of structurally-complex metamorphic and intrusive rocks, are found in the southwest corner of the sub-basin and the rocks become progressively younger moving towards the northeast.

Bear Creek cuts through buff sandstones, shales, and conglomerates in its upper reaches while the last 10 miles of the streambed consist of stratified gravel, sand and silt with a small amount of water-worn alluvium.

Bear Creek and its extension, Emigrant Creek, flow in a northwest direction while most of the other tributaries flow generally towards the north.

Climate

The lowest average annual precipitation in the Rogue River Basin, less than 20 inches, occurs in the Bear Creek Valley in the Medford area while the annual precipitation is near 30 inches in the southern part of the Bear Creek Basin and around 24 inches in the northwestern part. About 30 percent of the annual precipitation occurs during the irrigation season, May 15 - October 15. Snowfall is light in this section with an average annual fall of four inches at Medford Experiment Station increasing to near 18 inches annually at Ashland and a high of 137 inches occurring at the Siskiyou summit in the extreme southeast corner of the Basin.

Temperatures in the Basin are mild with an average range of highs and lows below elevation 1,350 from 47 to 81 degrees Fahrenheit in the summer months and 33 to 54 in the winter. Average variations at elevations near 4,500 feet are from 46 to 68 in the summer and 33 to 45 in the winter.

Annual growing season in this valley averages about 220 days according to the Bureau of Reclamation's climatological map.

SUB-BASIN INVENTORY - BEAR CREEK

Population

More than 40,000 persons reside in the Bear Creek Valley with the concentration in Medford, population 24,300 certified for 1958, which is the largest city in the Rogue River Basin. Ashland, population 8,800 certified for 1958, is the second largest city in the Bear Creek Valley and the third largest in the Rogue Basin. Other towns with populations above 1,000 are Central Point, 2,100 certified for 1958, and Jacksonville, 1,160 certified for 1958. There are 11 other communities in the Bear Creek Valley having population less than 1,000, in most cases less than 100. The location of towns was shown on the sub-basin stream map, Figure 111.

Land Ownership

Fourteen percent of the sub-basin area is government timber land, two percent is public domain, a fraction of a percent is under the control of the State Land Board, and most of the remainder is privately owned. The timber land is nearly all in the watershed of Ashland Creek south of the City of Ashland. Major land ownership divisions by sub-basins were summarized in Table 2.

Transportation Facilities

U. S. Highway 99 follows the center of the valley through Medford and Ashland and on south through the Siskiyou Pass, elevation 4,458, into California. Other major highways in the area are Crater Lake Highway, Oregon 62, which starts just north of Medford; Oregon 66, from Medford east; and Oregon 238, from Jacksonville and points west to Medford (Figure 19). There are other paved roads and gravel roads completely crisscrossing the sub-basin and nearly 100 miles of unimproved dirt roads.

There is a municipally-owned airport at Medford, a privately-owned landing strip at Davis Ranch near Medford, and a privately-owned airport at Ashland.

Airline service from Medford is available by United Airlines to Eugene, Salem, Portland, and to Eureka and Sacramento, California; by Pacific Airlines, formerly Southwest, to Crescent City, Sacramento, and Yreka, California; and by West Coast Airlines to North Bend.

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More than 40,000 persons reside in the Bear Creek Valley with the concentration in Medford, population 24,300 certified for 1958, which is the largest city in the Rogue River Basin. Ashland, population 8,800 certified for 1958, is the second largest city in the Bear Creek Valley and the third largest in the Rogue Basin. Other towns with populations above 1,000 are Central Point, 2,100 certified for 1958, and Jacksonville, 1,160 certified for 1958. There are 11 other communities in the Bear Creek Valley having population less than 1,000, in most cases less than 100. The location of towns was shown on the sub-basin stream map, Figure 111.

Land Ownership

Fourteen percent of the sub-basin area is government timber land, two percent is public domain, a fraction of a percent is under the control of the State Land Board, and most of the remainder is privately owned. The timber land is nearly all in the watershed of Ashland Creek south of the City of Ashland. Major land ownership divisions by sub-basins were summarized in Table 2.

Transportation Facilities

U. S. Highway 99 follows the center of the valley through Medford and Ashland and on south through the Siskiyou Pass, elevation 4,458, into California. Other major highways in the area are Crater Lake Highway, Oregon 62, which starts just north of Medford; Oregon 66, from Medford east; and Oregon 238, from Jacksonville and points west to Medford (Figure 19). There are other paved roads and gravel roads completely crisscrossing the sub-basin and nearly 100 miles of unimproved dirt roads.

There is a municipally-owned airport at Medford, a privately-owned landing strip at Davis Ranch near Medford, and a privately-owned airport at Ashland.

Airline service from Medford is available by United Airlines to Eugene, Salem, Portland, and to Eureka and Sacramento, California; by Pacific Airlines, formerly Southwest, to Crescent City, Sacramento, and Yreka, California; and by West Coast Airlines to North Bend.

The Southern Pacific Railroad follows Bear Creek passing through Central Point, Medford, Talent, and Ashland, and then south towards Redding, California.

Western Greyhound and Consolidated Pacific Trailways bus lines maintain regular northbound and southbound service on U. S. 99 and Evergreen Bus Lines operate from Medford to Jacksonville on Oregon 238 by way of Central Point and to Ashland on U. S. 99.

Regular freight truck service is maintained on U. S. 99 and irregular service on Oregon 238 and Oregon 62.

A logging railroad discussed in the Upper Rogue and Little Butte Creek sections starts at a Southern Pacific siding just north of Medford.

Present Economy

Bear Creek Valley is the agricultural center of the Rogue Basin and also has the greatest level of development and the most diversity of any section in the Basin.

Jackson County's timber industry, aside from logging operations, is centered in the Bear Creek Valley.

Famous for its pears, Jackson County produces 41 percent of the annual tonnage for the state, mostly in the Bear Creek Basin, and is second only to Hood River County. Apples, cherries, plums, prunes, walnuts, and filberts are also raised in the valley to a lesser degree.

Milk and beef cows, sheep, lambs, chickens, and turkeys are among the livestock raised in this area.

The only fruit and vegetable processing plants in southern Oregon are found in the Bear Creek Basin, one at Medford and one at Ashland.

Medford has two dairy manufacturing plants and there is also one located at Central Point and one at Ashland. There are two livestock processing plants at Medford as well.

Medford is a distribution center for retail and wholesale trade with

Basin at the mouth of Bear Creek from 1929 through 1956. The average annual yield at this location for all years of record is 112,000 acre-feet.

Mean monthly discharges for the same point are shown in Figure 119. This plot shows the distribution of the average annual yield with respect to time. Peak runoff in this sub-basin occurs in the month of March as the result of early snow melt coupled with late winter rains. The hydrograph is distorted during the irrigation season, May - October, due to the pattern of irrigation usage.

A minimum yield hydrograph for the critical year of record (1931) for Bear Creek at Medford is shown in Figure 120. Table 7 summarizes the critical flow and yield conditions for all of the Rogue Basin.

Flood and drought frequency curves have not been prepared for this sub-basin.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin was shown in Figure 20 and Table 16 is a summary of the water rights by classification existing at present in the Bear Creek Basin. Irrigation rights of 1,100 cubic feet per second represent 87 percent of the total. Ten percent, 121 cfs, of the rights are nonconsumptive in nature leaving 90 percent, including irrigation, consumptive rights.

Depletions

A depletion diagram of legal rights versus stream miles for Bear Creek is shown in Figure 121. This plot shows the total of all rights but does not indicate actual water use for the following reasons:

1. Irrigation rights are seasonal in nature with the legal irrigation season usually being from May 15 to October 15, and actual use depends upon the pattern of rainfall occurring during the specific season in question.

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TABLE 16

WATER RIGHTS SUMMARY

BEAR CREEK BASIN

USE	STREAM	TOTAL RIGHTS CFS	
Domestic	All		4.1
Municipal	Ashland Creek	27.7	
	Jackson Creek	2.0	
	Total - Municipal		29.7
Irrigation	Bear Creek	120.0	
	Emigrant Creek and tributaries	350.4	
	Griffin Creek	77.8	
	Jackson Creek	32.8	
	Others	519.3	
	Total - Irrigation		1,100.3
Power	Ashland Creek	54.0	
	Wagner Creek	30.0	
	Others	1.5	
	Total - Power		85.5
Industrial	All		6.4
Mining	All		33.5
Recreation	All		0.2
Wildlife	All		1.8
Fish Life	All		0.5
Pollution Abatement	None		
	TOTAL BEAR CREEK BASIN		1,262.0

2. Return flows from irrigation, particularly from the flooding type, means that all water diverted for this purpose is not used.

3. Power production is a nonconsumptive use so that water for this purpose becomes available for other use at downstream locations.

Ordinate values on the plot do not include supplemental rights and these are not part of the total in Table 16. Supplemental rights permit alternate sources of supply but do not add to original rights.

Heavy usage of water occurs at many points along Bear Creek and the rights are well distributed along the stream.

EXISTING NEEDS

Domestic

Domestic needs at present are satisfied as far as quantity but many sources are not of satisfactory quality. Underground water serves the needs of most of the rural population in the area.

Municipal

The major municipal user of water from the Bear Creek stream system is the City of Ashland, which gets its supply primarily from storage on Ashland Creek.

Medford has the greatest municipal consumption of water in the Basin but is supplied from Big Butte Creek drainage. The Medford water system also supplies the cities of Central Point and Jacksonville and the town of Eagle Point, thus serving a total population, in 1957, of nearly 34,000 people.

The City of Jacksonville also holds a municipal right for 2 cfs from Jackson Creek.

Irrigation

Seventy percent of the irrigation rights in the sub-basin is held

by the Talent Irrigation District and 292 cfs of that total are for the increased flows resulting from the Talent Project.

The Rogue River Valley Irrigation District holds 27 percent of the primary rights in the sub-basin and has supplemental rights totaling 250 cfs for return flows from other irrigation projects but this portion is not shown in Table 16. The remaining 3 percent of irrigation rights is held by individuals.

Irrigation lands in the Rogue Basin were shown in Figure 15 and Irrigation Developments in Figure 16. Both of these plots include the Talent Project as it will be upon completion and indicate that, at that time, most of the agricultural lands in the Ashland, Talent, and Phoenix areas will be receiving an adequate supply of irrigation water but supplemental water will still be needed in the Medford and Central Point areas and considerable potentially irrigable land will remain in the latter region.

Power

The City of Ashland holds power rights for 29 cfs which it uses in a plant, located on Ashland Creek, with installed capacity of 300 kilowatts generating 2,500,000 kilowatt hours annually. Another right, for 25 cfs with a priority date of 1860, exists on Ashland Creek. There is a total of 30 cfs of rights on Wagner Creek for power for mining purposes. Other power rights in the sub-basin have early priority dates and are for water wheels, flour mills, and sawmills.

Industrial

Industrial rights are small and for such purposes as railroad locomotive water supply, fire protection, milling, and ice and storage.

Mining

Mining rights, totaling 34 cfs, are located on several of the tributaries of Bear Creek. Most of the rights have priority dates in the 1860's, are for placer mining, and according to the State Department of Geology and Mineral Industries none were active as of August, 1958.

Irrigation

Completion of the Talent Project will find most of the sub-basin upstream from Medford with an adequate supply of water. However, the area at Medford and below will still need a relatively large additional supply of irrigation water if the lands are to be adequately irrigated (Figure 15).

Power

The power potential existing within the Bear Creek Basin is negligible and future power requirements undoubtedly will be met from outside sources.

Industrial

There is substantial potential for industrial growth in the Bear Creek sub-basin. Future expansion of industrial activities, however, will be restricted by the physical and economic availability of water supplies which must be imported from other watersheds. At present, practically all of the water resources of this sub-basin are committed to existing and under construction operations. In fact, substantial portions of the waters presently utilized in this sub-basin originate in the Upper Rogue, Little Butte Creek, and Klamath River Drainage Basin. Two general classifications of industrial expansion can be anticipated for the Bear Creek sub-basin. They are:

First, a varied and complex pattern of expansion in industrial operations based on the need to supply additional local consumer markets which will result from expanded populations of the Rogue River Drainage Basin and its service areas and,

Second, major industrial expansion in the field of resource-based industry.

Population growth, upon which local consumer markets depend, will result from two primary factors. The first being the attraction of people to the Bear Creek sub-basin by virtue of the favorable climate and living conditions and, second, the creation of job opportunities

by the development of resource-based industries throughout the entire Rogue River service area. Among the significant items are natural expansion of existing population, the influx of immigrants to the Basin looking for better living conditions and job opportunities, and the migration of retired people to this area. The expansion of local consumer market industrial requirements will obviously increase if new job opportunities are created in the Basin by virtue of resource-based industrial operations. On the other hand, the expansion of industrial activity in the resource base field is not dependent upon an expansion in the local consumer market field since the major utilization of products derived from this source will be outside of the Rogue River service area and, in fact, of a national or international character. It is possible that a major population increase in this sub-basin may actually have a detrimental effect on the establishment of natural resource oriented developments, due in part to conflicts over water supply and also because of serious problems relating to air and water pollution.

Industrial growth based on consumer markets of a local nature for the Rogue River Basin, and Bear Creek sub-basin in particular, will be of a varied and complex nature. Many interrelations between need and growth exist with one operation acting as a catalyst for another. The scope and variety of such development are too poorly defined in light of existing information to justify exhaustive treatment in a reconnaissance report of this nature. In general, some potentials exist for expansion of varying amounts in the food processing, limited basic chemical, specialty metal products, scientific equipment and instrument, wood remanufacturing, miscellaneous specialty manufacturing and similar fields.

At the present time, industrial uses in the Bear Creek sub-basin are supplied primarily by the City of Medford. The Jackson County Water Resources Committee indicated in their report to the State Water Resources Board that the proportionate share of industrial requirements related to total municipal use is low for the City of Medford in comparison to communities of similar size in other parts of the country. It can be anticipated that growth of local consumer market industries in this Basin, if supplied by the City of Medford, will represent in the future a larger percentage of total municipal water use. Projected needs for municipal supplies of Medford for the year 2007 are estimated

at 50,000,000 gallons per day. The Jackson County Committee on domestic and municipal water supplies further estimates that 48,000,000 gallons per day, in addition, would be required to serve large water-using industries if such were to be located in the Basin. It should be pointed out that the figure of 50,000,000 gallons per day represents the average day in the maximum week. If the ratio between residential and other public uses as compared to industrial uses supplied by the municipal system should come more in line as population growth is experienced, the value of 50,000,000 gallons per day will probably be increased to some extent in the range of five to ten cubic feet per second additional requirements without taking into consideration the 48 second feet of water rights required to supply major resource oriented industry. Deducting a modified municipal and consumer market base industry requirement of 55,000,000 gallons per day, we have available through Medford's established water rights 36,000,000 gallons per day for major resource oriented industry. The 36,000,000 gallons per day represent approximately 55 cfs, which is approximately enough flow to satisfy the water requirements for production in a 500-ton kraft mill pulping operation. On this basis, the City of Medford could provide enough water to the Bear Creek drainage from the main stem of the Rogue River to satisfy the water diversion requirements for approximately half of the probable pulping capacity of the Rogue River Basin on the assumption of kraft-type operations. Actually this quantity of water would satisfy approximately five-sixths of the pulping capacity which is considered economically feasible of development in the foreseeable future, and all the water required for the establishment of a first stage operation of approximately 300 tons per day, which was the level indicated as being feasible by the Sandwell Company in their report on the Rogue River Valley Pulp and Paper Development Study to the Oregon Development Commission.

Transportation, site location, and labor availability are not serious problems in consideration of the establishment of secondary wood products utilization in the Bear Creek sub-basin. Restrictive factors in the development of this type of industry are, first, the inadequacy of water supply within the Basin itself except at its most downstream limits where it joins the main stem of the Rogue River, and the potential problems of water and air pollution.

Whether the basic water supply for resource-oriented industries is

provided by the City of Medford or obtained directly by the industry through appropriation procedures with the State of Oregon is not a material item in terms of physical effect on the Rogue River main stem. In either case, water supply will be taken from the main stem of the Rogue River in the section between the mouth of Bear Creek and the mouth of Little Butte Creek.

Population projections for the City of Medford and its water service area indicate that the diversion requirements of the normal municipal supply needed in addition to presently available water will amount to some 40 second feet for this service area. At the present time, the City of Medford holds a permit for the diversion of 100 cfs from the main stem of the Rogue River in the vicinity of mile 132. On the basis of available data relating to flows at Dodge Bridge on the main stem of the Rogue, a depletion potential of 100 second feet would represent, at the point of diversion, a substantial reduction in the average recurrence interval of a selected average flow for a minimum month of any year. At the present time, the recurrence interval for a mean monthly flow of 900 second feet is about once in ten years. Uniform occurrence of the maximum depletion potential during a minimum month would result in a decrease in average recurrence intervals for 900 cfs below the point of diversion to approximately once in three years. While this value is not precise, it gives a very good indication of the effect of a depletion of this magnitude on flows between Dodge Bridge and Ray Gold. The finite value of the effect on total downstream flow would be a function of the location of use of the waters being diverted and the percentage of diverted flows that would ultimately return to the main stem as return flows from plant operation and municipal uses.

It should be pointed out that in addition to the industrial and municipal demands in this particular section of the river or the waters supplying this particular section of the river, there is a depletion potential if full utilization of the irrigable lands of lower Bear Creek Basin is to be realized. Estimates on the irrigable lands still without water after the completion and full-scale operation of the Talent Project vary greatly but are estimated to be in the order of magnitude of 10,000 acres. On the assumption of a conservative diversion requirement of one acre-foot per acre per month for the maximum month of the irrigation season, depletion potential of the main stem of the Rogue River to supply

the additional lands in the Bear Creek Basin would amount to more than 100 second feet. The optimum development depletion potential represented by the three uses - municipal, industrial, and irrigation - would create a condition wherein the average recurrence interval of a minimum month mean flow of 800 second feet or less would occur once every five years. The total annual volumetric diversion requirement to satisfy the optimum level of development would approach 100,000 acre-feet for the Bear Creek sub-basin. It must be recognized that portions of the water diverted from the main stem for utilization in this Basin will find their way back into the Rogue River through return flows. Without specific and detailed evaluation of uses, project works and location of facilities, any estimate of the return flow values is of questionable value.

It is very unlikely that needed water resources in this sub-basin can be provided by utilizing the excess flows of the winter period. This is primarily due to the almost complete utilization at present of available storage of a physically and economically feasible nature.

It is apparent that there is potential for substantial industrial expansion primarily in the resource-based industries in the Bear Creek Basin but the development of such industrial facilities as are required to handle this resource will pose serious problems in terms of conflict over water for consumptive and nonconsumptive uses. The water resources required to satisfy the needs of population growth and industrial expansion in the Bear Creek watershed will have to come from sources outside the sub-basin.

Mining

According to the State Department of Geology and Mineral Industries, mineral deposits of significance in the sub-basin consist of gold, tungsten, bentonite, coal, limestone, and granite. Little development of these deposits is expected since their quality is not sufficiently high to justify their development to the detriment of highly-productive land used for other purposes. Mineral deposits and active mines and mills in the Rogue Basin were shown in Figure 17.

Recreation

A great need for water-type recreational facilities in the Bear Creek

Basin already exists and the pressure on available facilities is great and continually increasing. While it is not essential that water-type facilities be established with the sub-basin itself, such facilities within close proximity could be easily justified.

Wildlife

Future wildlife needs should be no greater than those which presently exist.

Fish Life

The fishery resource will be difficult to maintain if the anticipated level of development within this sub-basin takes place. Fishing within this Basin in the future will probably consist primarily of lake-type fishing for resident trout.

Pollution Abatement

Pollution abatement needs, already a problem in the sub-basin, will require expansion of existing artificial abatement methods to meet future needs rather than depending upon streamflow. Already, some sewage treatment facilities are operating above their rated capacity and it is assumed that they will expand as needed to stay within standards set by the State Sanitary Authority.

Flood Control

Flood control needs will increase with increasing levels of development. Enlargement of Emigrant Reservoir, presently being done by the Bureau of Reclamation for the Talent Project, will provide storage space for flood control. It appears from the reservoir regulation curves that from 40 to 50 percent of the reservoir capacity would be available to reduce flood peaks each year, the exact amount depending upon the sequence of events occurring during the previous irrigation season and upon the current runoff pattern. Storage at this site, shown in Figure 43 was included as part of the optimum flood control study for the Rogue Basin. The regulated outflow for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13.

BEAR CREEK

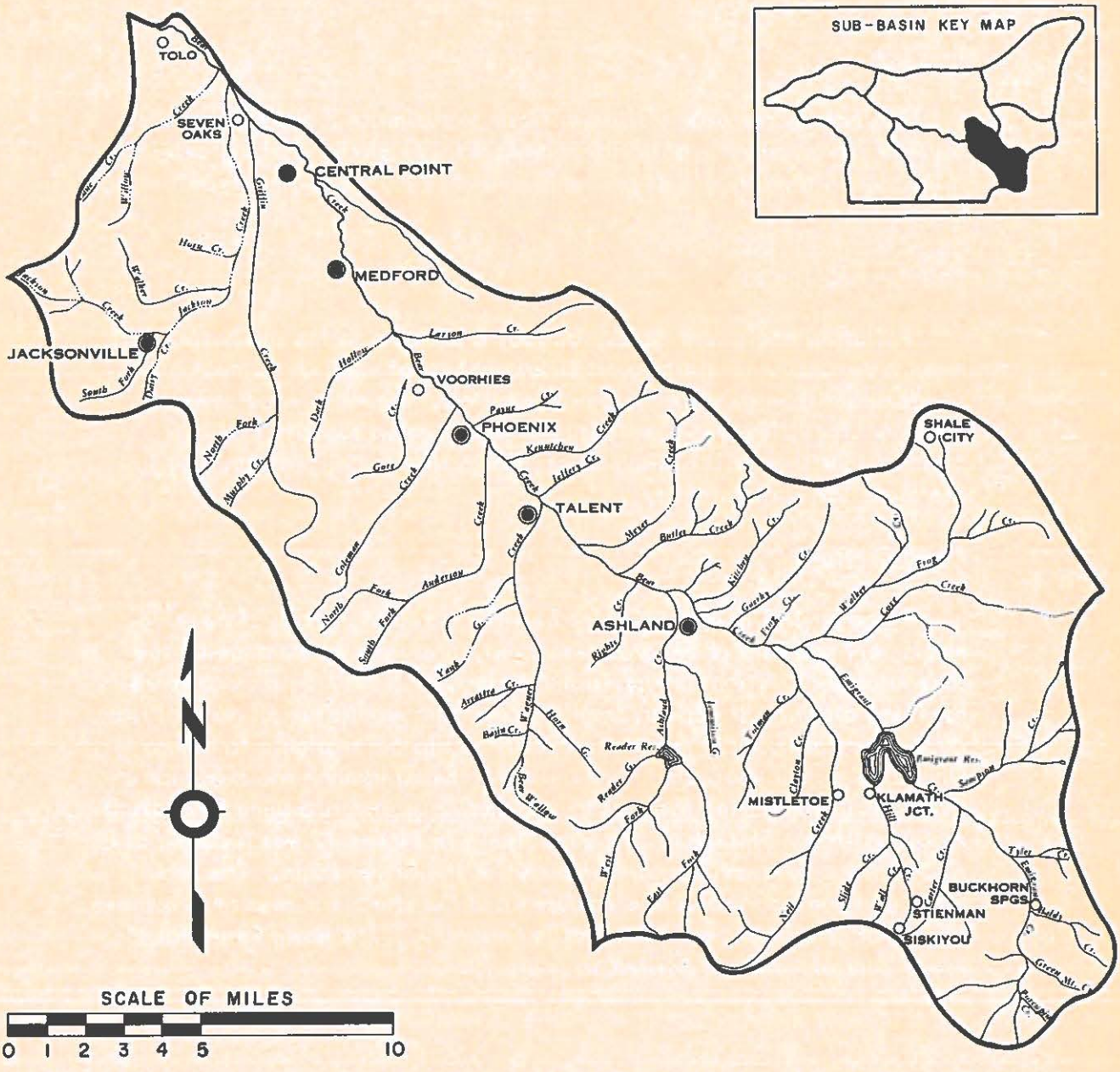
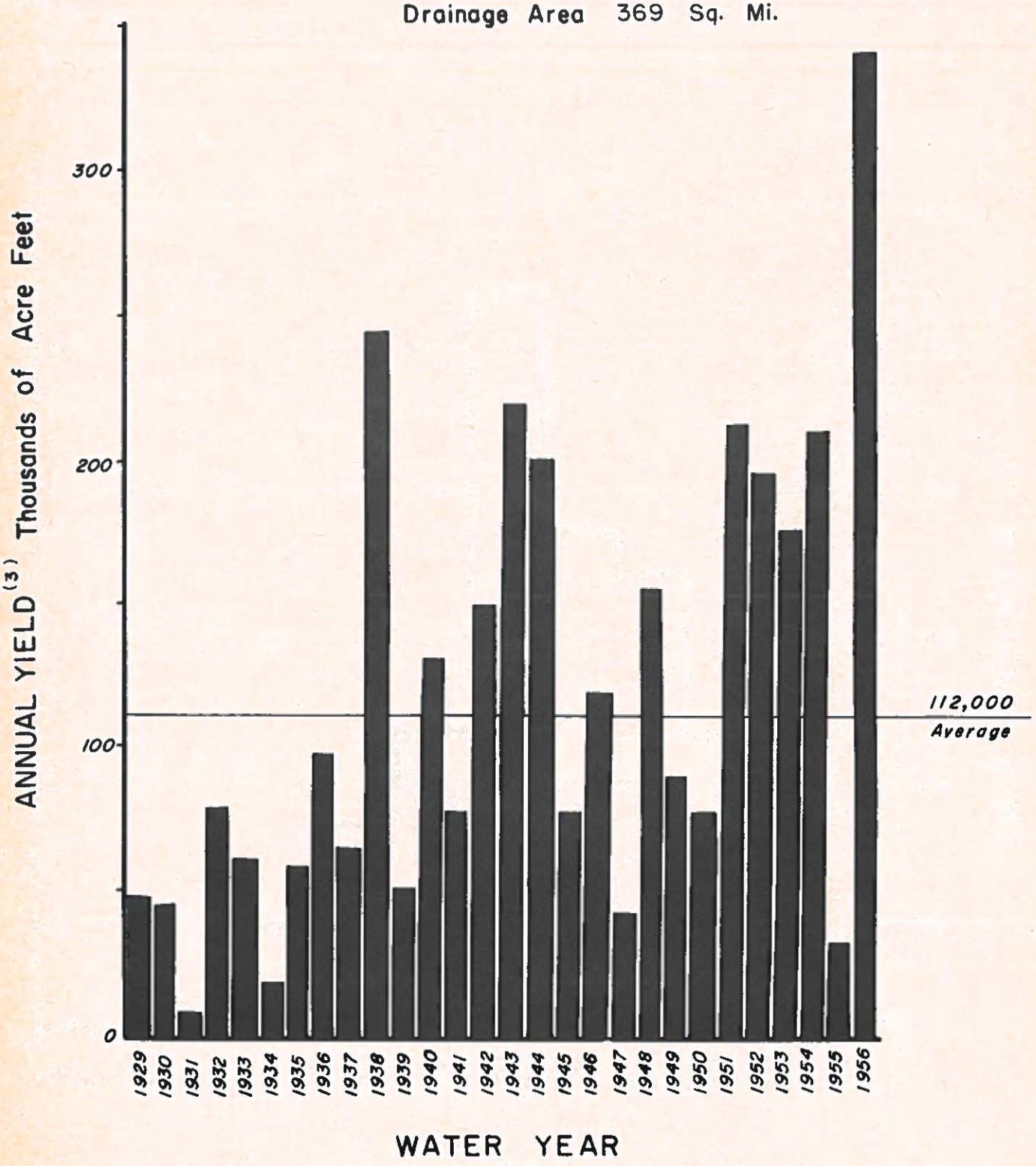


FIGURE 117

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
BEAR CREEK

Drainage Area 369 Sq. Mi.



(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

Drawn 6-12-58
File No. 15.220

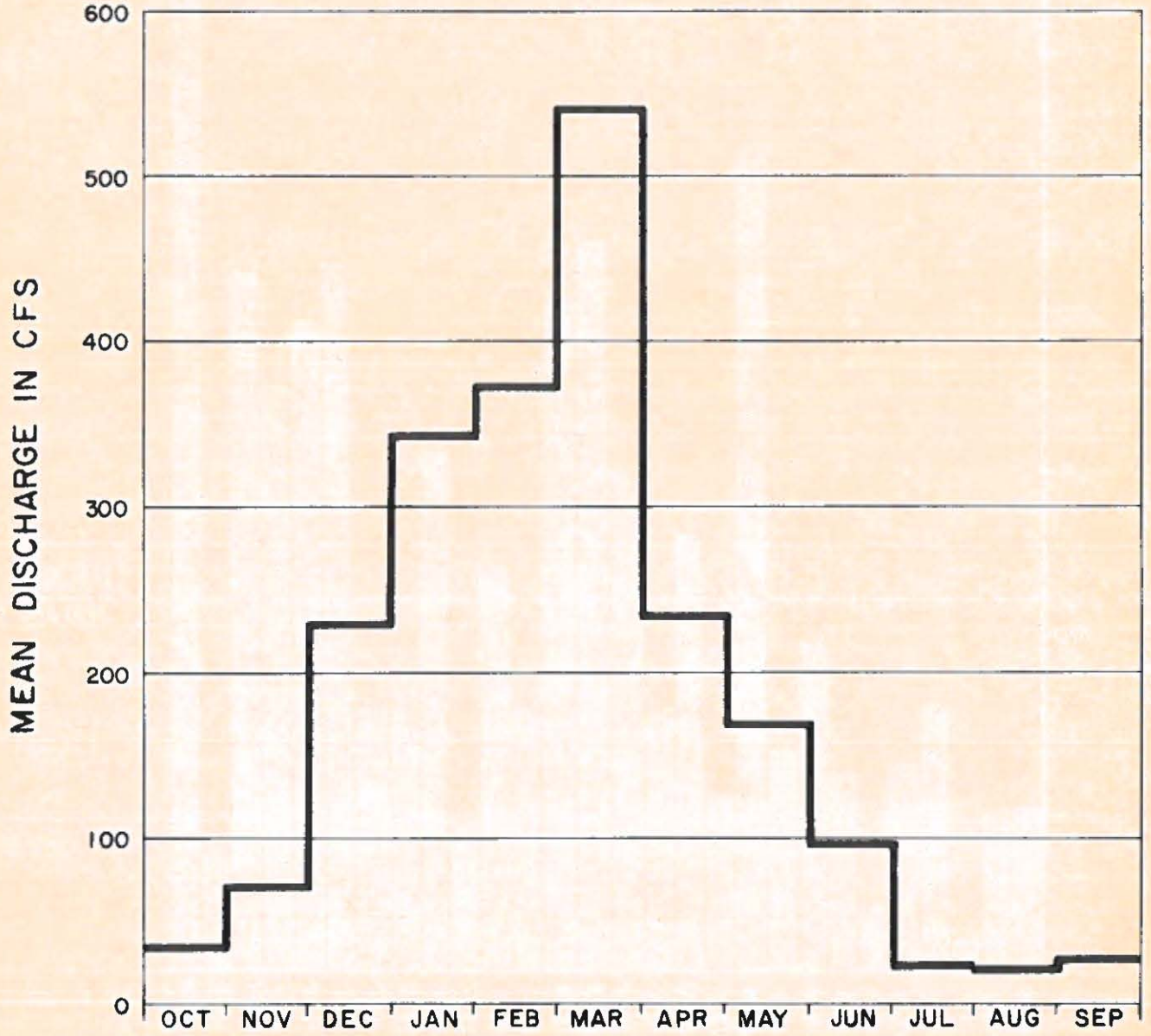
FIGURE 118

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

BEAR CREEK

1929 - 1956



Drawn Aug. 15, 1958
File No. 15.202
FIGURE 119

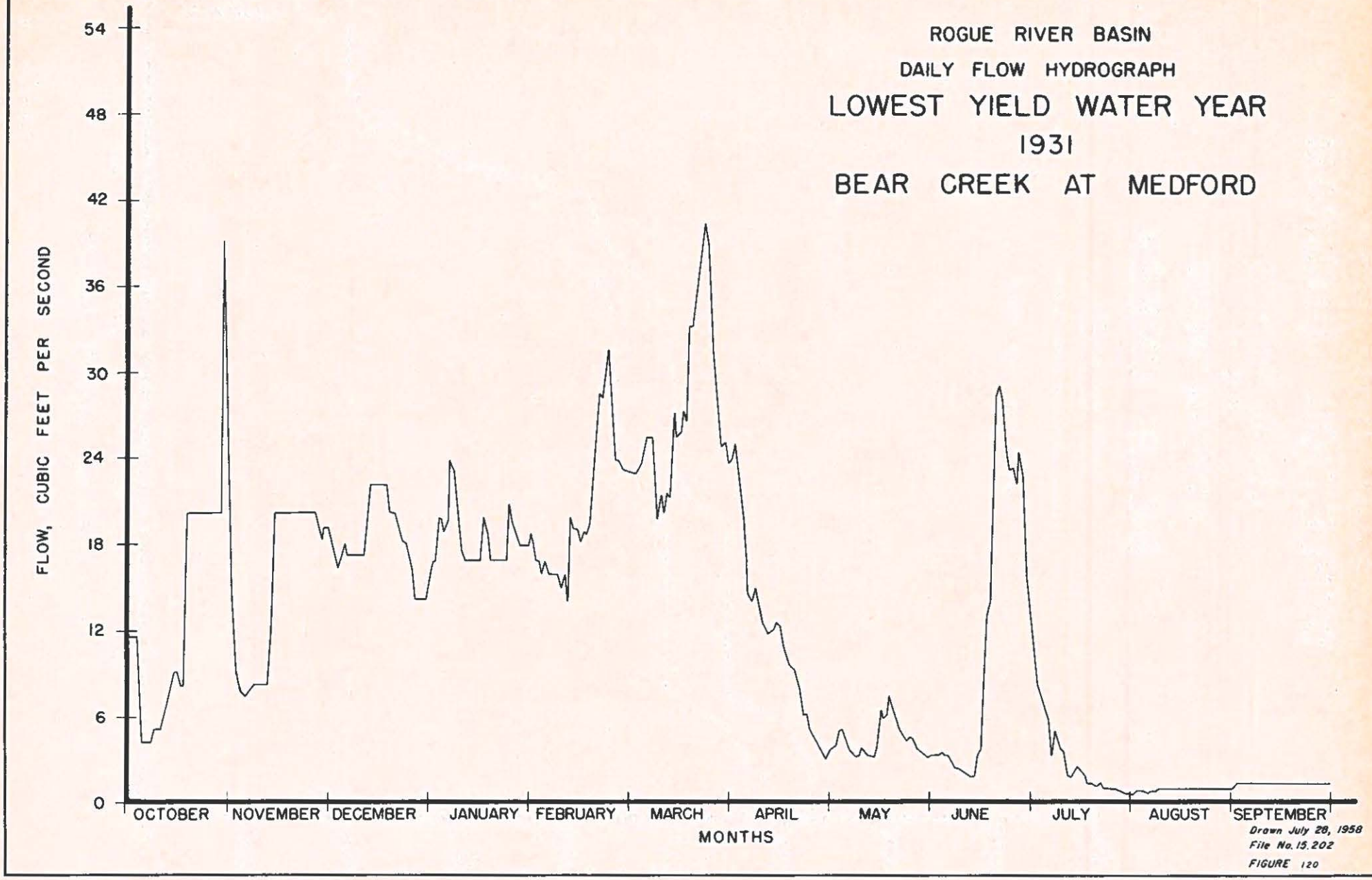
ROGUE RIVER BASIN

DAILY FLOW HYDROGRAPH

LOWEST YIELD WATER YEAR

1931

BEAR CREEK AT MEDFORD



Drawn July 28, 1958
File No. 15.202
FIGURE 120

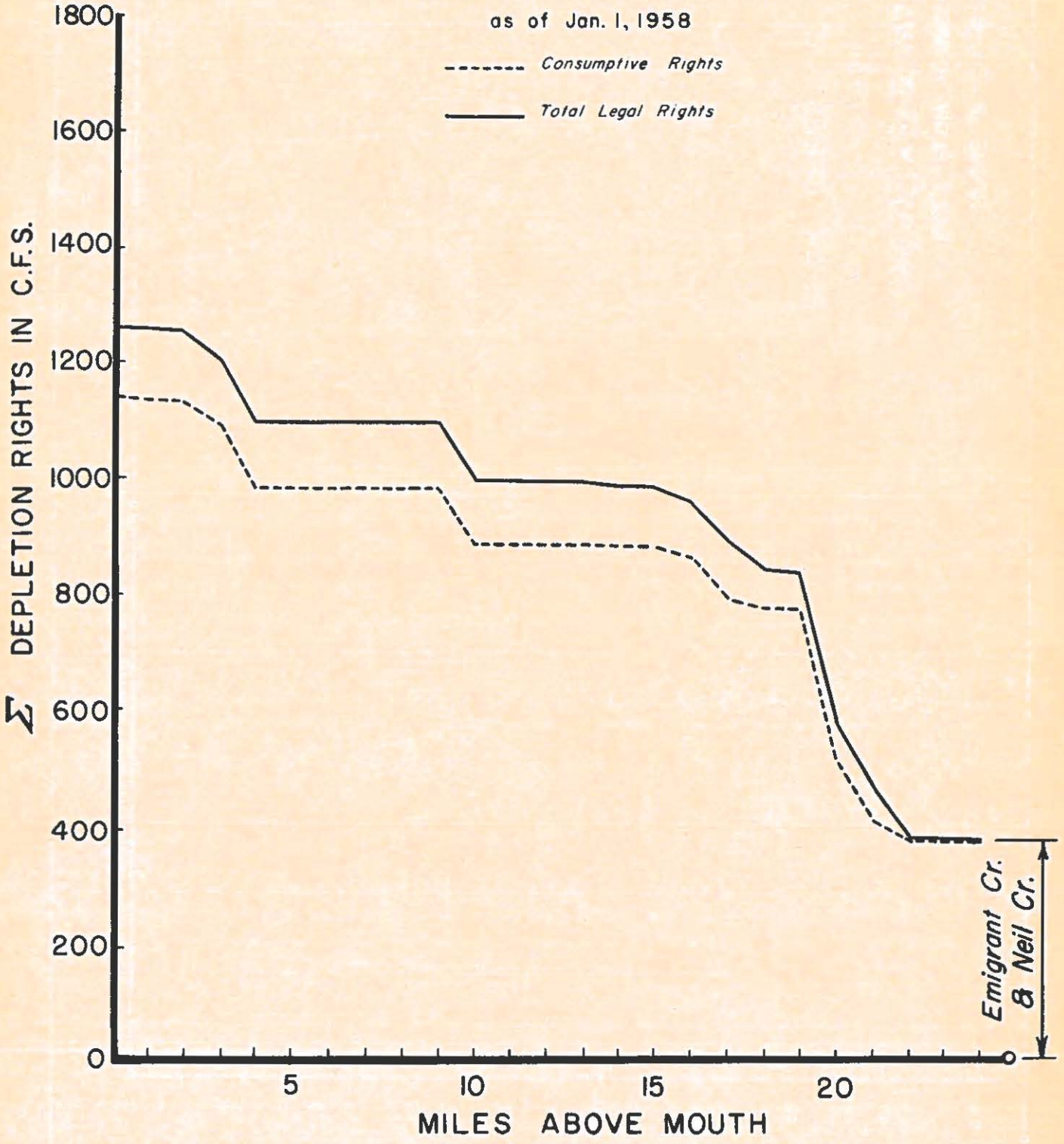
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

BEAR CREEK

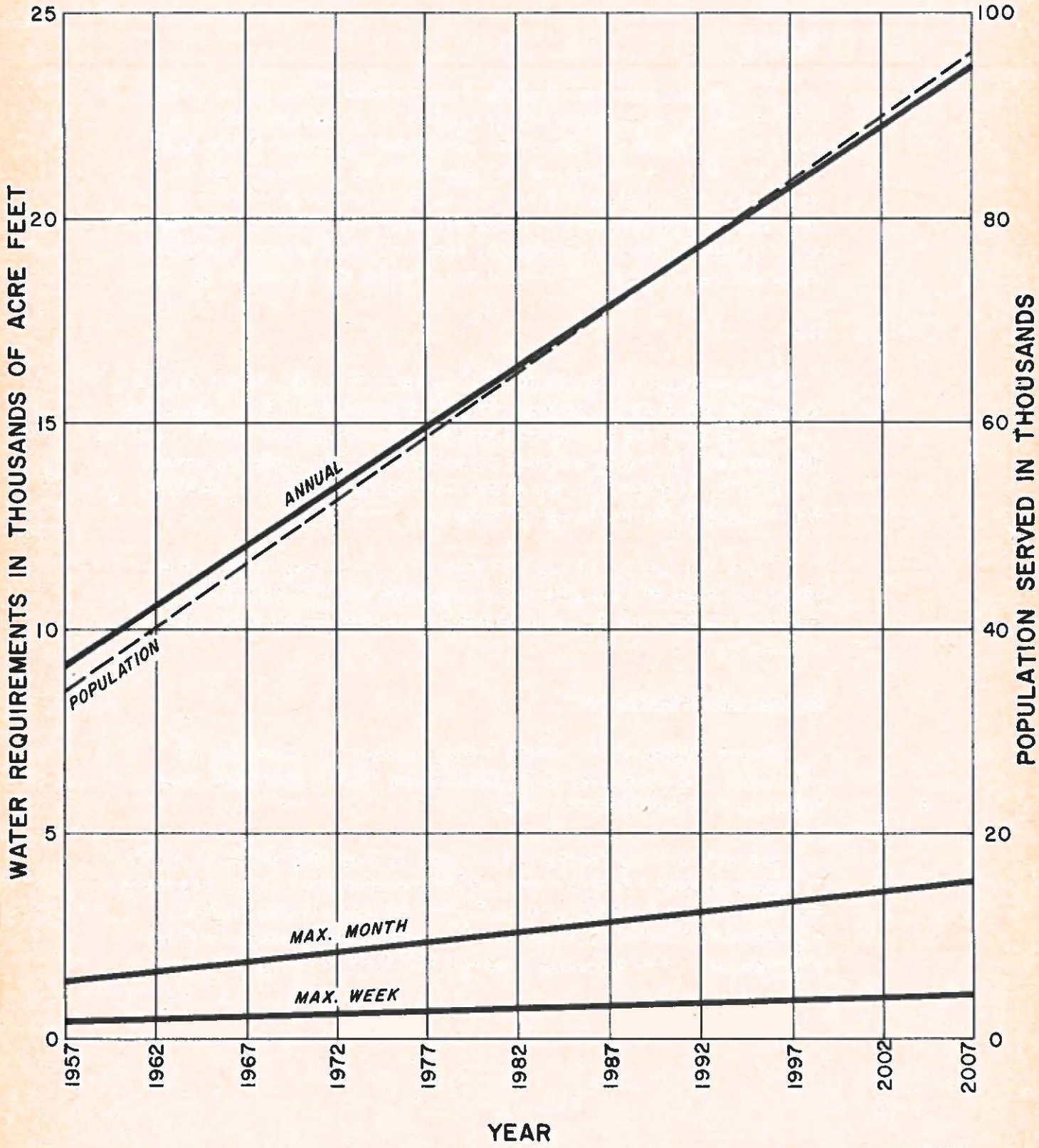
as of Jan. 1, 1958



Drawn - Oct. 31, 1958
File No. 15 302

FIGURE 121

ESTIMATED FUTURE NEEDS OF THE MEDFORD WATER SYSTEM



Source: Jackson County Water Resources Committee Report, September, 1957.

Drawn: August, 1958
File No. 15
FIGURE 122

SECTION 4 APPLEGATE VALLEY

GENERAL DATA

Location

This section includes all of the Applegate River and its tributaries which takes in the southern half of the central portion of the Rogue River Basin. The confluence of the Applegate and Rogue Rivers is at mile 95. Major tributaries of the Applegate are Williams Creek at mile 19.5, the Little Applegate River at mile 34, and Carberry Creek at mile 50. The Applegate River main stem extends to the limits of the Rogue River National Forest located at the summit of the Siskiyou Mountains in California. Figure 123 is the stream map for the Applegate Valley.

Size

The Applegate Valley area, 768 square miles, ranks fourth in size among the sub-basins, makes up 15 percent of the total Rogue Basin and has 420 square miles in Jackson County, 260 in Josephine County, and the remainder in Siskiyou County in California. The Little Applegate River drains 15 percent of the valley and the remainder is drained by the main stem and many small tributaries.

There are nearly 700 miles of streams in the valley consisting in part of 51 miles of Applegate River main stem and 20 miles of Little Applegate River with the remainder being composed of many shorter tributaries.

Topography and Geology

Eighty percent of the valley is mountainous and unsuitable for agriculture. The majority of the agricultural lands are located along the main stem and Williams Creek.

Elevations along the Applegate River go from 850 feet at its mouth to approximately 2,000 feet at the California-Oregon border, and along the Little Applegate River from 1,450 feet at its confluence with the Applegate to 5,200 feet at its source. There are many peaks in this drainage basin with elevations above 5,000 feet, the highest being

Dutchman's Peak, elevation 7,418 located in the southeast corner of the valley at the head of Yale Creek.

Stream slopes are relatively mild in the bottom lands, 24.3 feet of drop per mile for the Applegate River and 33 feet per mile for Williams Creek, but the headwater streams have much steeper slopes. The Little Applegate River drops 188 feet per mile; Slate Creek 38 feet per mile to mile 9 and 296 feet per mile above mile 9; and Carberry Creek has an average slope of 70 feet per mile. The Rogue Basin stream system profile was shown in Figure 2.

Most of the rock formations in this sub-basin consist of volcanic and sedimentary rocks. Fairly large regions of quartz diorite and related rocks exist in the southwestern and northwest corners of the Basin. The larger valley areas consist of extensive alluvium deposits. Stream beds, where the slopes are mild, are composed of stratified gravel, sand, and silt, and water-worn alluvium, while in the steeper regions stream beds are composed primarily of a sandstone structure.

The southern boundary of the sub-basin includes the Siskiyou Mountains which run in a generally east-west direction. The Applegate River above its confluence with the Little Applegate bears generally northwest as does the Little Applegate River from its headwaters. Below the confluence with the Little Applegate River, the Applegate moves towards the northeast.

Climate

Annual precipitation varies from 30 inches at the mouth of the Applegate River decreasing to 20 inches annually at mile 35 and increasing again to 40 inches annually in the higher elevations. About 17 percent of the annual precipitation occurs during the irrigation season, May 15 - October 15, in the area around the town of Williams while this increases to more than 30 percent in the higher elevations. Snowfall is about 19 inches on the average at the town of Williams.

Average air temperatures in the valley, near elevation 1,500, range from 43 to 78 during the summer and 32 to 55 in the winter.

The average annual growing season is 240 days near the mouth

of the Applegate but decreases to 180 days at the highest elevations according to the Bureau of Reclamation's climatological map.

Population

Total population in this valley is below 4,000 persons with the town of Wilderville, 1950 census population of 212 and located at mile 1 on Slate Creek, being the only one of the 13 towns in the valley having more than 200 residents. The location of towns was shown on the sub-basin stream system map, Figure 123.

Land Ownership

Fifty percent of the sub-basin area is government-owned timberland; four percent is public domain; and a fraction of a percent is under the State Land Board; the remainder being privately owned. Timber covers the Basin nearly solidly in this southern half and there is considerable timber located in all of the other mountainous areas with the flat valley lands being the only regions which do not have any appreciable stands. Major land ownership divisions by sub-basins for the Rogue Basin were summarized in Table 2.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19. U. S. 199 cuts across the northwest corner of the valley through the town of Wilderville and Oregon 238 enters Murphy from the north and then follows the Applegate River to Ruch where it turns to the northeast towards Jacksonville in the Bear Creek Basin.

Other paved roads in the Basin connect the towns of Provolt and Williams and the Applegate and Thompson Creek Guard Stations. One goes from Ruch for several miles towards the south along the Applegate River.

There are many maintained gravel roads following the major creeks, some continuing on towards the west into the Illinois Valley and there are more than 200 miles of unimproved dirt roads in the sub-basin.

There is no direct airplane service to this valley but there is a short

railroad which comes from the Southern Pacific lines at Grants Pass and extends across the northern portion of the Basin to terminate at mile 4 on the Applegate River. This line goes by the name of California and Oregon Coast Railway. There is another short spur from the opposite side of the river at mile 4 extending south for a few miles towards Cheney Creek to stop at about mile 3. This has been abandoned.

Western Greyhound operates regular bus schedules over U. S. 199 from Grants Pass to Crescent City.

Regular freight truck schedules also are maintained on U. S. 199.

There is no boat or airline transportation directly serving the Applegate Valley.

Present Economy

This valley once saw a lot of mining activity but now is primarily a farming area although not very highly developed.

Irrigation agriculture is practiced all along the Applegate main stem below its confluence with the Little Applegate and in a few places along Williams Creek but no lands in the area presently receive an adequate supply of irrigation water.

Dairy and beef cows are raised throught the area and there is a small concentration of pear orchards near the towns of Provolt and Williams.

Logging operations take place in the southern part of the valley in the timbered areas of the mountains.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

Climatological stations are located at Williams and Cooper, each station having recording gages measuring both temperature and precipitation (Figure 30). Average annual precipitation for the Rogue Basin was shown in Figure 3 and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

There are only four active stream gaging stations in the Applegate Valley, only one of which is located on the main stem. These, along with nine inactive stations, are located as shown in Figure 29. Stream gaging records are published in Water Supply Papers by the U. S. Geological Survey.

Yields

Annual yields for the years 1929 through 1955, computed for the Applegate River at its mouth, are shown in Figure 124. The average annual yield at this location for all years of record is 580,000 acre-feet.

Mean monthly discharges for the same point are shown by the hydrograph in Figure 125. This plot shows the distribution of the average annual yield with respect to time. Peak runoff in this sub-basin occurs during the months of January and February as the result of winter rains.

Minimum flow and minimum yield hydrographs for the critical year of record at the gaging stations existing in the area are shown in Figures 126-133. The critical years at the different stations are not the same because of the difference in periods covered by the records at these stations. Table 7 summarizes the critical flow and yield conditions which have occurred in the Rogue Basin.

Drought frequency curves for the gaging station of the Applegate River at Applegate along with the flood frequency curve for the same location are shown in Figure 134. The maximum flood curve was prepared from work by the Corps of Engineers and minimum curves were computed independently by the State Water Resources Board using data from water-supply papers. The curves show that for a 10-year average recurrence interval a flood of 22,000 cubic feet per second at Applegate could be expected or low flows averaging 200 cfs for 365 consecutive days, 11 cfs for 30 consecutive days, and 7.5 cfs for one day. This does not mean that flows of this magnitude will occur once every 10 years but rather that over a long-term period, say 100 years, such flows will probably occur 10 times at irregular intervals which average once every 10 years.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin was shown in Figure 20. Table 17 is a summary of the water rights by classification existing at present in the Applegate Valley section of the Rogue Basin. The majority of rights, 66 percent, is for mining, followed by irrigation, 31 percent. All of the rights in this section total 1,132 cfs of which 364 cfs are consumptive in nature.

TABLE 17

WATER RIGHTS SUMMARY

APPLEGATE VALLEY

USE	STREAM		TOTAL RIGHTS CFS
Domestic	All		4.0
Municipal	None		
Irrigation	Applegate River	160.6	
	Little Applegate River	28.9	
	Williams Creek	16.7	
	Slate Creek	5.2	
	Others	144.1	
	Total - Irrigation		355.5
Power	Little Applegate River	1.0	
	Others	7.1	
	Total - Power		8.1
Industrial	All		4.9
Mining	Applegate	68.8	
	Little Applegate	134.1	
	Williams	10.0	
	Others	540.4	
	Total - Mining		753.3
Recreation	None		
Wildlife	None		
Fish Life	All		6.4
Pollution Abatement	None		
	TOTAL APPLEGATE VALLEY		1,132.2

Depletions

Depletion diagrams of legal rights versus stream miles for the Applegate River and three of its tributaries, Slate Creek, Williams Creek and Little Applegate River, are shown in Figures 135-138. The plots show the total of all rights but do not indicate the actual water use because of the complexity of consumptive depletions and the availability of water used nonconsumptively for other use at downstream locations. Ordinate values on the plots do not include supplemental irrigation rights and these are not part of the totals in Table 17. Supplemental rights permit alternate sources of supply but do not add to original rights.

Two-thirds of the rights on the Applegate River stream system are nonconsumptive. Average monthly runoff of the system is of such a nature that there is water in excess of rights for the months of December through May. Of its tributaries, nonconsumptive rights equal about fifty percent of the total on Williams Creek, nearly 85 percent the total on Little Applegate River, while for Slate Creek the rights are early all consumptive in nature.

EXISTING NEEDS

Domestic

Rights for domestic use total 4 cfs for surface water from the streams.

Municipal

There is no municipal use of water at present in the Applegate Valley.

Irrigation

According to the Bureau of Reclamation, none of the agricultural lands of the sub-basin are adequately irrigated and much of the agricultural land is not developed at present. More than 40 percent of the irrigation rights are for Slate Creek water but the highest level of development in the valley occurs along the Applegate main stem which has an additional 45 percent of the irrigation rights. The remaining rights are located on the Little Applegate River, Williams Creek, and other small tributaries.

Irrigation Lands in the Rogue Basin were shown in Figure 15 and Irrigation Developments in Figure 16.

Power

Power rights are small and primarily for water wheel or farm power use. There is no power produced for other than individual use. Existing power sites in the Rogue Basin along with their capacity and annual generation were listed in Table 5.

Industrial

Industrial use is primarily for log ponds with only 1.9 cfs of rights for other industrial purposes.

Mining

Two-thirds of the total water rights existing in the Applegate Valley are for the purpose of mining. Twelve percent of this group exists along the Little Applegate River, nine percent on the Applegate main stem, one percent from Williams Creek, and the remainder scattered throughout the Basin. The large total of rights for mining purposes, 753 cfs, belies the current mining activity in this sub-basin, as evaluated by the State Department of Geology and Mineral Industries. Active mining operations consisted of five for gold and one for limestone as of August, 1958 (Figure 17).

Recreation

There are no recreational water rights in this sub-basin and recreational use of water is slight. Fishing in the stream system and at Squaw Lakes, which are located near the California border in the southeast corner of the sub-basin, is the major water associated type of recreation. The total area of all lakes and reservoirs above 5 acres in size is 130 acres.

There are seven forest camps in the upper part of the valley and a county park near Murphy (Figure 18).

Wildlife

Wildlife needs for water in this sub-basin are small and easily satisfied.

Fish Life

The Applegate main stem and its tributaries below the town of Provolt are heavily used for spawning by anadromous fish. About one-fifth of the spring chinook spawn in this area, mainly on the main stem of the Applegate, and a large percentage of silvers and steelhead also spawns in this area, primarily on Williams and Slate Creeks (Figures 22-24).

Sufficient water to adequately cover the spawning gravel in some of the smaller tributaries is not always available. A mean monthly discharge hydrograph showing the desirable base flow for fish as recommended by the State Game Commission for the Applegate River at its mouth is shown in Figure 139. This plot indicates that, for average flow conditions, there is insufficient water to satisfy requirements for proper management of the fishery resources during the months of July through October. Fish water requirements for the Rogue Basin stream system were shown in Figure 42.

Water temperatures above 65 degrees Fahrenheit, which sometimes accompany low flows occurring during warm, dry summers, is detrimental to fish life. Water temperature data is not available for this sub-basin.

It is estimated by the State Game Commission that a total of 115 stream miles available for migratory fish with 242,000 square yards of spawning gravel exist in the Applegate Valley.

Flood Control

The runoff pattern in this sub-basin is affected more by rainfall than by snow, and peak discharges occur usually in the winter months, January and February. On some of the smaller upstream tributaries floods and high waters occasionally occur in December. The runoff pattern in this sub-basin is shown in Figure 125 which was discussed in the section under Yields.

Flood damages run high in this valley; more than 10 percent of the total damages in the Rogue Basin from the 1955 flood occurred in the Applegate Valley, most of which was direct agricultural damage. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 listed damages which occurred during the 1955 flood.

FUTURE NEEDS

Domestic

An appreciable population expansion is not anticipated unless better use is made of the agricultural lands in the valley through irrigation.

Municipal

Municipal requirements should not pose a problem in the future.

Irrigation

The irrigation potential in the Applegate Valley is fairly large, particularly in the Williams Creek Basin downstream from the town of Williams and all along the main stem of the Applegate River. Since the natural flow of the Applegate and its tributaries is very low during the irrigation season, particularly the months of August and September, storage would be necessary to supply sufficient water to fully develop agricultural lands. A complete survey with that in mind is included in the future plans of the Bureau of Reclamation.

Power

There is little power potential in this area because of long periods of low stream flow.

Industrial

Industrial expansion involving water use in the Applegate sub-basin is not likely to include major water using industries.

The primary fact supporting this conclusion is that adequate water supplies for major industrial use cannot be provided from natural stream flows.

The potentials which do exist for industrial growth are in the timber and mineral industries fields.

Excepting the section of the Applegate River near its confluence with

the main stem of the Rogue, problems of water supply for industrial use will be critical without the development of storage in the Applegate system. Based on past records, a 150-ton pulp operation, if located at the lower end of the sub-basin, would have a depletion potential which would reduce mean flow of the minimum month to the zero level with an average recurrence interval of once in five years. Actual flows below the point of return of used plant water would represent about two-thirds of the diverted flow but temperature would be a critical item. It is anticipated that industrial expansion in the timber industry in this sub-basin will be limited to moderate size units whose water requirements are less significant than pulp or paper operations.

Mineral industries growth presents some possibility for industrial expansion. As pointed out by the Water Resources Committees of Jackson and Josephine Counties, additional expansion of operations based on the limestone deposits of the Applegate Basin have been considered. The potential cement plant operation at Marble Mountain would require approximately 1½ cubic feet per second. Additional deposits spread throughout the sub-basin may result in new and expanded operations as the needs of the West for cement grow in the future. Water for this use in the foreseeable future is estimated at less than 5 cfs.

Adverse factors of water supply, transportation facilities, plus quantity and/or quality of basic resource will keep industrial development in this area depressed. Construction of water storage facilities by the Corps of Engineers could, under their flood control program, materially reduce the water supply problems.

Mining

Antimony, gold, asbestos, limestone, and marble are mineral deposits of significance in this sub-basin according to the State Department of Geology and Mineral Industries. Mining rights for water are already large but either are not fully utilized or are exercised at infrequent intervals. It is unlikely that future requirements will be any greater than the existing level of rights.

Recreation

Future expansion of recreational facilities is unlikely unless a storage

project, or projects, takes place in the area. Such a development would help the entire Rogue Basin in meeting its future recreational needs.

Wildlife

Wildlife needs will probably remain static unless their habitat is appreciably changed by future developments which are unlikely.

Fish Life

Increasing minimum flows would be the major factor resulting in improvement in the present status of the fishery resource in the Applegate Valley. This could be accomplished only by storage and could be included as part of the benefit to be obtained by the development of the region's agricultural potential through storage for irrigation purposes. The great value of the lower reaches of this tributary system for the migratory fish might possibly justify storage solely for the maintenance of the fishery resource.

Construction of storage reservoirs would enhance the fishery resource by making it possible to meet desirable base flow requirements but, at the same time, would reduce the miles of streams available to migratory fish. The area of spawning gravel within the reservoir would be inundated but the usable area downstream would increase due to higher flows.

Pollution Abatement

Meeting the future needs for pollution abatement can best be accomplished by improving minimum flows. As for other purposes, this would require storage somewhere in the tributary system.

Flood Control

Flood control by means of storage is the method in the Applegate Valley which best meets the cost-benefit requirements of the Corps of Engineers. From this standpoint the best site of those studied by the Corps is that called Copper, located approximately at mile 49 near the town of Copper on the Applegate River main stem. There are many other possible storage sites in the sub-basin, few of which meet the

requirements for economic justification. The Copper site has a further advantage of being located far enough upstream so that it would not seriously affect the spawning area for anadromous fish and would, in fact, improve downstream conditions by maintaining a higher minimum flow than that which would occur without such storage.

For the purpose of determining the optimum flood control potential of the Rogue Basin, the following storage sites were included in the study by the State Water Resources Board: Applegate, Ruch, McKee Bridge and Cooper on the main stem; Little Applegate and Yale on the Little Applegate River; Carberry on Carberry Creek; Williams on Williams Creek; and Slate on Slate Creek. These sites were shown in Figure 43.

The regulated outflows for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13.

APPLEGATE VALLEY

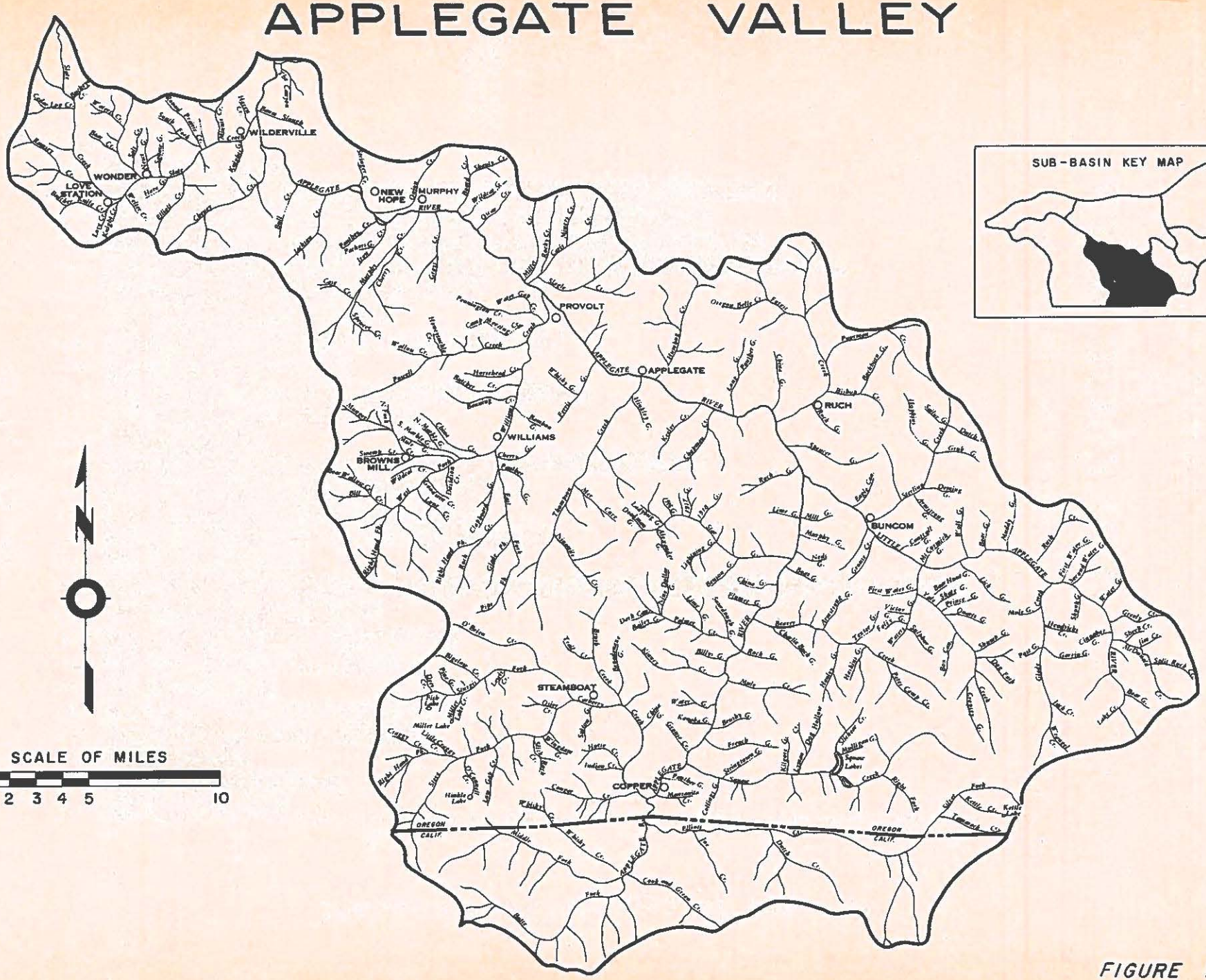
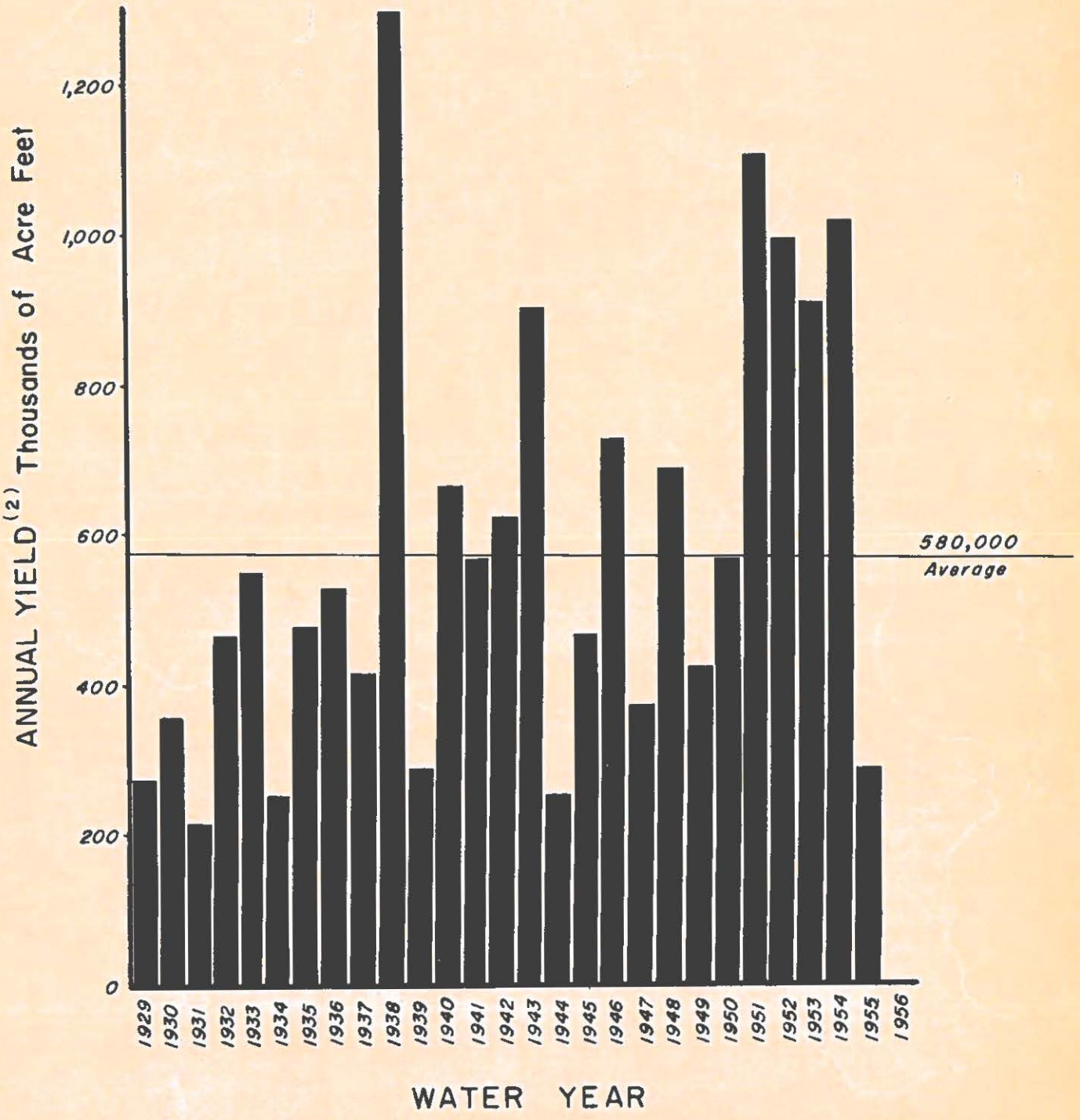


FIGURE 123

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(2)
OF
APPLEGATE RIVER

Drainage Area 764 Sq. Mi.



(2) Determined directly from USGS Water Supply Papers for years of record. Direct stream flow correlations used for remaining years.

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File No. 15.220

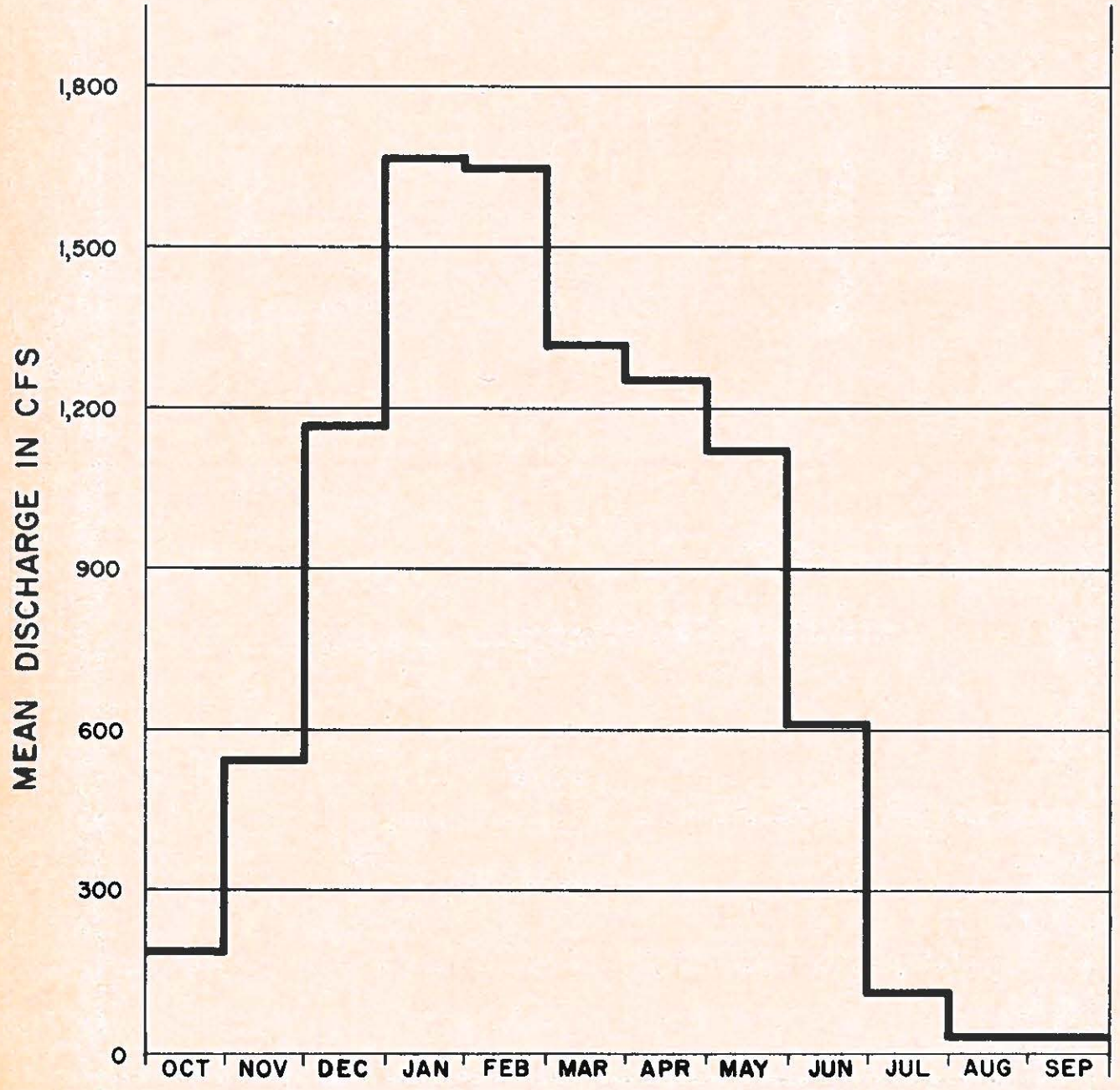
FIGURE 124

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

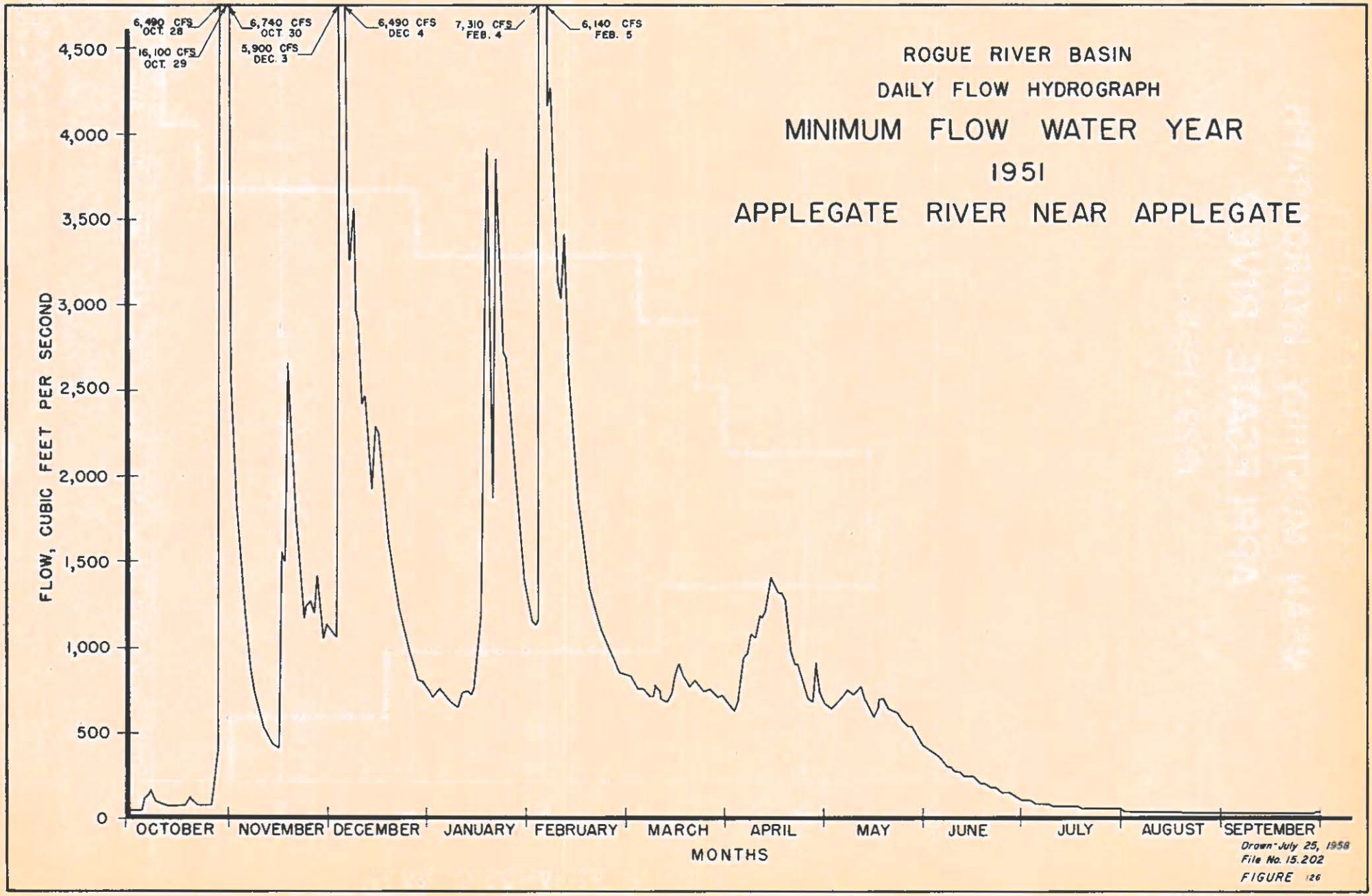
APPLEGATE RIVER

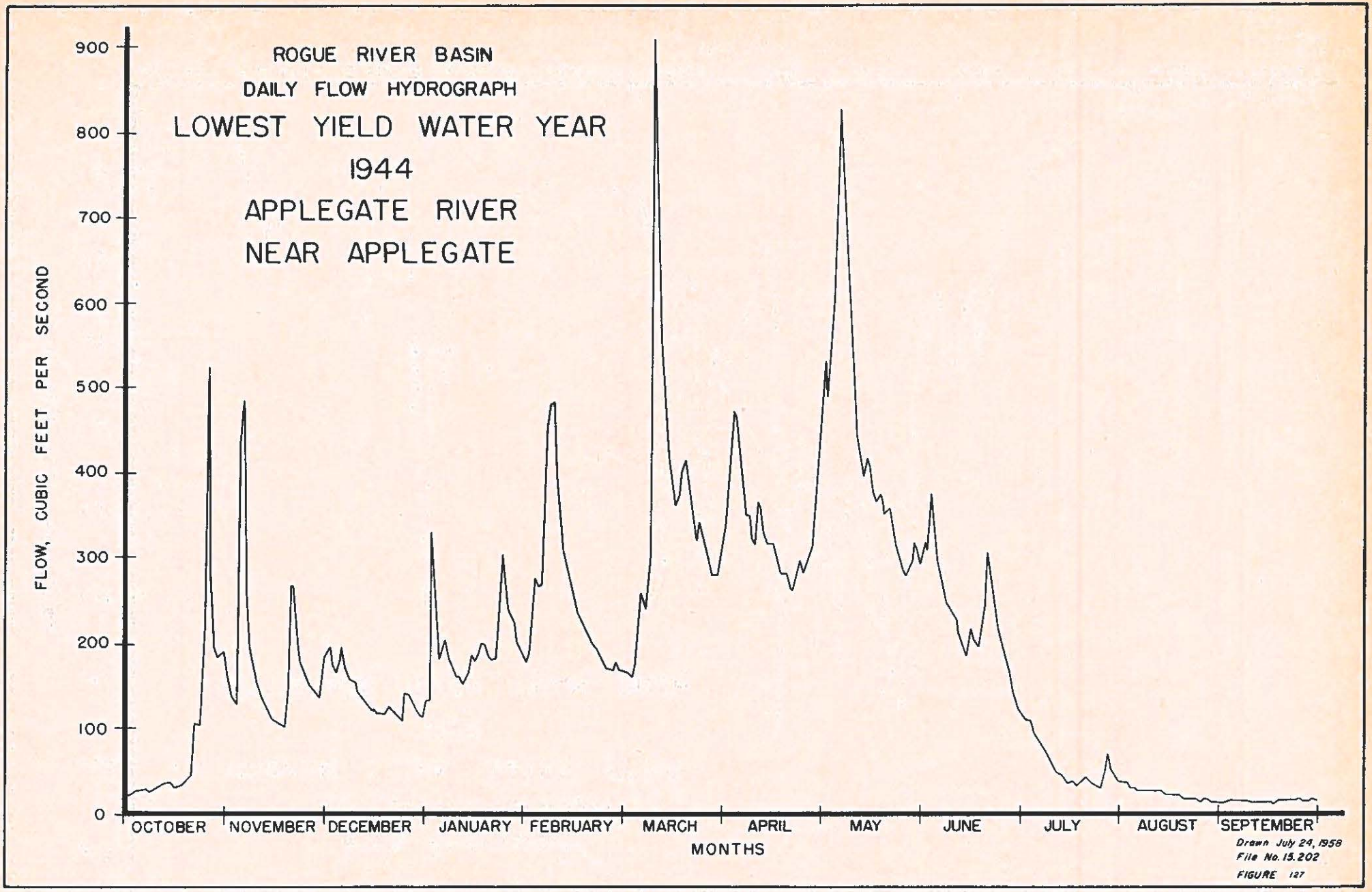
1929 - 1955



Drawn Aug. 15, 1958
File No. 15.202

FIGURE 125


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1951
APPLEGATE RIVER NEAR APPLEGATE
6,490 CFS OCT. 28
16,100 CFS OCT. 29
6,740 CFS OCT 30
5,900 CFS DEC. 3
6,490 CFS DEC 4
7,310 CFS FEB. 4
6,140 CFS FEB. 5
FLOW, CUBIC FEET PER SECOND
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn-July 25, 1958
File No. 15.202
FIGURE 126


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1944
APPLEGATE RIVER
NEAR APPLEGATE
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
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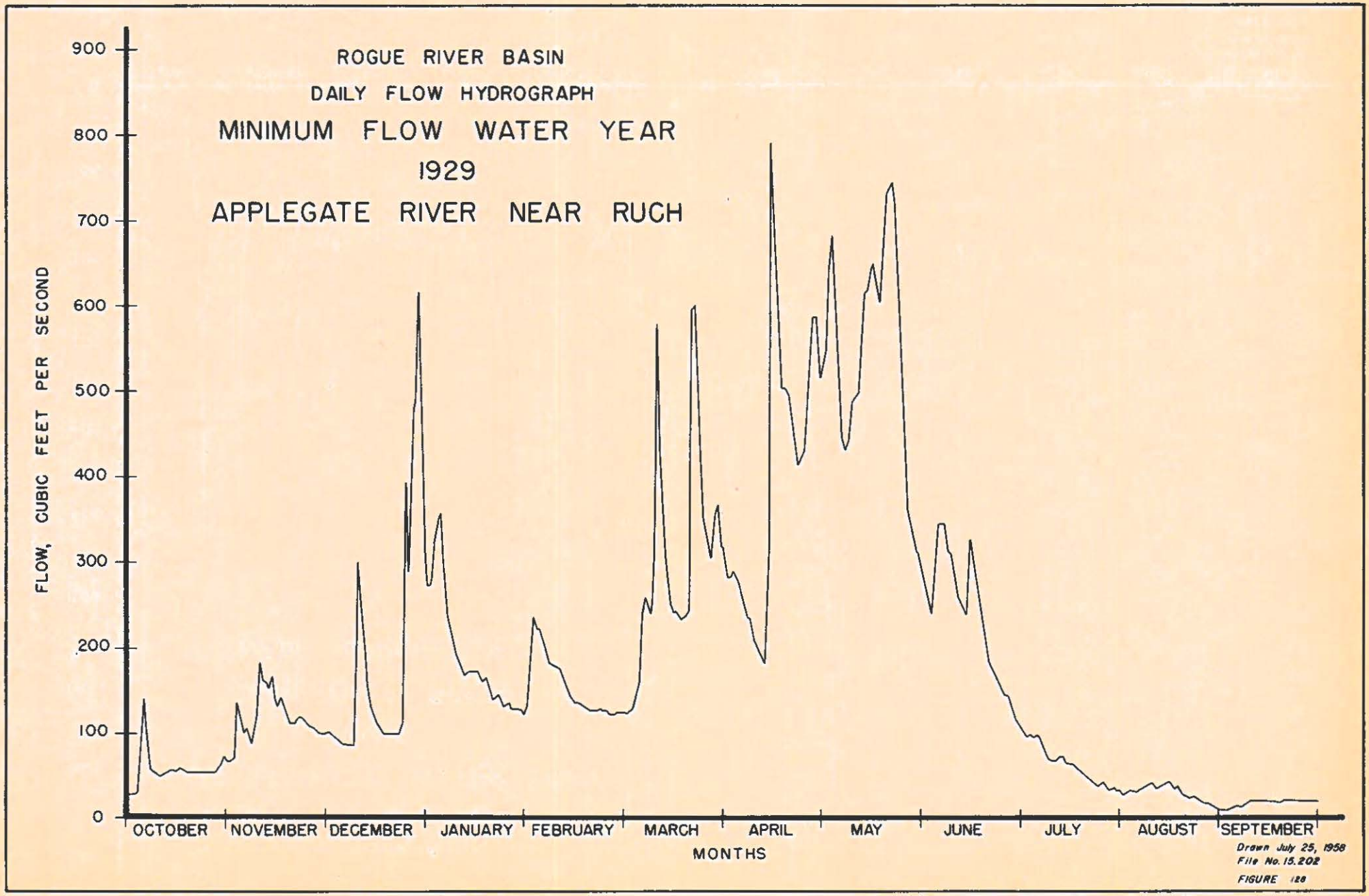
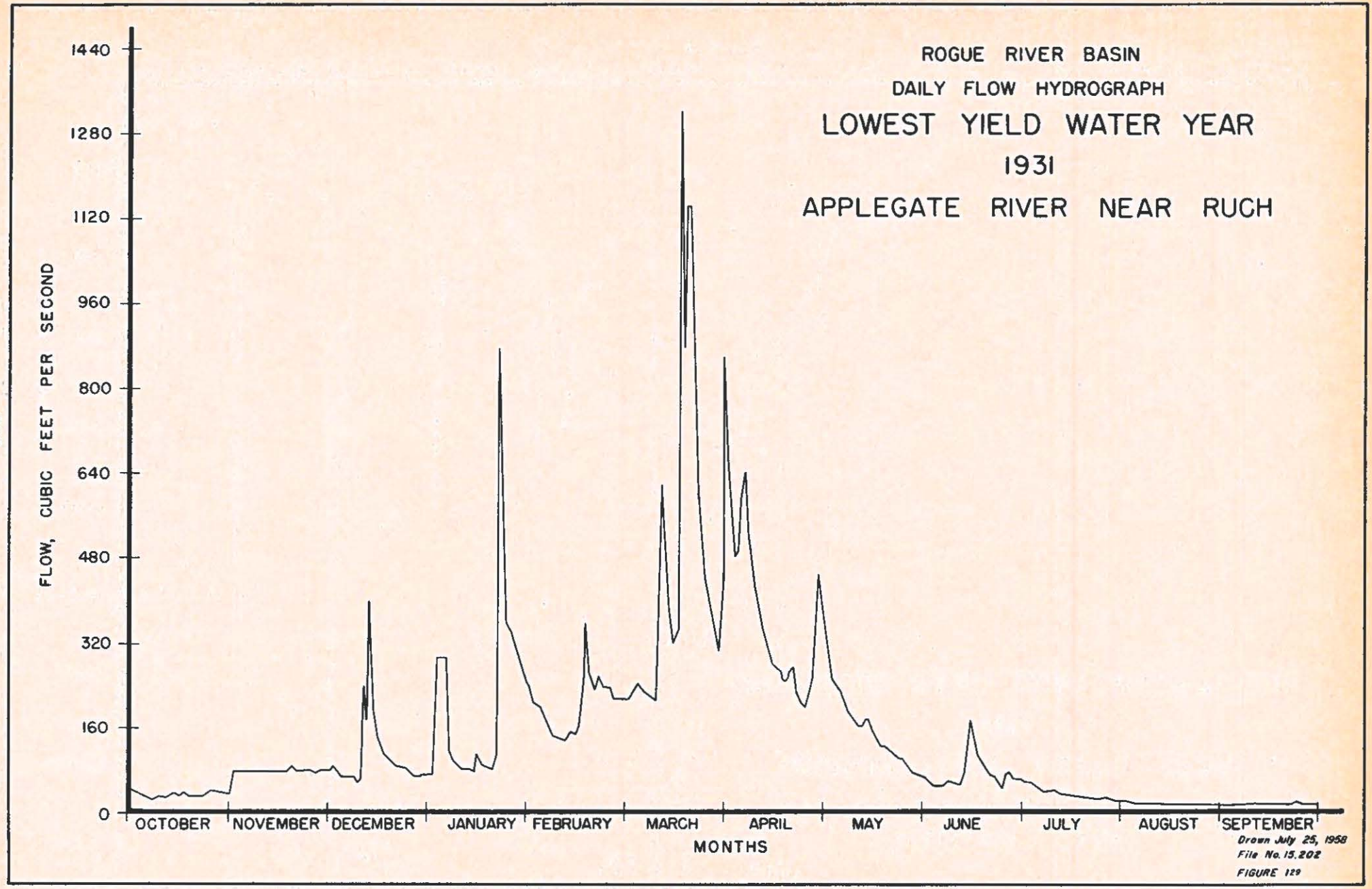
File No. 15.202
FIGURE 127


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1929
APPLEGATE RIVER NEAR RUCH
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 25, 1958
File No. 15.202
FIGURE 128


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1931
APPLEGATE RIVER NEAR RUCH
FLOW, CUBIC FEET PER SECOND
1440
1280
1120
960
800
640
480
320
160
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
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File No. 15.202
FIGURE 129

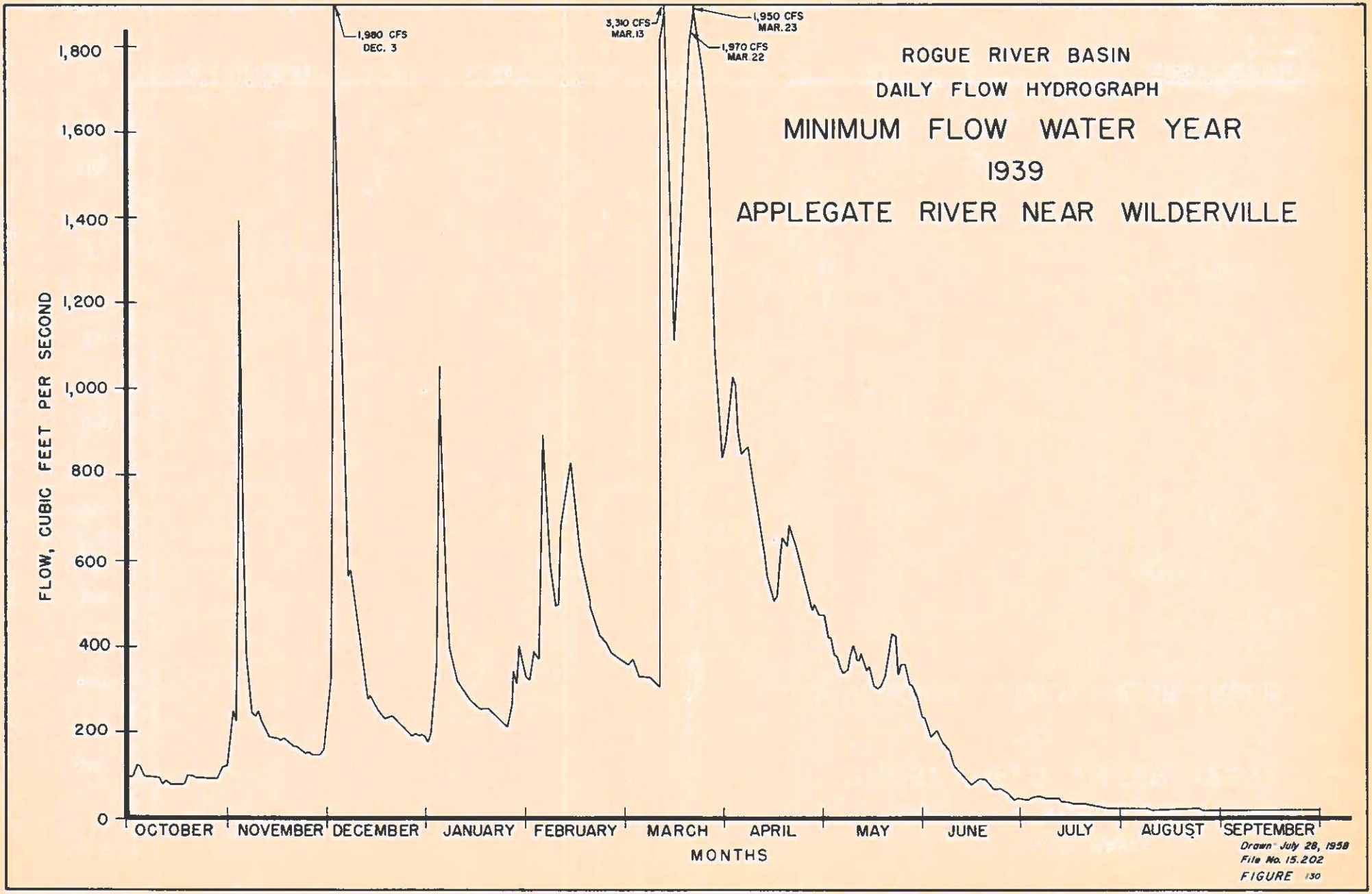
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1939
APPLEGATE RIVER NEAR WILDERVILLE
1,980 CFS DEC. 3
3,310 CFS MAR. 13
1,950 CFS MAR. 23
1,970 CFS MAR. 22
FLOW, CUBIC FEET PER SECOND
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
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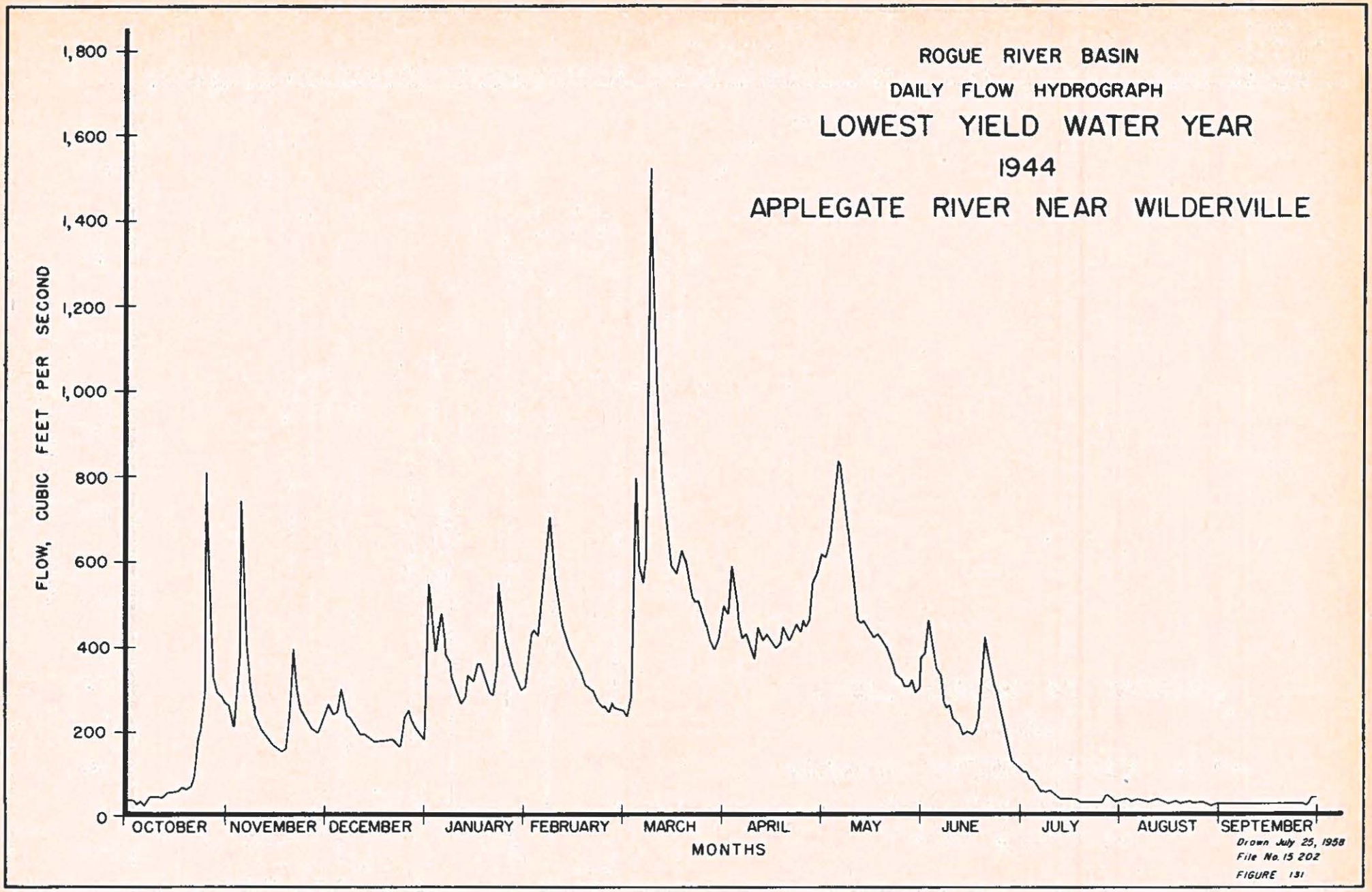
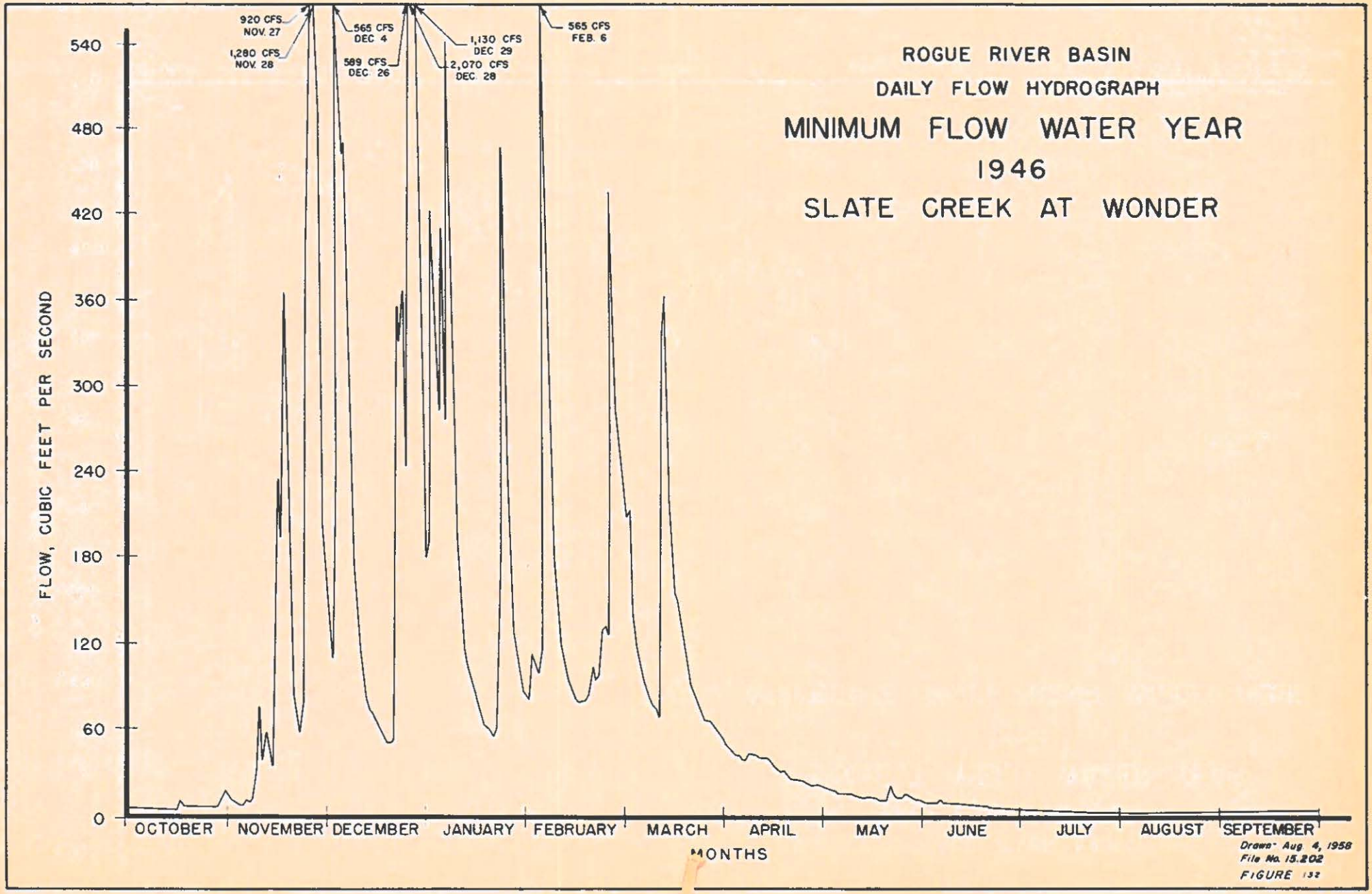
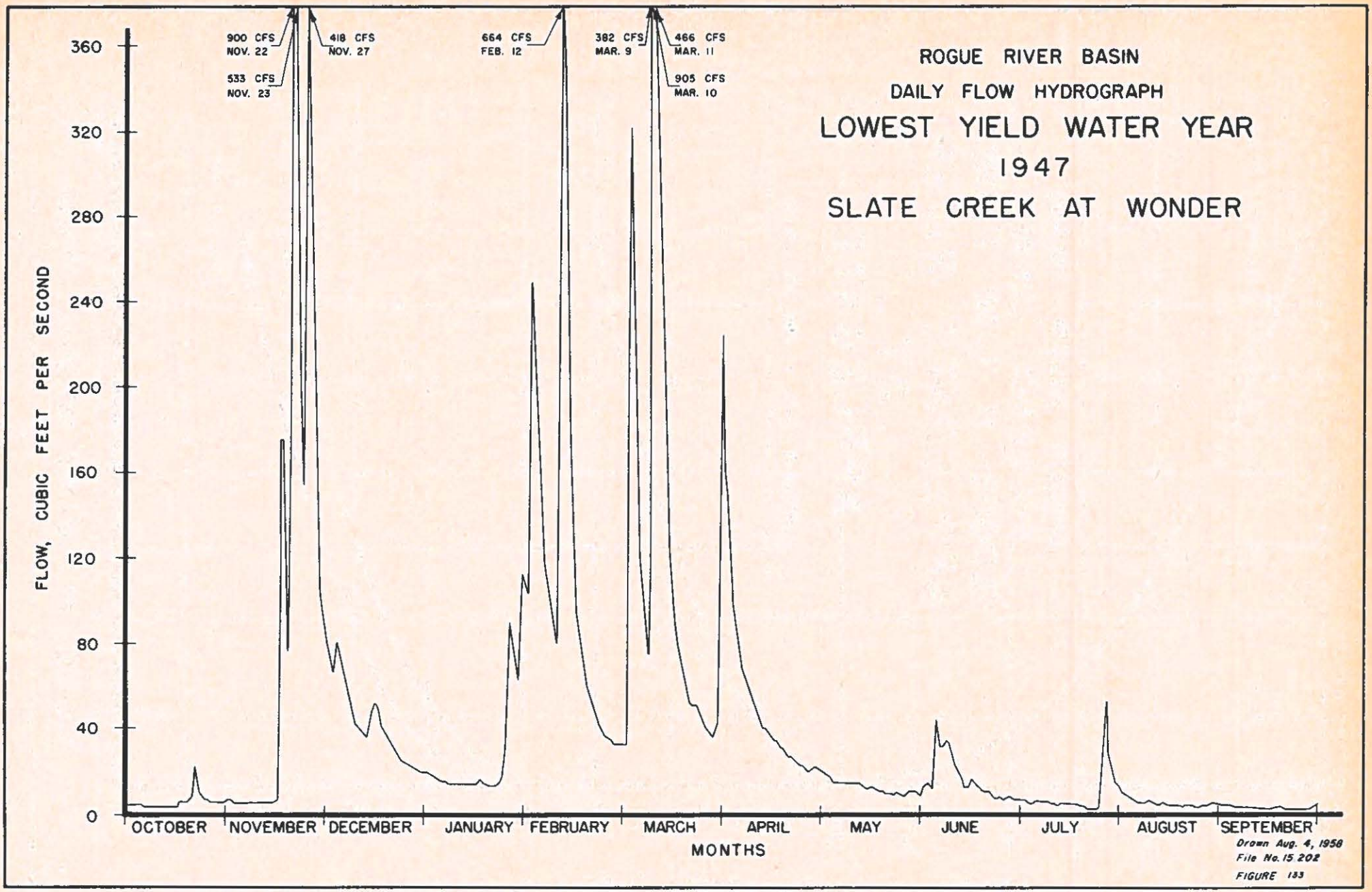
FIGURE 130


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1944
APPLEGATE RIVER NEAR WILDERVILLE
FLOW, CUBIC FEET PER SECOND
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 25, 1958
File No. 15 202
FIGURE 131


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1946
SLATE CREEK AT WONDER
920 CFS NOV. 27
1,280 CFS NOV. 28
565 CFS DEC 4
589 CFS DEC 26
1,130 CFS DEC 29
2,070 CFS DEC 28
565 CFS FEB. 6
FLOW, CUBIC FEET PER SECOND
540
480
420
360
300
240
180
120
60
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug 4, 1958
File No. 15.202
FIGURE 132


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1947
SLATE CREEK AT WONDER
900 CFS NOV. 22
533 CFS NOV. 23
418 CFS NOV. 27
664 CFS FEB. 12
382 CFS MAR. 9
466 CFS MAR. 11
905 CFS MAR. 10
FLOW, CUBIC FEET PER SECOND
360
320
280
240
200
160
120
80
40
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 4, 1958
File No. 15 202
FIGURE 133

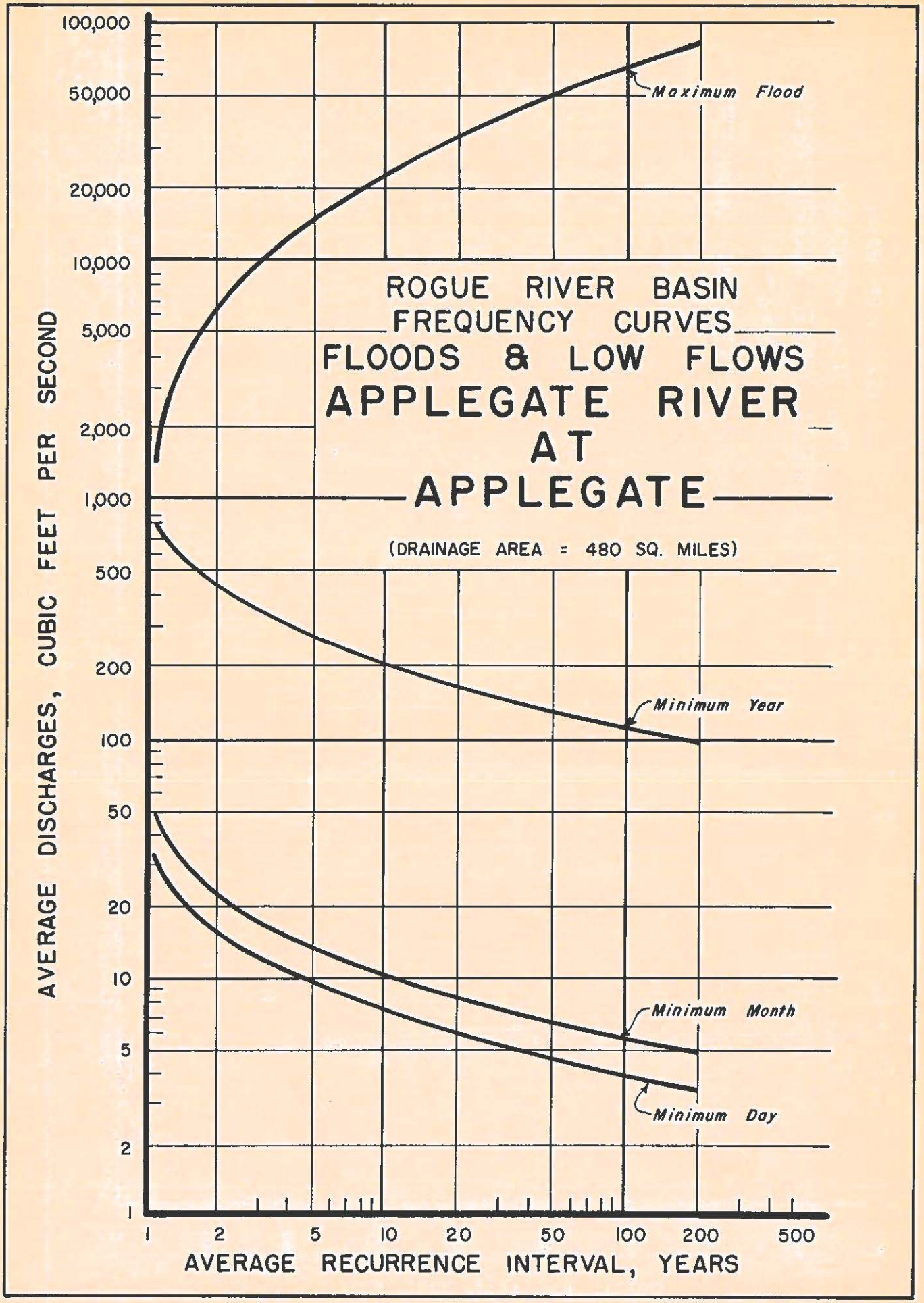

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
APPLEGATE RIVER
AT
APPLEGATE
(DRAINAGE AREA = 480 SQ. MILES)
Maximum Flood
Minimum Year
Minimum Month
Minimum Day
AVERAGE DISCHARGES, CUBIC FEET PER SECOND
100,000
50,000
20,000
10,000
5,000
2,000
1,000
500
200
100
50
20
10
5
2
1
1
2
5
10
20
50
100
200
500
AVERAGE RECURRENCE INTERVAL, YEARS

FIGURE 134

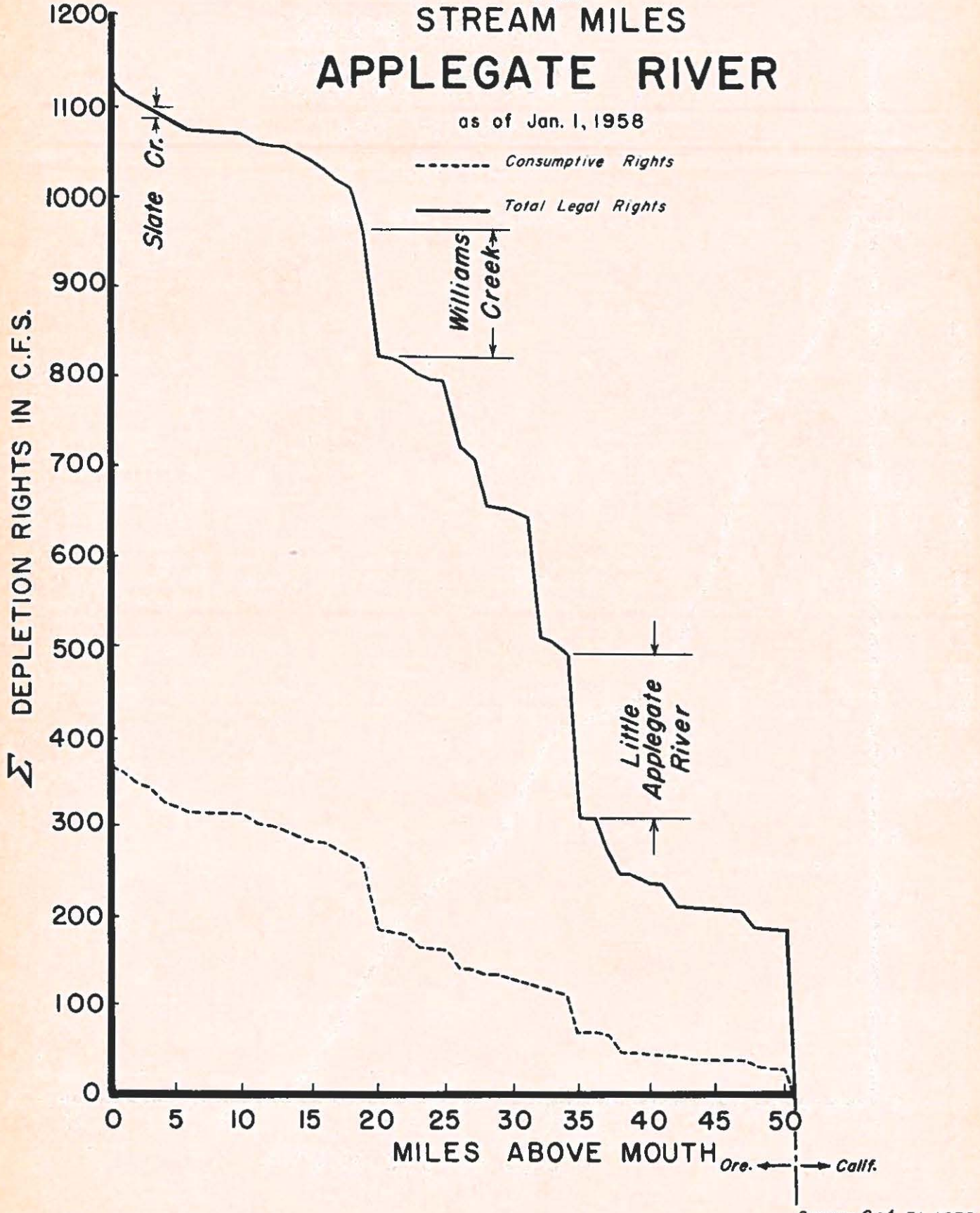
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

APPLEGATE RIVER

as of Jan. 1, 1958



Drawn - Oct. 31, 1958
File No 15302

FIGURE 135

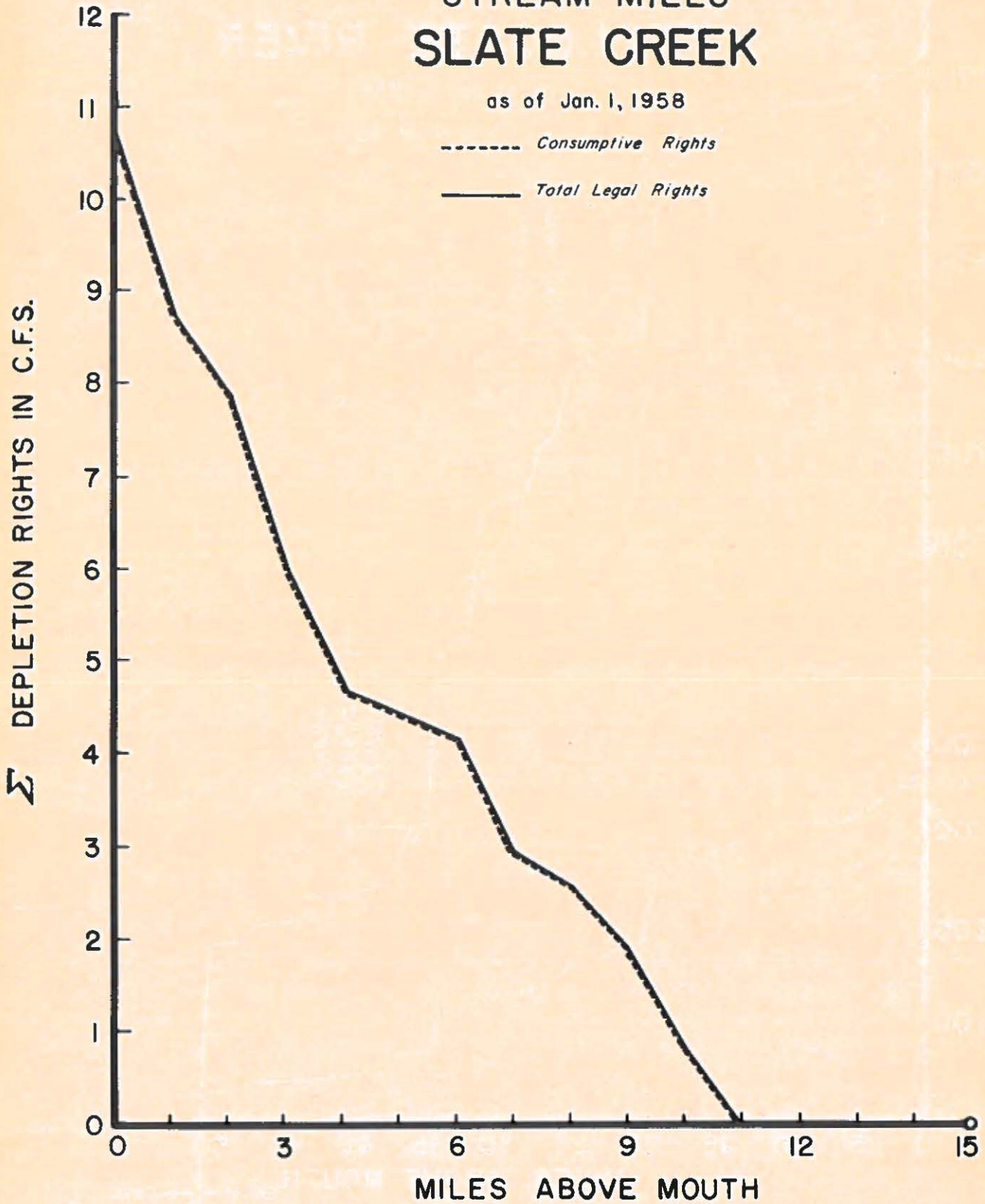
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

SLATE CREEK

as of Jan. 1, 1958



Drawn Oct. 29, 1958
File No. 15302

FIGURE 136

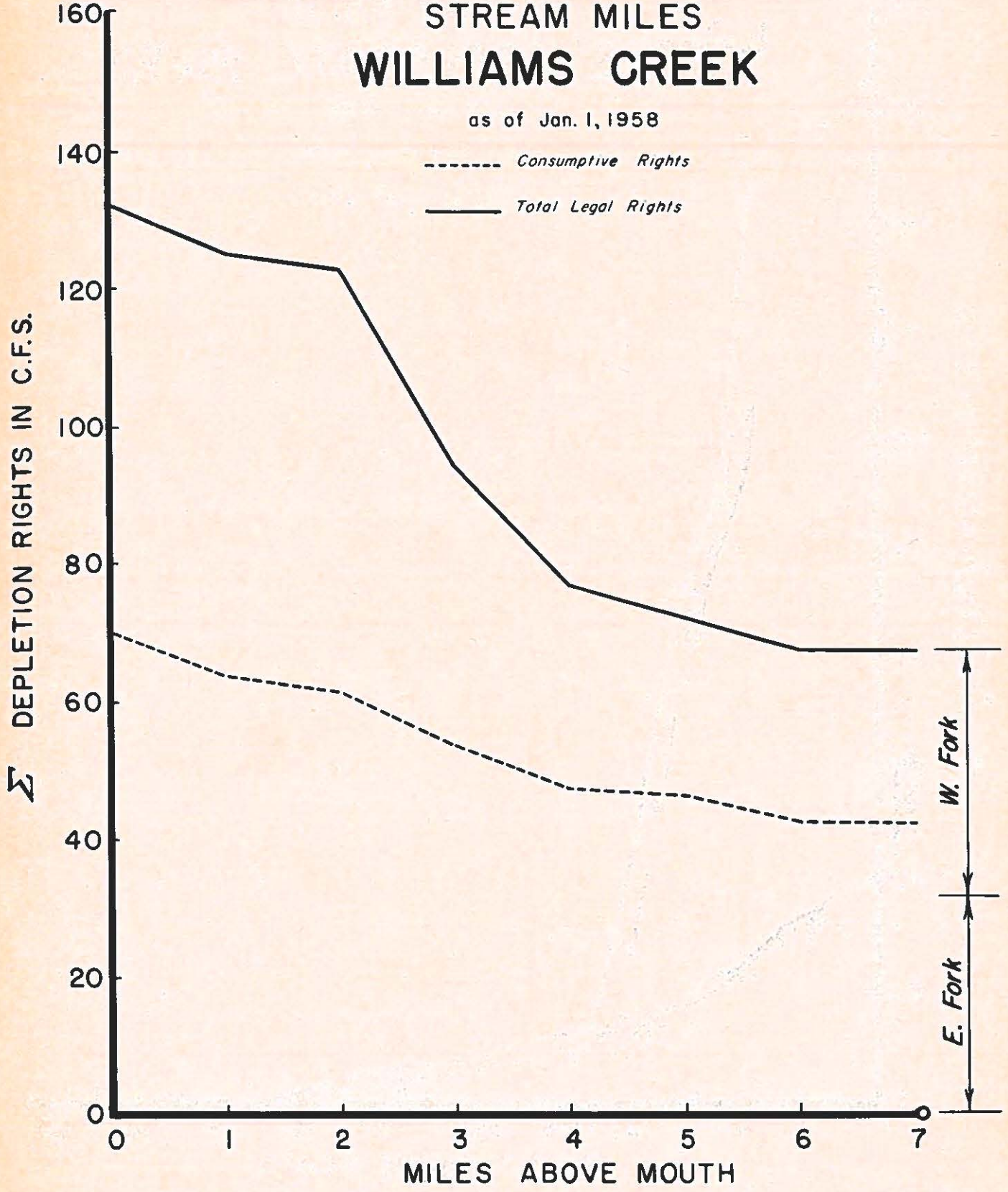
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

WILLIAMS CREEK

as of Jan. 1, 1958



Drown - Oct. 29, 1958
File No 15302

FIGURE 137

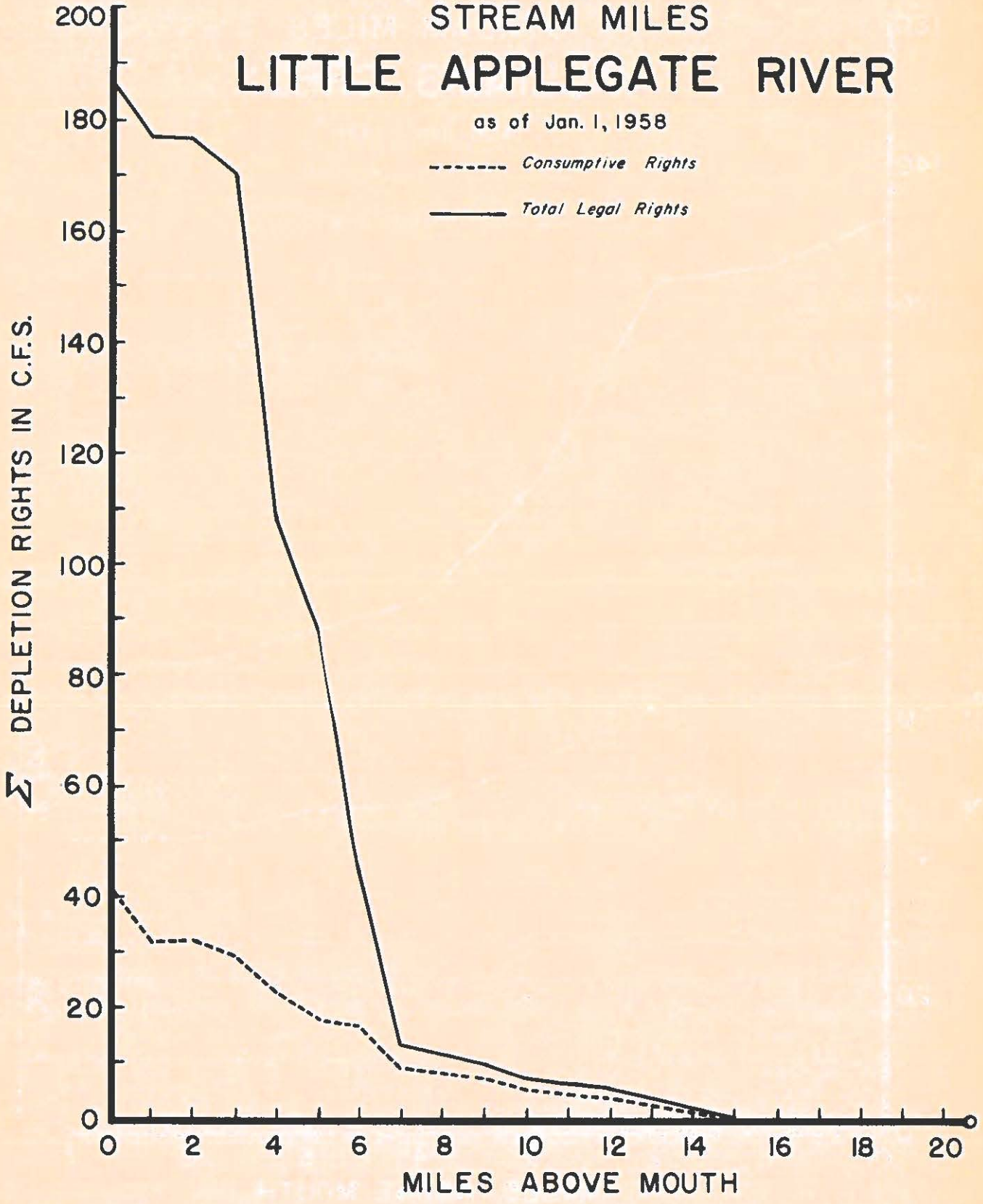
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

LITTLE APPLEGATE RIVER

as of Jan. 1, 1958



Drawn May 27, 1958
File No. 15 302
FIGURE 138

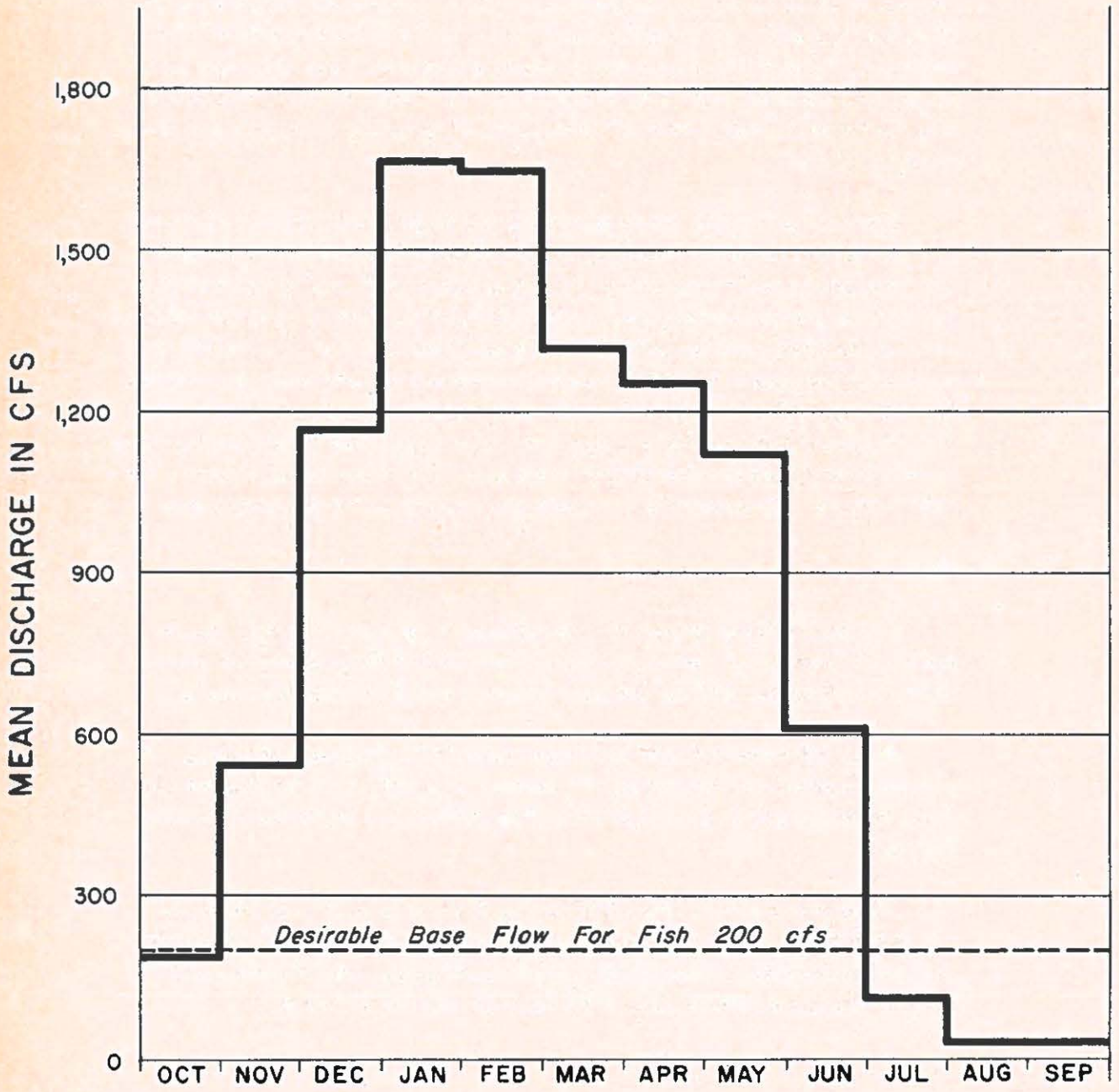
ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

APPLEGATE RIVER AT MOUTH

1929 - 1955

WITH FISH WATER REQUIREMENTS



Drawn Aug. 15, 1958
File No. 15.202

FIGURE 139

SECTION 5 MIDDLE ROGUE

GENERAL DATA

Location

This sub-basin includes all of the Rogue River watershed between river mile 68 and 133 with the exception of the Applegate and Bear Creek Basins, each of which is discussed separately. This is an arbitrary subdivision of the Rogue main stem and includes the northern half of the central portion of the Rogue Basin which encompasses the drainage areas of Grave, Jumpoff Joe, and Evans Creeks as well. Grave Creek joins the Rogue at mile 68, Jumpoff Joe Creek at mile 83.3, and Evans Creek at mile 110.6.

The Rogue Range, which separates the Rogue and Umpqua drainage basins, is the northern boundary of the Middle Rogue River sub-basin. The western boundary is formed by the divide which separates drainage into the Rogue main stem above mile 68 from drainage into other streams or into the Rogue below mile 68. The southern boundary is the divide separating drainage into the Rogue main stem from drainage into either the Applegate River or Bear Creek. The eastern boundary is formed by the divide separating the drainage between Evans and Trail Creeks above mile 149 and between the Rogue main stem and Evans Creek below mile 149. Figure 140 shows the complete stream system for this sub-basin.

Size

This is the third largest of the sub-basins and contains 943 square miles, 18 percent of the Rogue Basin, of which 500 square miles are in Josephine County, 440 in Jackson County, and 3 in Douglas County.

About 23 percent of the sub-basin area is Evans Creek drainage, 18 percent Grave Creek drainage, 12 percent Jumpoff Joe Creek drainage, and the remainder is drainage into other tributaries or directly into the Rogue.

There are approximately 870 miles of streams in this sub-basin of which the Rogue main stem comprises 65 miles, 36 miles each for Grave and Evans Creeks, 21 miles for Jumpoff Joe Creek, and the remainder distributed among many shorter tributaries varying in length.

Topography and Geology

Seventy-five percent of the area would be classed as mountainous terrain unsuitable for farming and about 20 percent as agricultural lands located along the Rogue main stem, particularly in the vicinity of Grants Pass, the middle stretches of Grave Creek, the lower reaches of Evans Creek, and in the Sams Valley area, and the remaining 5 percent is in foothills or is unsuitable for farming because of climate.

Nearly all of the valley lands lie below elevation 1,300 with those of Sams Valley between 1,250 and 1,300; along Evans Creek 950 to 1,000; Grave Creek running from 620 up; and along the Rogue River from 600 to 1,200. King Mountain, elevation 5,265, located in Grave Creek drainage very near the northern boundary of the sub-basin, is the highest point and there are several other peaks above elevation 4,000 in the area.

Stream gradients vary widely from tributary to mouth throughout the Basin with the Rogue averaging approximately 9 feet of drop per mile; Evans Creek dropping 270 feet per mile in its headwater areas and then leveling off to an average of 30 feet of drop per mile below river mile 28; Jumpoff Joe Creek averaging approximately 120 feet per mile; Grave Creek 159 feet per mile in the headwater region and approximately 38 feet per mile below river mile 20. The Rogue Basin stream system profile was shown in Figure 2.

Geologic information is available only for the western portion of the sub-basin and shows that the northwestern part consists of a galice formation consisting of black to dirty gray shale with subordinate amounts of sandstone, a little grit, and some volcanic rocks. The area west of Grants Pass consists of quartz diorite and the southwestern portion of the sub-basin consists mainly of meta-volcanic rocks with a slight scattering of meta-sedimentary rocks. The broader valleys of the sub-basin contain an extensive amount of alluvium.

The Rogue main stem flows in a westerly direction to mile 95 and then travels generally northward through the remainder of the sub-basin. Both Grave and Jumpoff Joe Creeks parallel the Rogue in its central section and enter the Rogue traveling in a westerly direction. Evans

Creek starts from the northern divide, separating the Rogue Basin from the Umpqua Basin, and travels in a generally south or southwesterly direction to its juncture with the Rogue main stem.

Climate

Average annual precipitation is near 30 inches in the vicinity of Grants Pass and in Sams Valley, 35 inches near Wolf Creek and Merlin, and 50 inches in the vicinity of Galice. Less than 20 percent of the annual precipitation occurs during the irrigation season, May 15 - October 15, with the exception of the area surrounding Merlin where nearly 30 percent of the precipitation occurs during this period. Snowfall is light in the valley regions ranging from below 9 inches annually at Grants Pass to below 15 inches at Wolf Creek. At the higher elevations, such as Sexton Summit, the average annual snowfall increases to nearly 102 inches.

Average air temperature variations go from 44 to 81 degrees Fahrenheit during the summer and 33 to 55 during the winter at elevations below 1,200 feet, and from 37 to 69 during the summer and 32 to 46 during the winter at elevations above 3,800 feet.

Annual growing seasons according to the Bureau of Reclamation's climatological map are in the neighborhood of 240 days throughout the valleys of this sub-basin.

Population

Total population in the Middle Rogue sub-basin is in the neighborhood of 25,000 persons and is second to Bear Creek Valley for the Rogue River Basin. Most of the population is centered around Grants Pass, which has a 1958 certified population of 9,900. There are three other towns in the Basin having populations greater than 500; Rogue River - 1958 certified population of 600, Gold Hill - 1958 certified population of 650, and Wolf Creek - 1950 census population of 500. Only two other towns in the sub-basin have more than 100 persons; Sunny Valley, 1950 census population of 148, and Merlin, 1950 census population of 300. The location of all towns is shown on the sub-basin stream system map, Figure 140.

Land Ownership

One-third of the Middle Rogue area is government timber land managed by either the Forest Service or the Bureau of Land Management; five percent is public domain land, a fraction of a percent is under the control of the State Land Board, and the remainder is privately owned. Nearly 40 percent of both Evans and Grave Creeks drainage is government timber land. Major land ownership divisions by sub-basins for the Rogue Valley were summarized in Table 2.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19. U. S. 99 traverses the Middle Rogue section from north to south passing through the towns of Wolf Creek and Pleasant Valley to the City of Grants Pass where it turns to the east and follows the Rogue River and passes near the towns of Rogue River and Gold Hill where it again changes direction to follow Bear Creek towards the City of Medford. Another paved route, Oregon 234, starts at Gold Hill and travels through Sams Valley where it turns toward the east to join the Crater Lake Highway about a mile and a half east of Dodge Bridge, which is located at mile 138.5 on the Rogue River.

A paved route from Grants Pass, called the Lower River Road, travels west along the north and eastern banks of the Rogue to finally join the Redwood Highway, U. S. 199, in the Applegate Valley. The towns of Rogue River and Wimer are connected by a paved road as are the towns of Gold Hill and Central Point by a route called the Old Stage Road. Another paved route from Gold Hill roughly parallels U. S. 99 to join with it just north of the community of Seven Oaks.

The other tributary basins in the Middle Rogue section are served by many miles of gravel roads and more than 300 miles of unimproved dirt roads.

The county maintains an airport at Grants Pass which has sufficient runway length to handle medium-sized planes and there is a privately-owned landing strip for small planes two miles southwest of Grants Pass.

The Southern Pacific Railway main line enters the Middle Rogue

section at Wolf Creek and travels south through Merlin and Grants Pass, then east to Gold Hill where it continues through Central Point and on to Medford.

Both Western Greyhound and Consolidated Pacific Trailways bus lines operate regular northbound and southbound schedules over U. S. 99 and Western Greyhound also operates schedules over U. S. 199 from Grants Pass.

Several regular freight truck schedules are maintained on the two U. S. highways and irregular schedules serve other parts of the sub-basin.

Present Economy

Timber industries are of major importance to this sub-basin and one of the heaviest concentrations of sawmill activity in the Rogue Basin is located here, near the town of Merlin.

Croplands are found wherever there are valley areas and the heaviest concentration is the Grants Pass region. There are nearly 1,500 farms in this section with the average value of land and buildings per farm being a little more than $17,000 and the average value of land and buildings per acre a little greater than $276.

Dairy farming and chicken raising is carried on extensively in this region. Agricultural crops are primarily of a specialty type.

Grants Pass is a distribution center having sales in 1954 amounting to $26,000,000 retail and $10,000,000 wholesale.

There are two dairy manufacturing plants located in Grants Pass as well as two poultry processing plants and one livestock processing plant.

Tourist trade is important to this region, particularly in the Grants Pass area where there are many facilities available for use by tourists. Traffic is heavy on U. S. 99, especially during the vacation season, and there is also considerable traffic on the Redwood Highway.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

The major climatological station of this section is maintained by the Weather Bureau at Sexton Summit where detailed meteorological data, including precipitation and air temperature, are gathered. Other stations are located at Grants Pass, for both precipitation and temperature but nonrecording; at Williams, having both recording and nonrecording gages for precipitation only; and at the town of Copper, gathering precipitation data. The location of these stations was shown in Figure 30. Average annual precipitation for the Rogue Basin was shown in Figure 3 and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

There are nine active stream gaging stations in this sub-basin. These, along with inactive stations, are located as shown in Figure 29. The Grants Pass gaging station is the most downstream station on the Rogue main stem. Stream gaging records are published in Water-Supply Papers by the U. S. Geological Survey.

Yields

Annual yields for all years of records are shown for the Rogue River at Raygold and at Grants Pass and for Grave, Jumpoff Joe, and Evans Creeks at their mouths in Figures 141-145. The average of annual yields for all years of record are: Rogue River at Grants Pass, 2,310,000 acre-feet; at Raygold, 2,080,000 acre-feet; Jumpoff Joe Creek, 111,000 acre-feet; and, Grave Creek, 201,000 acre-feet.

Mean monthly discharges for the same points are shown in Figures 146-150. These plots show the distribution of average annual yields with respect to time. Peak runoff at the three locations occurs in the months of January and February as the result of winter rains, and flows of the main stem at Grants Pass remain relatively high through May due to snow melt in the headwater areas on the western slopes of the Cascades.

Minimum flow and minimum yield hydrographs for the critical year

of record at the gaging stations existing in the area are shown in Figures 151-158. The critical year shown for each location is dependent upon how far back the records for each station go and, in all probability, the early 1930's would be the critical time for all stations if all of the records covered that period. Table 7 summarizes the critical flow and yield conditions which have occurred in the Rogue River Basin.

Drought frequency curves for the Rogue River at Raygold and at Grants Pass, and for Evans Creek at Bybee Springs, along with flood frequency curves for the same locations, are shown in Figures 159-161.

Maximum flood curves were prepared from work by the Corps of Engineers and minimum curves were computed independently by the State Water Resources Board using data from water-supply papers. The curves show that for a 10-year average recurrence interval at Grants Pass a flood of 80,000 cubic feet per second could be expected or low flows averaging 2,200 cfs for 365 consecutive days, 875 cfs for 30 consecutive days, and 780 cfs for one day. This does not mean that such flows will occur once every 10-years, but rather that over a long-term period, say 100 years, such flows will probably occur 10 times at irregular intervals which average once every 10 years.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin was shown in Figure 20 and Table 18 is the summary of the water rights by classification existing at present in the Middle Rogue section of the Basin. Power rights, the largest group, total 3,736 cfs which are 50 percent of all the rights, and there is a total of 2,008 cfs for mining, 1,475 for irrigation, and 126 for municipal use. All rights total 7,380 cfs of which 1,622 cfs are consumptive in nature.

Depletions

Depletion diagrams of legal rights versus stream miles for the Middle Rogue section and three of its tributaries, Grave, Evans, and Jumpoff Joe Creeks; and for Wolf Creek, a tributary of Grave; and Pleasant Creek, a tributary of Evans, are shown in Figures 162-167.

TABLE 18

WATER RIGHTS SUMMARY

MIDDLE ROGUE RIVER BASIN

USE	STREAM		TOTAL RIGHTS CFS
Domestic	All		9.4
Municipal	Rogue River		125.5
Irrigation	Rogue River	305.0	
	Grave Creek	13.8	
	Jumpoff Joe Creek	1,008.3	
	Evans Creek	24.8	
	Others	123.6	
	Total - Irrigation		1,474.5
Power	Rogue River	3,707.0	
	Jumpoff Joe Creek	0.6	
	Others	28.5	
	Total - Power		3,736.1
Industrial	All		12.0
Mining	Jumpoff Joe Creek	62.5	
	Rogue River	3.0	
	Grave Creek	221.5	
	Others	1,721.8	
	Total - Mining		2,008.2
Recreation	All		0.3
Wildlife	None		
Fish Life	All		13.7
Pollution Abatement	None		
	TOTAL MIDDLE ROGUE RIVER BASIN		7,379.7

The plots show the total of all rights but do not indicate the actual water use because of the complexity of consumptive depletions and the availability of water used nonconsumptively for other use at downstream locations. Ordinate values on the plots do not include supplemental rights and these are not part of the totals in Table 18. Supplemental rights permit alternate sources of supply but do not add to original rights.

Rights on Grave Creek and its tributary, Wolf Creek, are primarily nonconsumptive. Based upon average discharges for each month for all years of record, Grave Creek is over-appropriated for all months with the exception of January and February.

Rights on Jumpoff Joe Creek are about half consumptive and half nonconsumptive. Jumpoff Joe Creek is over-appropriated for all months of the year.

Rights on Evans Creek main stem are nearly all consumptive but its tributary, Pleasant Creek, has mostly nonconsumptive water rights. There is sufficient water to meet the total rights in the Evans Creek Basin for the months of December through April.

EXISTING NEEDS

Domestic

Rights for domestic use of water total less than 10 cfs for surface water from the streams.

Municipal

Municipal rights are all for Rogue River main stem water. The largest right, 100 cfs, is held by the City of Medford in anticipation of future needs. Also, the Rogue River Water Company, which serves the cities of Grants Pass and Gold Hill, has water rights on the Middle Rogue River sub-basin.

Irrigation

The largest irrigation right in the Middle Rogue River Basin, for 1,000 cfs of water from Jumpoff Joe Creek and Louse Creek to irrigate 40,000 acres

from storage of a 50,000 acre-foot capacity reservoir, has a priority date of 1937 for part and 1941 for the remainder and is filed under the name of Merlin Irrigation District although such a district has not yet been formed. This application was filed in anticipation of a Bureau of Reclamation project in the area and, in the advent of the construction of such a project, the source of water for development would be from this right.

The largest irrigation right being exercised is held by Grants Pass Irrigation District for 230 cfs from the Rogue main stem to irrigate 18,390 acres. Other large irrigation rights for Rogue River water are held by the Gold Hill and Fort Vannoy Irrigation Districts. In addition, the Sams Valley Irrigation Association has a right of 5 cfs for water from Rock Creek and other small tributaries in the Sams Valley area to irrigate 400 acres of land.

The only lands receiving an adequate supply of irrigation water are those served by the Table Rock Ditch Company which uses Rogue River water from a diversion point located in the Upper Rogue River sub-basin.

Irrigation lands in the Rogue Basin were shown in Figure 15 and irrigation developments in Figure 16.

Power

Nearly all of the power rights are for Rogue River main stem water. Of this group, Copco holds a right for 1,560 cfs for the months of September through May to be reduced to 1,060 during June, July, and August, and Pacific Portland Cement Company has rights for a total of 1,347 cfs. The Grants Pass Irrigation District holds a power right for 800 cfs, but this water is used to operate hydraulically-driven pumps which lift water to the District's distribution system, and not to produce electric power. Hydroelectric power installations were tabulated in Table 5. The location and physical features of power developments in the Rogue River Basin were shown in Figure 21.

Industrial

Industrial rights for the use of water are scattered throughout the Basin and are for such uses as mining, milling, manufacturing, fire protection, gravel plants, sawmills, railway use, and bottling plants. Nearly

all of these rights are small, less than 1 cfs, the largest right being for 2 cfs for a tributary of Galice Creek to be used for milling.

Mining

Mining rights, 2,010 cfs, represent 30 percent of all the rights in the Middle Rogue River sub-basin but permanent mining activity in this area uses very little water. The location of mineral deposits and active mining operations in the Rogue Basin were shown in Figure 17.

Recreation

As with other sub-basins, water rights for recreational use in this section are negligible but water does play an important part in the overall recreation picture. Savage Rapids pool, 50 acres, is the only lake or reservoir-type of water facility of significance in the area and receives heavy pressure especially during the tourist season. The Rogue main stem is of major importance in this area and is heavily fished, particularly in the lower part of the sub-basin.

Recreation areas in the Rogue Basin were shown in Figure 18.

Wildlife

The wildlife resource is small in the more heavily populated sections of the region and in the other areas the needs are easily satisfied due to the low level of development by man.

Fish Life

Nearly three-fourths of the annual run of fall chinook salmon spawn in this sub-basin in the main stem of the Rogue. Grave Creek is also an important spawning area for this species of fish, and a smaller number uses the lower reaches of Jumpoff Joe Creek and its tributary, Louse Creek, with an even smaller number using Evans Creek. Evans Creek is also an important spawning area for steelhead trout and a few silver salmon utilize this stream as well. Fish spawning areas in the Rogue Basin were shown in Figures 22-24.

Sufficient water to adequately cover the spawning gravel in some

of the smaller tributaries is not always available. Mean monthly discharge hydrographs with desirable base flows for fish as recommended by the State Game Commission for critical points in the Middle Rogue River stream system are shown in Figures 168-170. The plots indicate that, for average flow conditions, there is insufficient water to satisfy requirements for proper management of the fishery resources during the months of August and September in the Rogue at Grants Pass and in Grave Creek at mile 20.1, the critical point for that stream. Evans Creek average flows meet requirements for the entire year.

Fish water requirements for the Rogue Basin stream system were shown in Figure 42. Water temperatures above 65 degrees Fahrenheit which sometimes accompany the low flows occurring during warm, dry summers are detrimental to fish life. Water temperature data for this sub-basin is plotted in Figures 171-185. No temperature data is available for the Rogue tributaries.

It is estimated by by the State Game Commission that a total of 120 stream miles available to migratory fish with 143,000 square yards of spawning gravel exists in the Middle Rogue River sub-basin.

Pollution Abatement

Pollution abatement problems are not serious in this sub-basin with the exception of some industrial processes which occasionally create conditions detrimental to fish life.

The major towns in this area handle sewage disposal by means of sewage treatment facilities, and increasing population will require expansion of such facilities. There are sewage plants at Grants Pass and Gold Hill, primary treatment at the former, secondary at the latter.

Flood Control

Floods in this sub-basin are caused almost entirely by heavy winter rains. All of the streams in this section are flashy in nature and runoff occurs rapidly after rainfall. Peak flows occur usually in the months of January and February with occasional high flows in December and March. Runoff patterns at representative locations in the sub-basin are shown by mean monthly hydrographs, Figures 146-150, which were discussed under Yields.

Flood damages in this sub-basin during the 1955 flood were more than $2,469,000, or 61 percent of the total damage occurring in the Rogue River Basin, and nine-tenths of this occurred along the Rogue main stem, particularly in the Grants Pass area, due to the high level of development of this region. A large portion of the damage on the Rogue main stem was residential while the major damage in the other areas was agricultural.

Flood damages of significance occur in all of the major tributary basins. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 lists the damages which occurred during the 1955 flood.

FUTURE NEEDS

Domestic

The inadequacy of ground water supplies, both in respect to quality and quantity, means that future needs will probably be met from surface water sources.

Municipal

Grants Pass, the major municipal user of water from the Middle Rogue section, cancelled an application for 10 cfs for industrial use but is considering applying for an additional 10 or 12 cfs of water from the main stem to meet future municipal needs. Future water supplies for the City of Medford will be met using water from the Rogue main stem. Other municipal needs probably will not increase much above the present level.

Irrigation

The irrigation potential in this sub-basin is large and most of the lands presently being irrigated could benefit from additional supplies of irrigation water. There is much land either being dry farmed or potentially irrigable located in Sams Valley, Evans Valley, and along Grave and Jumpoff Joe Creeks. The Bureau of Reclamation has published a feasibility report to irrigate lands in Jumpoff Joe Creek, called their Merlin Division, and in their latest proposal have eliminated lands along Grave Creek from consideration as being economically unjustifiable at present.

Formation of the Sams Valley Irrigation Association in 1952 and construction of the Sams Valley Reservoir and Canal in 1954 have improved the irrigation situation in that area, but considerable land still remains which does not receive an adequate supply of irrigation water (Figure 15).

Power

Figure 41 was a profile showing the location of sites, along with heads, used in the power potential computations. Those in this sub-basin included in the study were Rock Point, Gold Hill, and Ament on the main stem; Homestead Gulch on Evans Creek; Sexton on Jumpoff Joe Creek; and Pease Bridge on Grave Creek.

Average discharges for each month were determined for every site and discharge duration curves were prepared from this information. These are shown in Figures 186-191.

With the use of heads and discharges, monthly power potentials were determined for each site and duration curves were prepared from this information. With the use of these plots, Figures 192-197, the power potential at individual sites can be determined.

Potentially there is sufficient water flowing in the Middle Rogue stream system in the month of September to develop an average of 19,000 kilowatts of power (13,680,000 KWH of energy per month) if the head shown in Figure 41 were utilized. This potential varies by months to a maximum (occurring in the month of February during the winter rains) of 76,000 kilowatts (54,720,000 KWH of energy per month), giving an average for the mean discharge for all years of record of approximately 49,000 kilowatts (429,240,000 KWH of energy annually). This is the potential in addition to existing installations which means that roughly 8 percent of the total power potential of the Middle Rogue River Basin has been developed.

Industrial

The Middle Rogue River sub-basin shares with the Bear Creek Basin (Medford area) the maximized assets for the expansion of industrial activity within the Rogue River Basin. Within this sub-basin there is a

substantial potential for the expansion of resource-based industry in the timber classification. Development in this field could be in pulp, paper and hardboard operations or other wood utilization and remanufacturing processes.

The area has mineral deposits of significance and could in the future be the base of an expanding minerals industry economy. Much more data will be required covering the basic resource both with regard to quality and quantity before any realistic analysis of the mineral industries potential and its effect on water use in the Basin can be evaluated.

There is potential for agricultural expansion within this sub-basin primarily in the upstream portions of the unit. Major areas available for more intensive agricultural development lie in Sams Valley and adjacent areas. Expanded agricultural activity in this area might provide, in conjunction with additional development in Bear Creek, a source of agricultural products which would result in food processing operations located within the Middle Rogue Basin. The water use and quality control aspects of the food processing potential cannot be sufficiently defined to warrant specific conclusions at this time. Far more critical in terms of the sub-basin's water resource picture will be the effect of bringing the presently unirrigated lands to irrigated agricultural production.

The immediate potential for industrial development in the Rogue sub-basin is in the field of pulp and paper operations and other secondary processes. Transportation assets, both rail and highway, plant sites, labor availability and water supply are factors representing advantages to this particular area of the Rogue River Basin. The March 31, 1958, report of Sandwell and Company, Inc., of Seattle, Washington, indicates that the Grants Pass area (located within the Middle Rogue sub-basin) probably has more in its favor for the development of pulp and paper operations than any other individual area in the Basin.

The report by Sandwell and Company indicates that initial requirements for the operation of a 300 ton per day kraft paper operation would amount to some 15 cfs with an ultimate requirement of 30 to 50 cfs. This is a somewhat lower requirement than the 10 cfs per 100 tons of pulp capacity utilized for preliminary analysis in this report. In view of the conflicts that will undoubtedly develop between the use of water for

industrial purposes and other consumptive as well as nonconsumptive beneficial uses, it is reasonable to assume that greater use in water efficiency will be required of a plant located in the Rogue River Basin than for existing units located in areas outside of the Rogue Basin.

In their report, Sandwell and Company also points out that unless the legislative restrictions regarding diversion of water from the Rogue River for industrial purposes are rescinded, alternate sources of supply will be necessary before industrial expansion of this type can take place in the Middle Rogue watershed. Alternate sources of water supply within the Middle Rogue sub-basin which can be given reasonably serious consideration as satisfactory for industrial operations representing large capital investments are the Evans Creek, Jumpoff Joe Creek and Grave Creek tributaries to the Middle Rogue sub-basin. On the basis of available records, it would appear that none of these tributaries can supply sufficiently reliable resources from natural stream flow during the months of July, August and September. This would necessitate storage upon these tributaries in order to provide an assured flow during the critically low flow periods of the summer and early fall. Ultimate diversion requirements for development of approximately 600 tons of pulp and capacity would require a volume of approximately 35,000 acre-feet per year. In three out of twenty-three years of record on Jumpoff Joe Creek, this requirement would represent the entire yield of the stream without giving consideration to other consumptive requirements for irrigation and other beneficial uses. When it is realized that the Merlin Project proposed by the Bureau of Reclamation would require some 29,000 acre-feet annually from Jumpoff Joe Creek watershed, it is obvious that a serious conflict between consumptive uses is involved in this tributary basin.

The Grave Creek tributary has a substantially better yield than that of Jumpoff Joe Creek. Minimum values are in excess of 60,000 acre-feet per year. Storage and diversion of the full ultimate requirement for pulp and paper operations of 35,000 acre-feet per year when added to the optimum irrigation storage requirements of from seven to ten thousand acre-feet per year would result in conflicts between these consumptive uses and nonconsumptive beneficial uses in the lower section of this Basin. Resolution of the conflict in this area between the consumptive uses of industrial supply and agriculture will rest on detailed evaluation of the economic agricultural potential of the Grave Creek

Basin and a more detailed evaluation of industrial storage need and its economic effect on plant operation costs.

The deterrents to development of pulp and paper operations on Grave Creek are the problem of pollution abatement in the lower section of Grave Creek and the restricted labor market in this particular area. Acceptable sites in this Basin are above the confluence of Grave Creek and Wolf Creek. It is in this location that the rail and road transportation facilities exist. The problems of maintaining adequate water conditions, both quantity and quality-wise for beneficial nonconsumptive uses in the lower eight miles of Grave Creek, will present a difficult problem.

The total resource availability of Evans Creek is somewhat less than that of Grave Creek, although the Evans Creek Drainage Basin has an additional 54 square miles of drainage area. The analyses applied to Grave Creek would be applicable to Evans Creek with the exception that undeveloped irrigation potential in this valley is substantially less indicating a reduction in level of conflict between consumptive uses. It is probable that any location of a large pulp and paper operation would be in the general vicinity of the community of Rogue River because of the availability of road and rail transportation at that point. Rail transportation does not continue up into the Evans Creek Drainage Basin.

It should be borne in mind, however, that the values indicated in this discussion are volumetric and all three tributary basins under discussion do not have water available during the critical three months of the summer for either of the consumptive uses indicated. For all three of the tributary basins discussed therein, it will be necessary to make an economic evaluation of the cost of water than can be assumed in the pulp and paper operations if the source of the water supply is to be from storage facilities within one of these three areas. Although detailed economic analyses are outside the scope of this report, it will be difficult to obtain economically justifiable storage for these tributaries. Foreseeable needs have a magnitude of approximately 50 to 70 cfs with approximately 25 to 35 cfs of actual consumptive use.

<u>Mining</u>

According to the State Department of Geology and Mineral Industries

there are many mineral deposits of economic significance in this region consisting of chromite, cobalt, copper, gold, nickel, quicksilver, tungsten, asbestos, barite, granite, limestone, semi-precious gems, and silica. A few such deposits are presently being developed to a small extent with processing plants located in the Grants Pass area and future development depends upon more detailed knowledge of the size and quality of such deposits. Mineral deposits and active mines and mills in the Rogue Basin were shown in Figure 17.

Recreation

Heavy tourist traffic on Highway 99 has resulted in substantial development of facilities in the Grants Pass area and upstream along the Rogue main stem. However, there is need for considerable expansion of facilities, particularly water recreational types.

Wildlife

Wildlife needs will probably remain static unless their habitat is appreciably changed by future developments, but a change in unlikely.

Fish Life

If the existing characteristics of the stream system remain unaltered, changes in the fishery resource will result primarily from increasing fishing pressure. Construction of storage reservoirs in this region would enhance the fishery resource by making it possible to meet desirable base flow requirements. At the same time, such reservoirs would reduce the miles of streams available to migratory fish, and the area of spawning gravel within the reservoir would be inundated, but the usable area downstream would be increased due to higher flows.

Pollution Abatement

Requirements for pollution abatement will increase along with increases in population and increases in level of development of this region. Additional sewage treatment facilities will be required as population loads increase. Strict adherence to existing sanitary codes and requirements will be necessary by all existing and future industrial developments.

Flood Control

Flood control needs will increase with increasing levels of development. Storage is necessary to provide adequate protection in this sub-basin, particularly along the Rogue main stem. There are many possible sites in the area but few meet the requirements for economic justification.

A project on Evans Creek is being included as part of the Corps of Engineers' current study and preliminary results indicate that such a project will probably be recommended primarily for irrigation benefits rather than flood control.

For the purpose of determining the optimum flood control potential of the Rogue Basin, the following storage sites in this sub-basin were included in the study by the State Water Resources Board: Meadows, Upper Evans, Homestead Gulch and Evans Valley on Evans Creek; Sexton on Jumpoff Joe Creek; and Pease Bridge on Grave Creek (Figure 43).

The regulated outflows for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13.

MIDDLE ROGUE

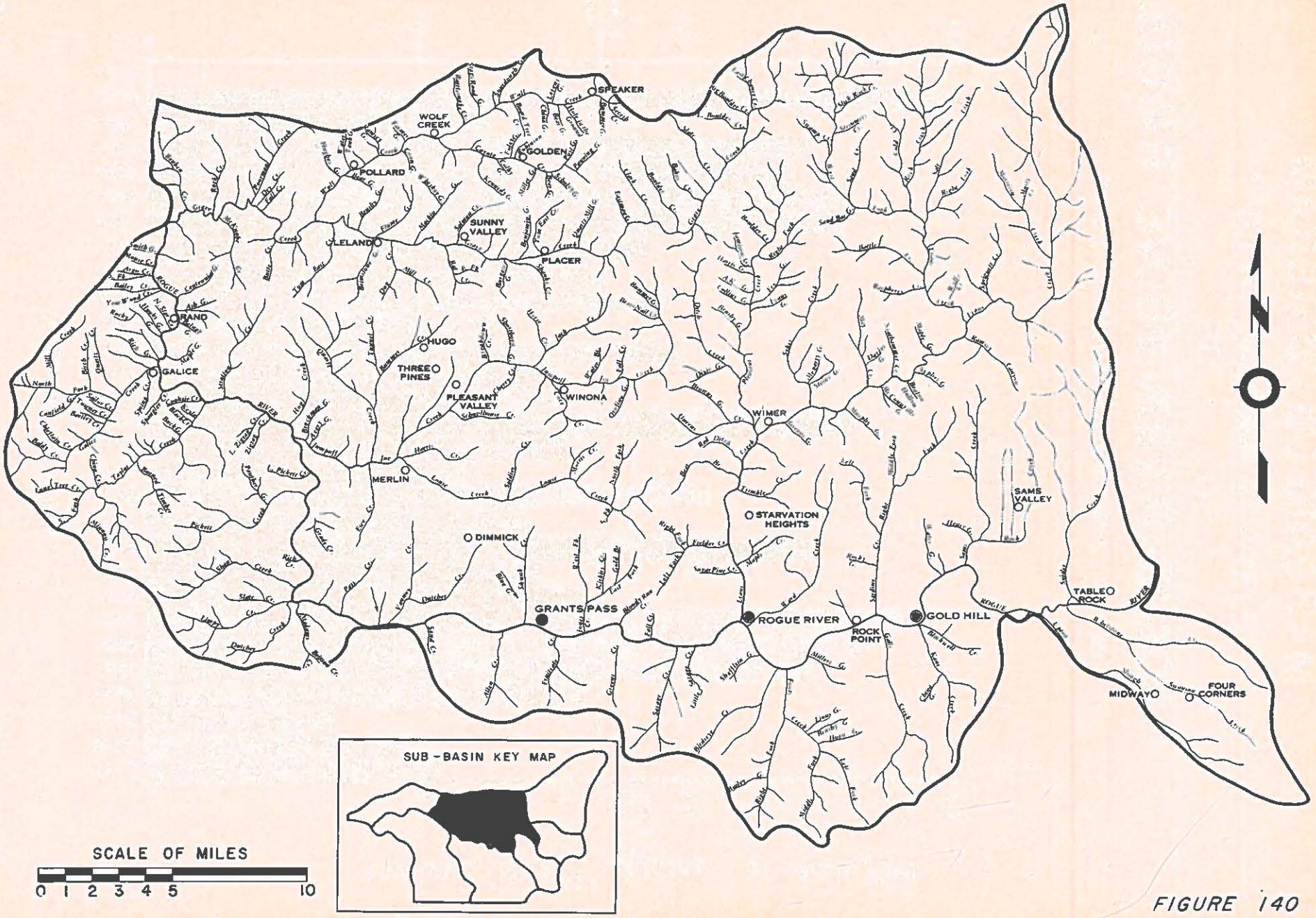
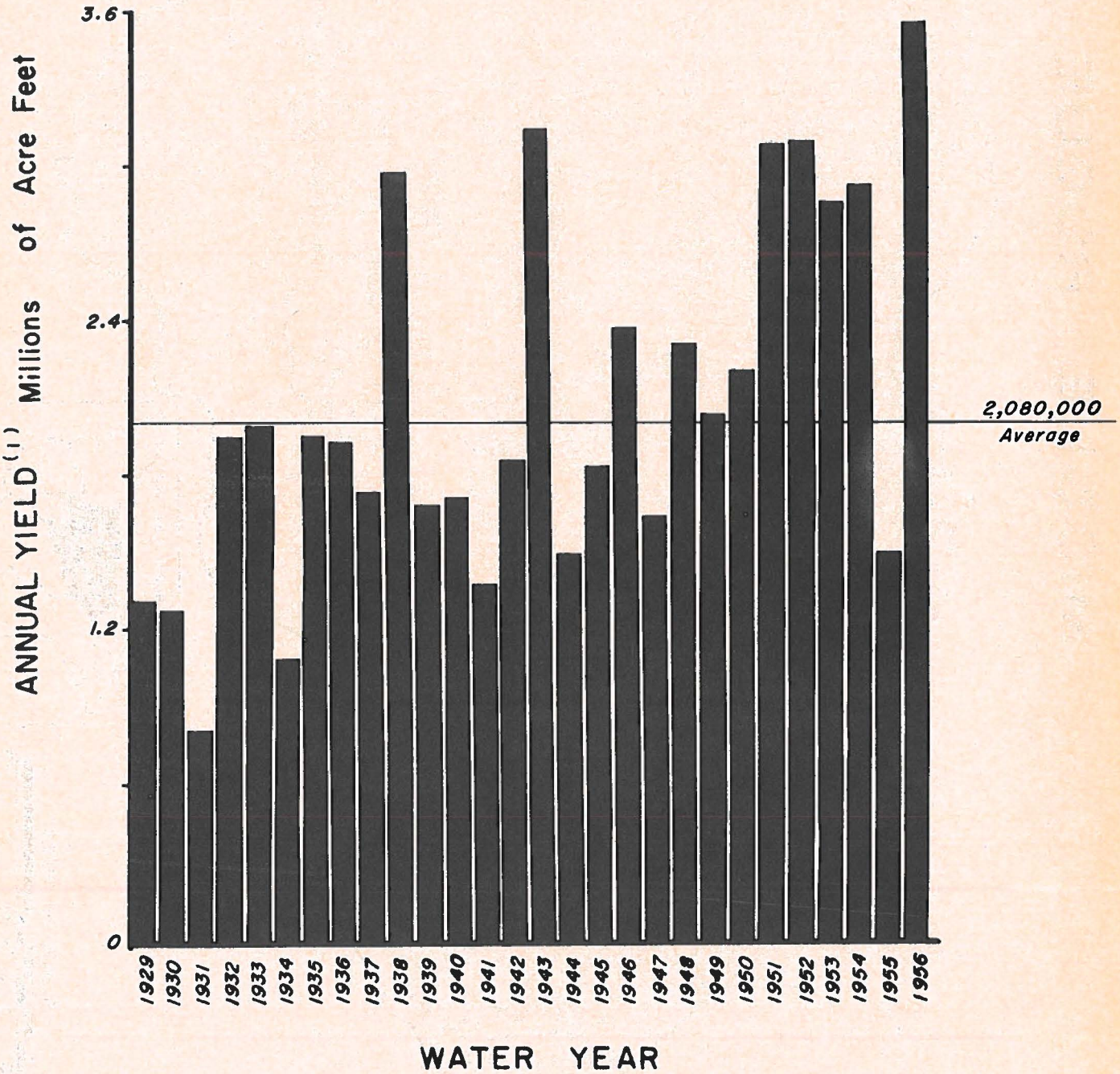


FIGURE 140

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(1)
OF
ROGUE RIVER ABOVE RAYGOLD

Drainage Area 2020 Sq. Mi.



(1) Determined directly from USGS Water Supply Papers for all years.

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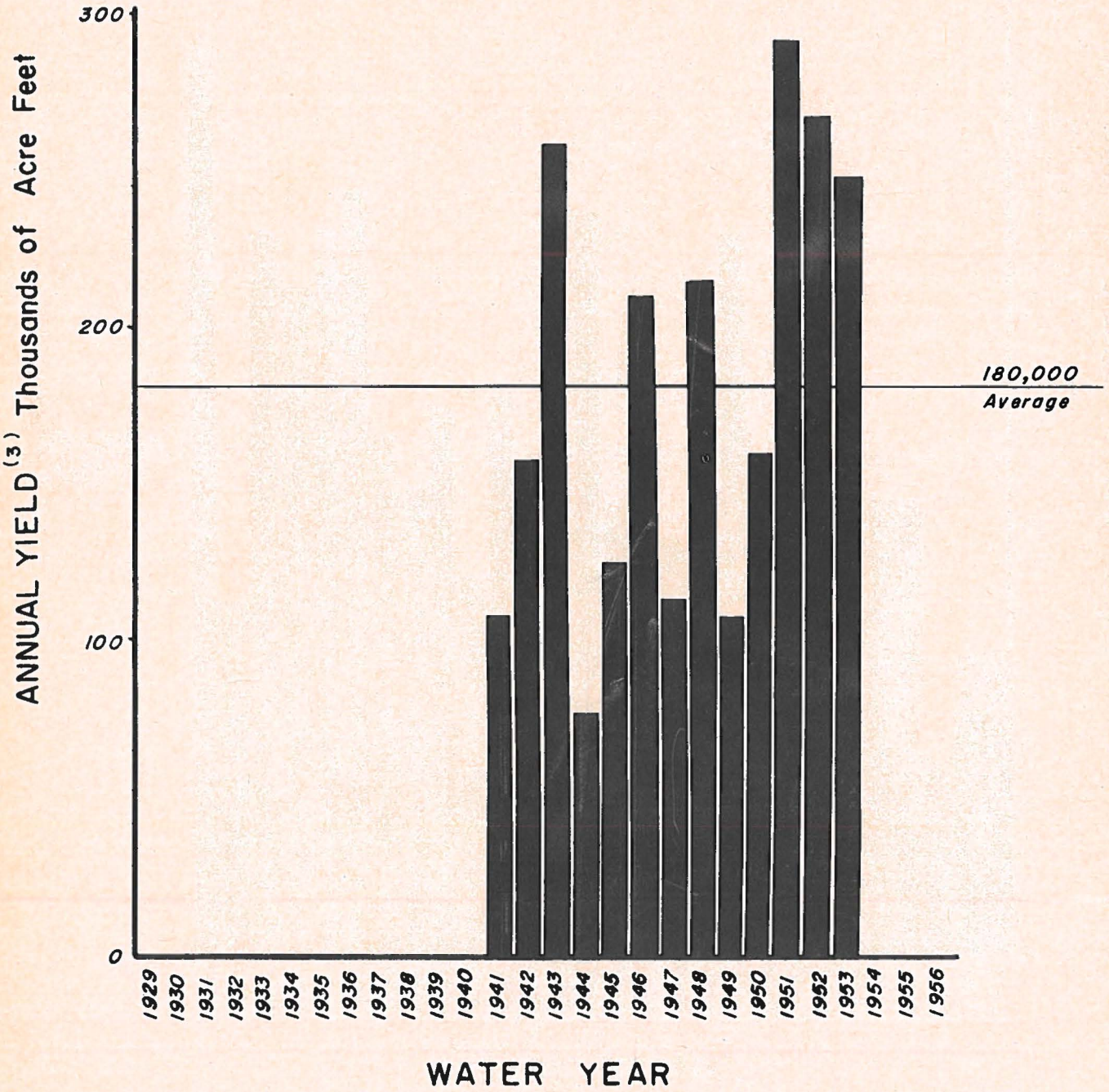
FIGURE 141

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
EVANS CREEK

Drainage Area 218 Sq. Mi.



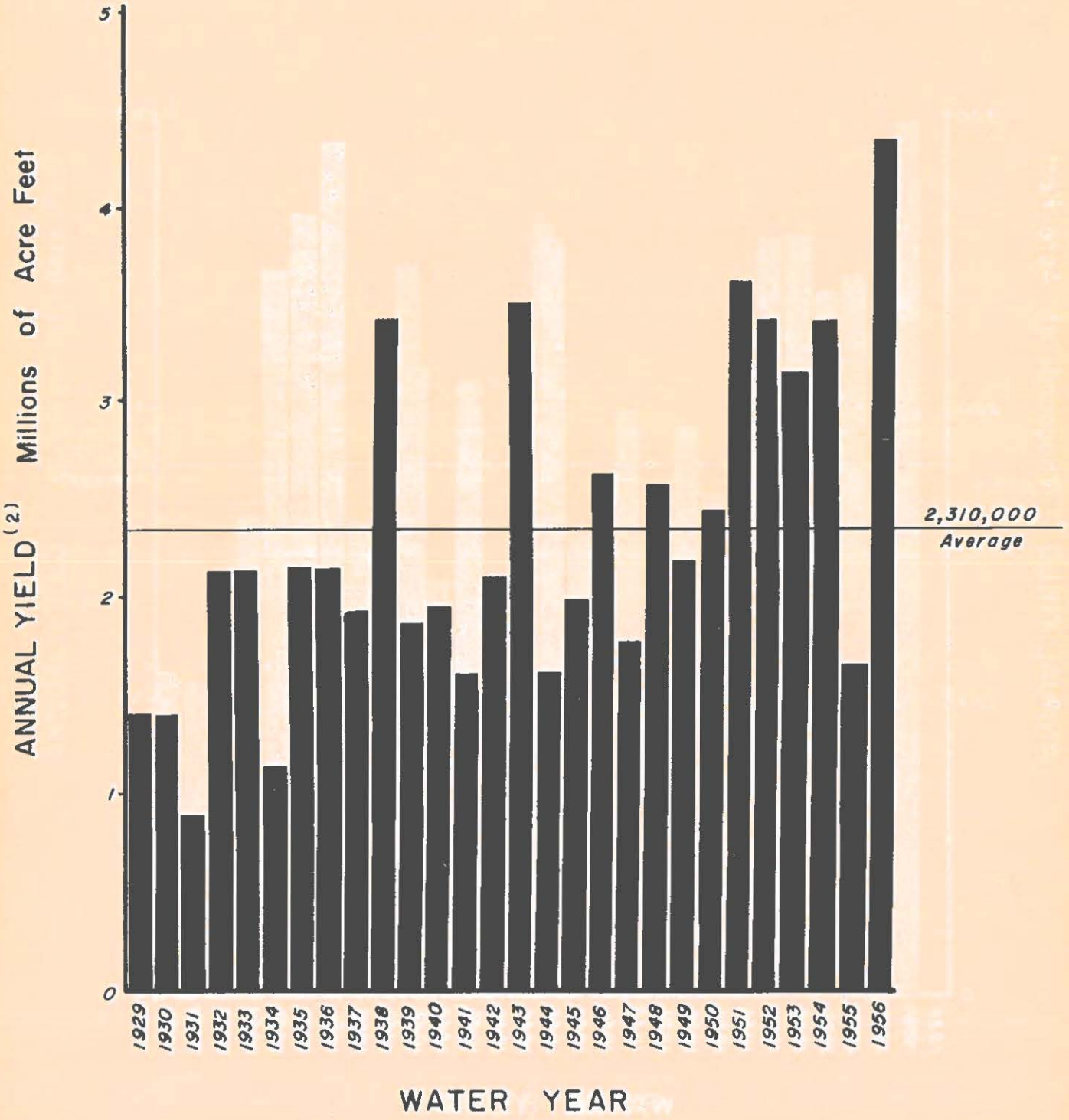
(3) Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.

Drawn: 6-13-58
File No. 15.220

FIGURE 142

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD(2)
OF
ROGUE RIVER ABOVE GRANTS PASS

Drainage Area 2420 Sq. Mi.



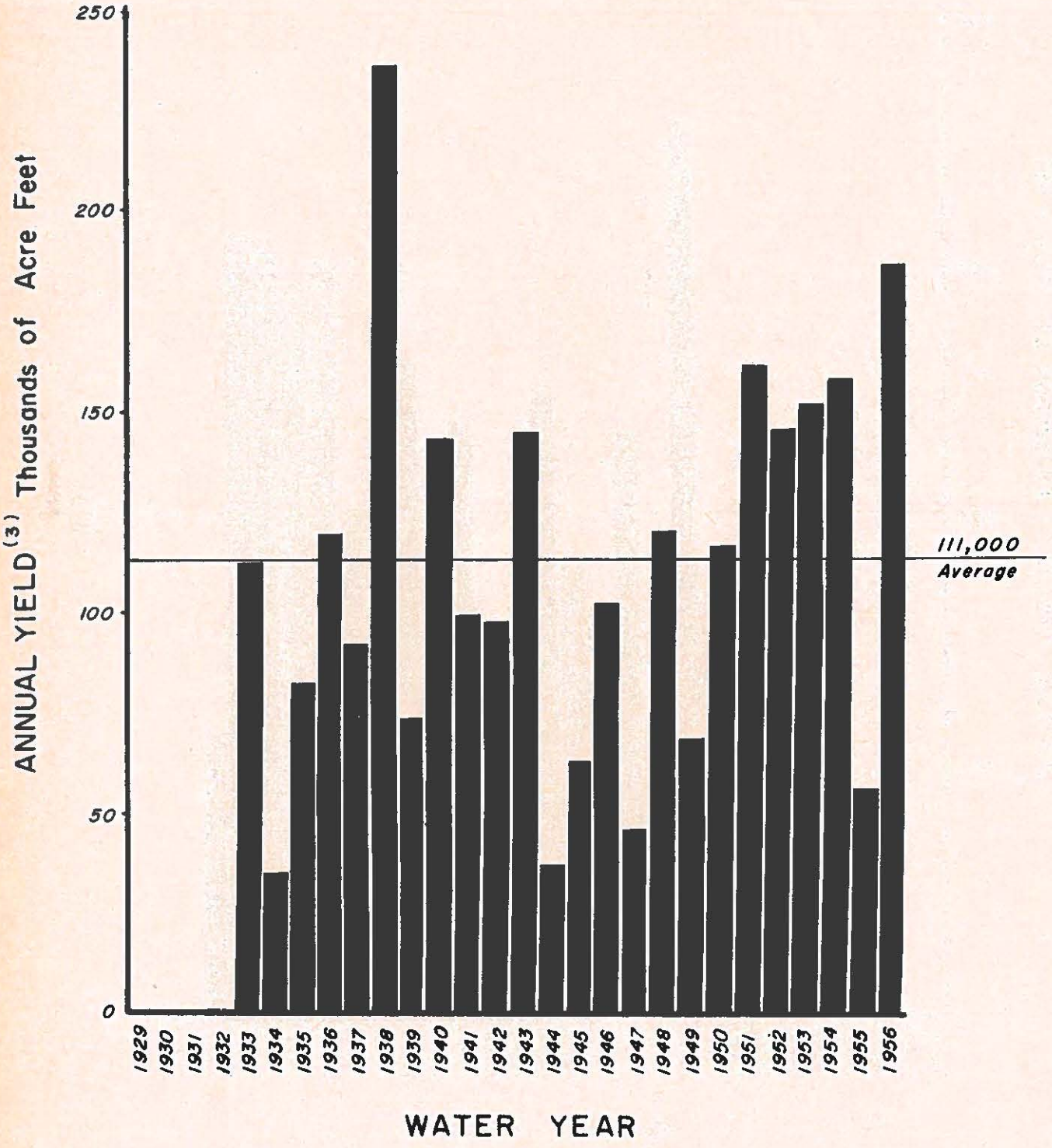
(2) Determined directly from USGS Water Supply Papers for years of record. Direct stream flow correlations used for remaining years.

Drawn: 6-13-58
File No. 15.220

FIGURE 143

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
JUMPOFF JOE CREEK

Drainage Area 110 Sq. Mi.



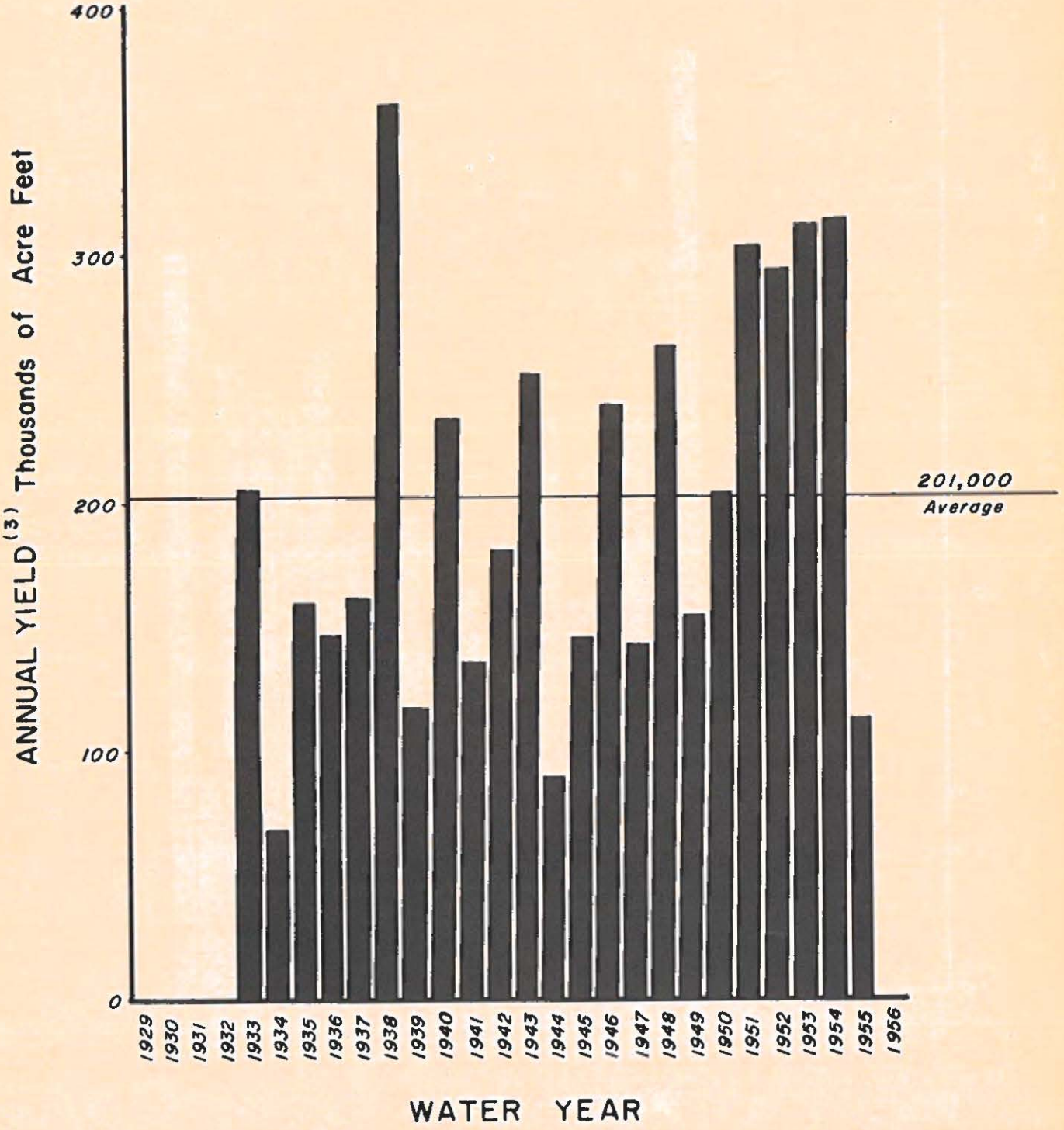
(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

Drawn: 6-13-58
File No. 15.220

FIGURE 144

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
GRAVE CREEK

Drainage Area 164 Sq. Mi.



(3) Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.

Drawn: 6-14-58
File No. 15.220

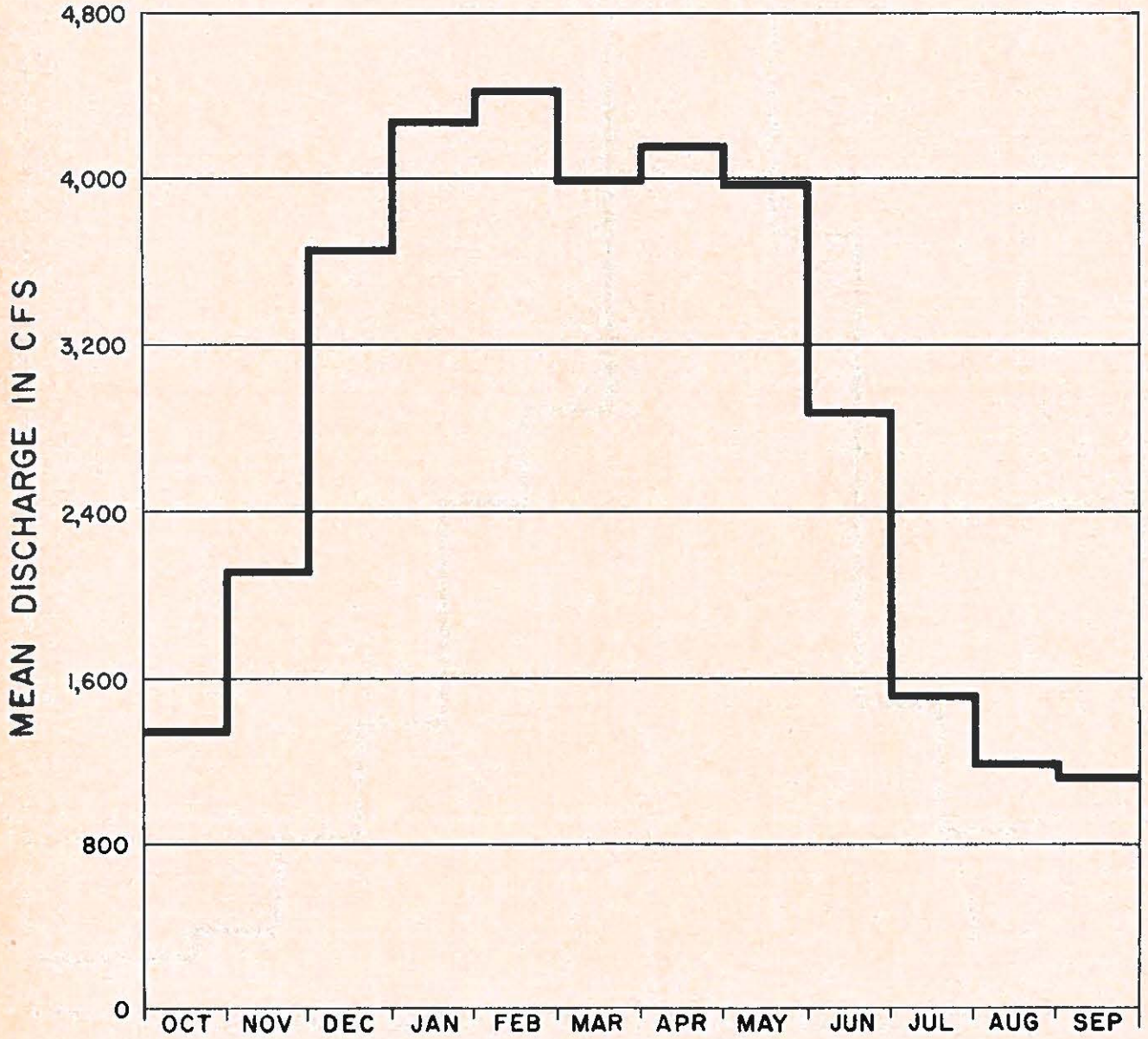
FIGURE 145

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER ABOVE RAYGOLD

1929 - 1956



Drawn Aug. 18, 1958
File No. 15.202

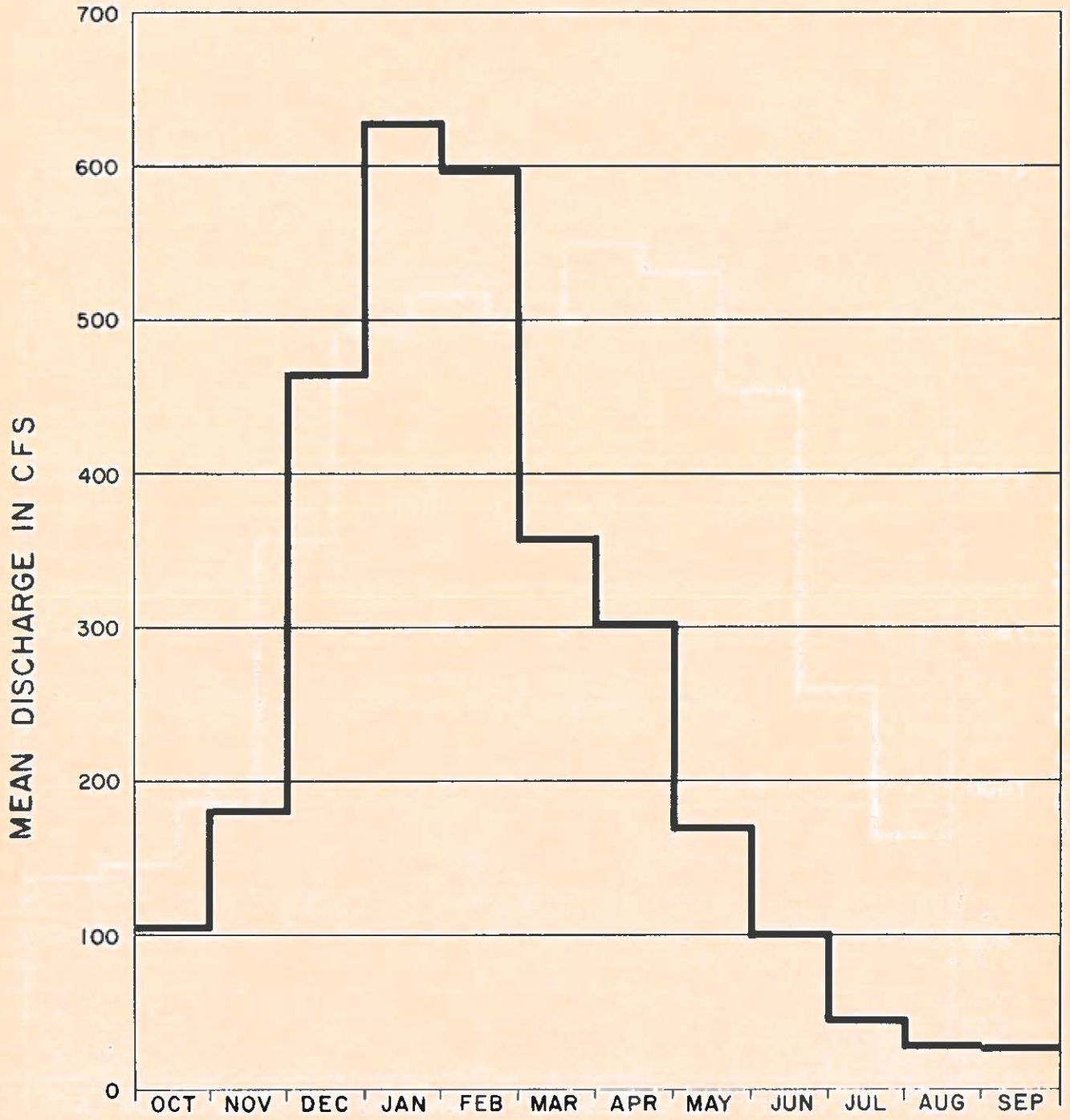
FIGURE 146

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

EVANS CREEK

1941-1953



Drawn Aug. 15, 1958
File No. 15.202

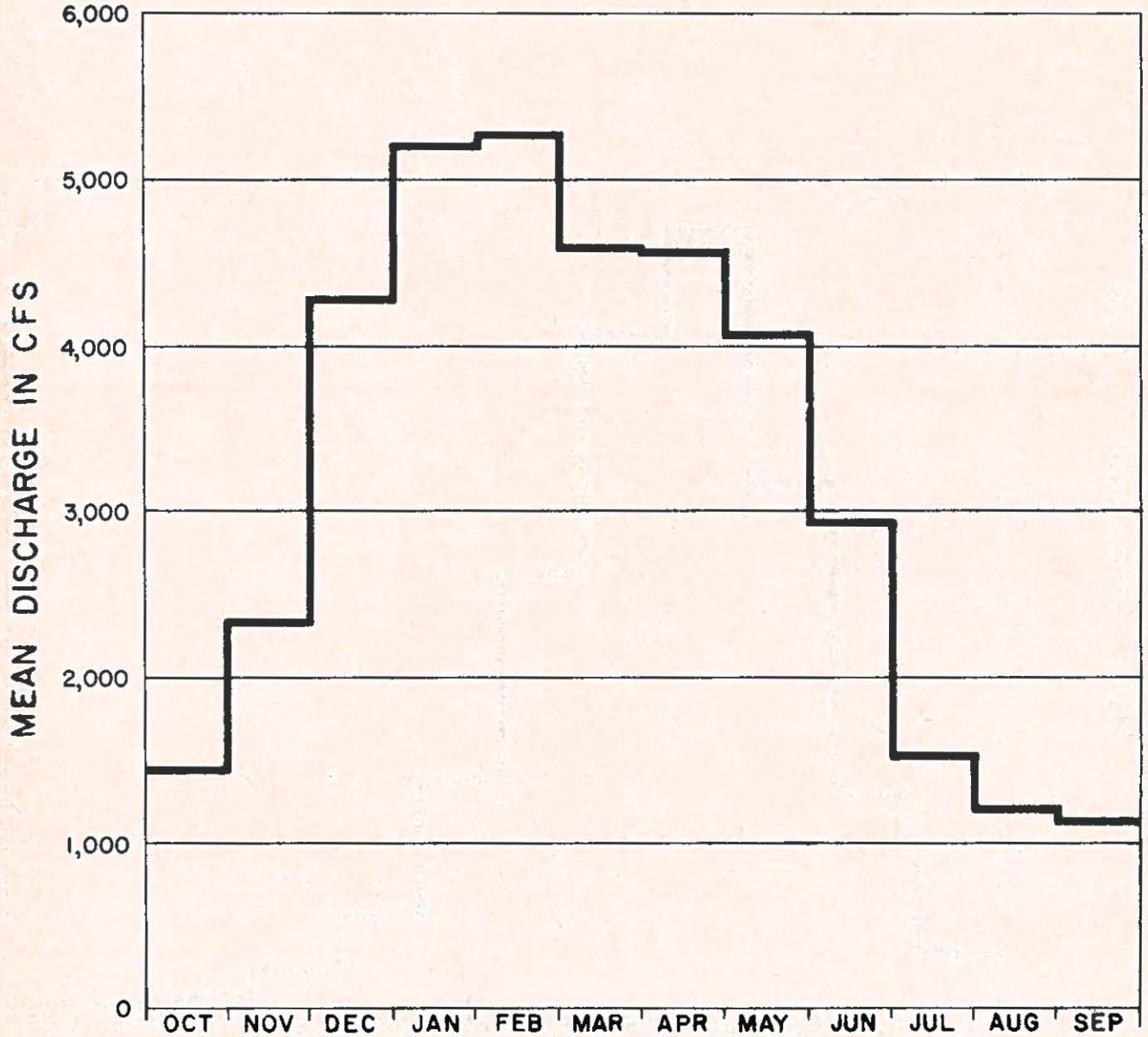
FIGURE 147

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER ABOVE GRANTS PASS

1929 - 1956



Drawn Aug. 18, 1958
File No. 15.202

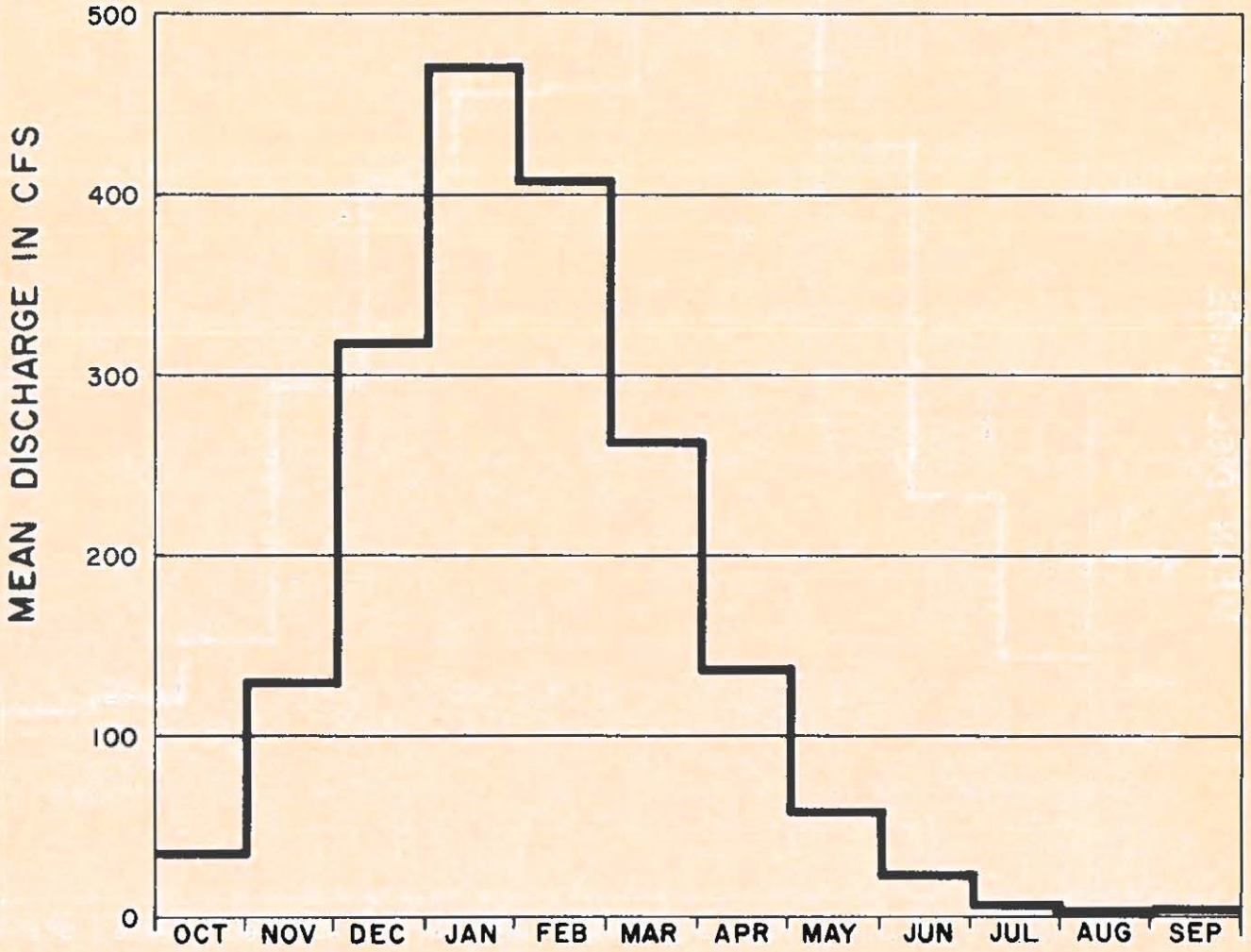
FIGURE 148

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

JUMPOFF JOE CREEK

1933 - 1956



Drawn Aug. 18, 1958
File No. 15.202

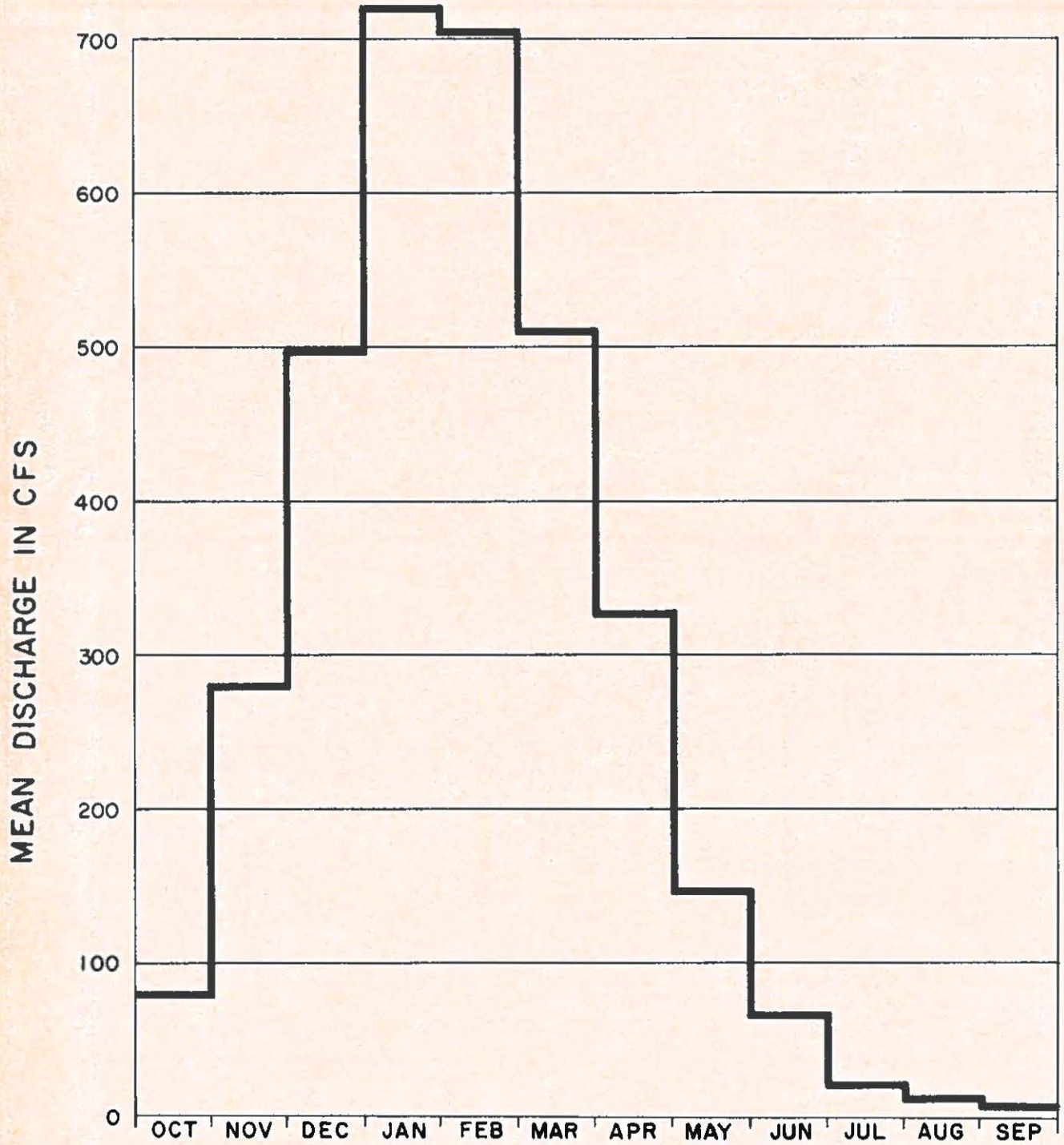
FIGURE 149

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

GRAVE CREEK

1933 - 1955



Drawn Aug. 15, 1958
File No. 15.202

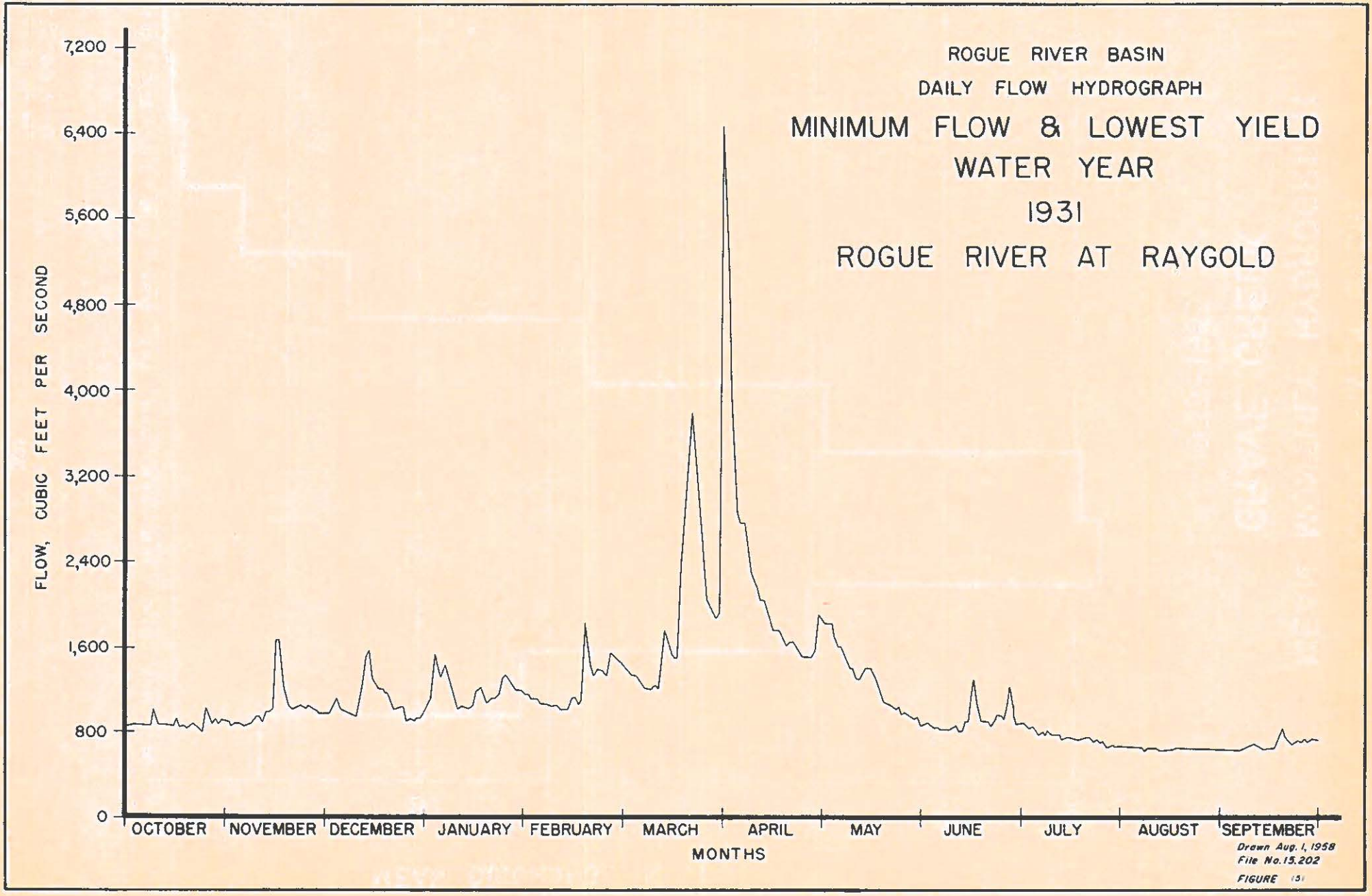
FIGURE 150

ROGUE RIVER BASIN

DAILY FLOW HYDROGRAPH

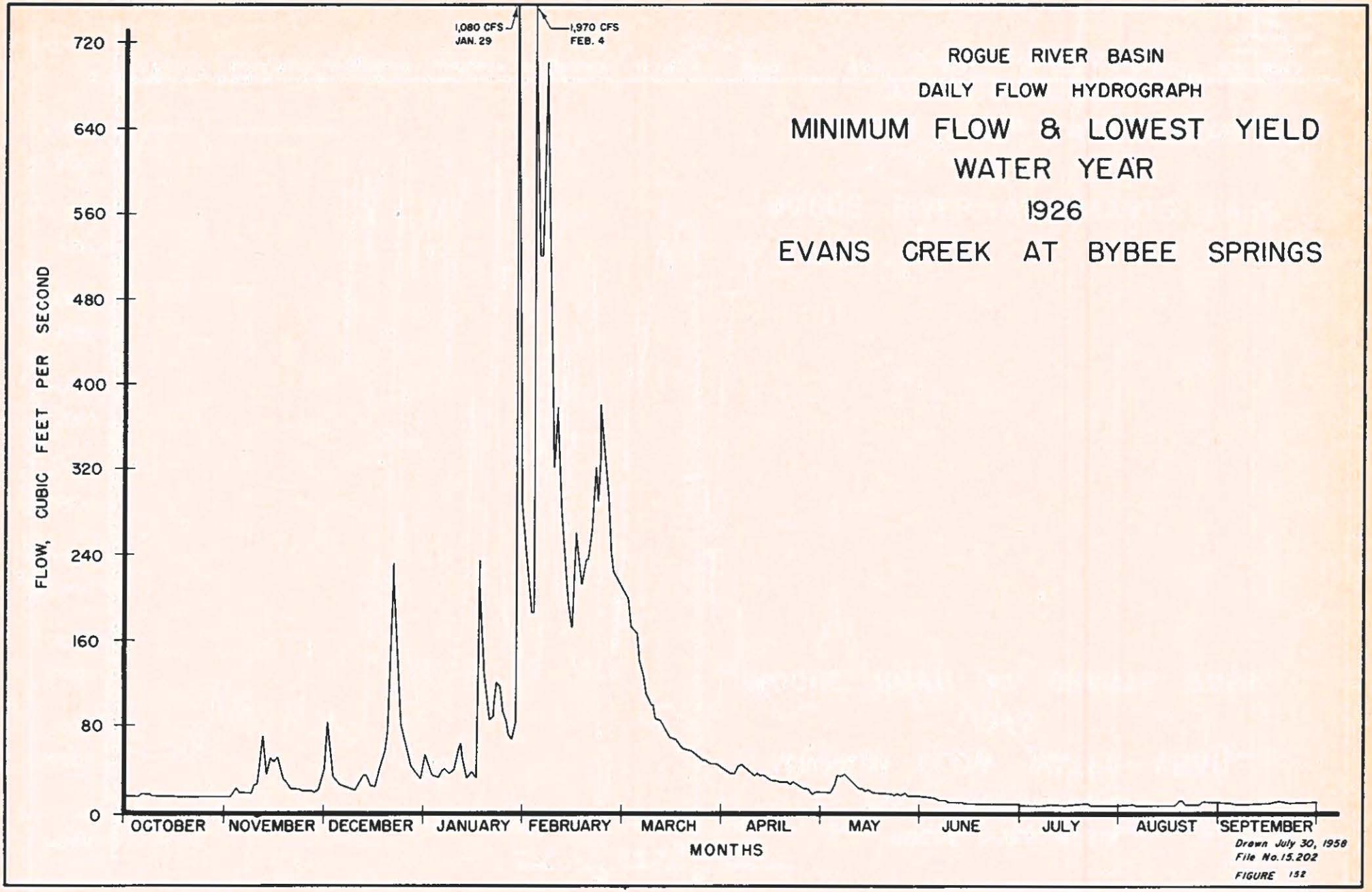
MINIMUM FLOW & LOWEST YIELD WATER YEAR 1931

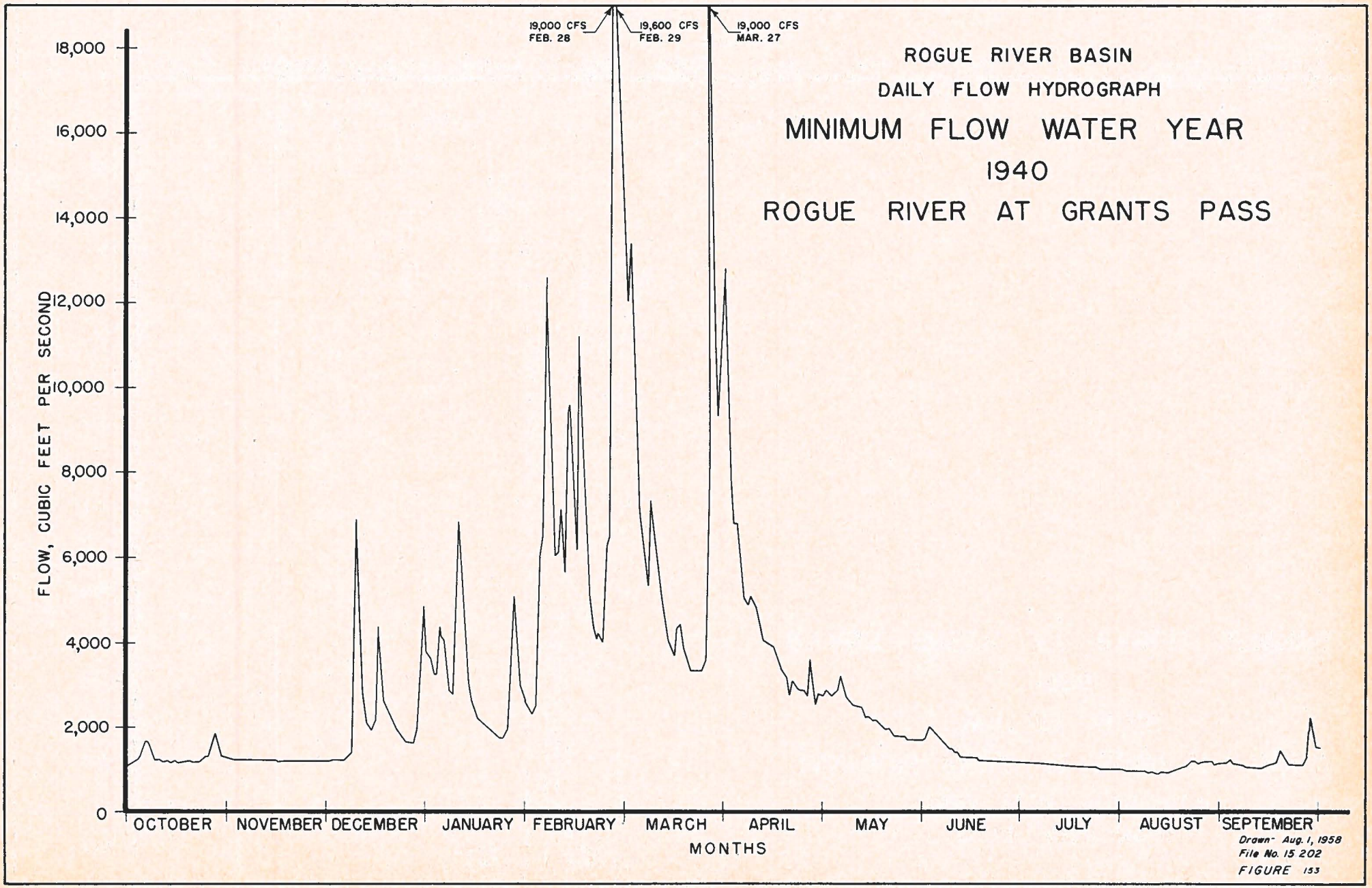
ROGUE RIVER AT RAYGOLD

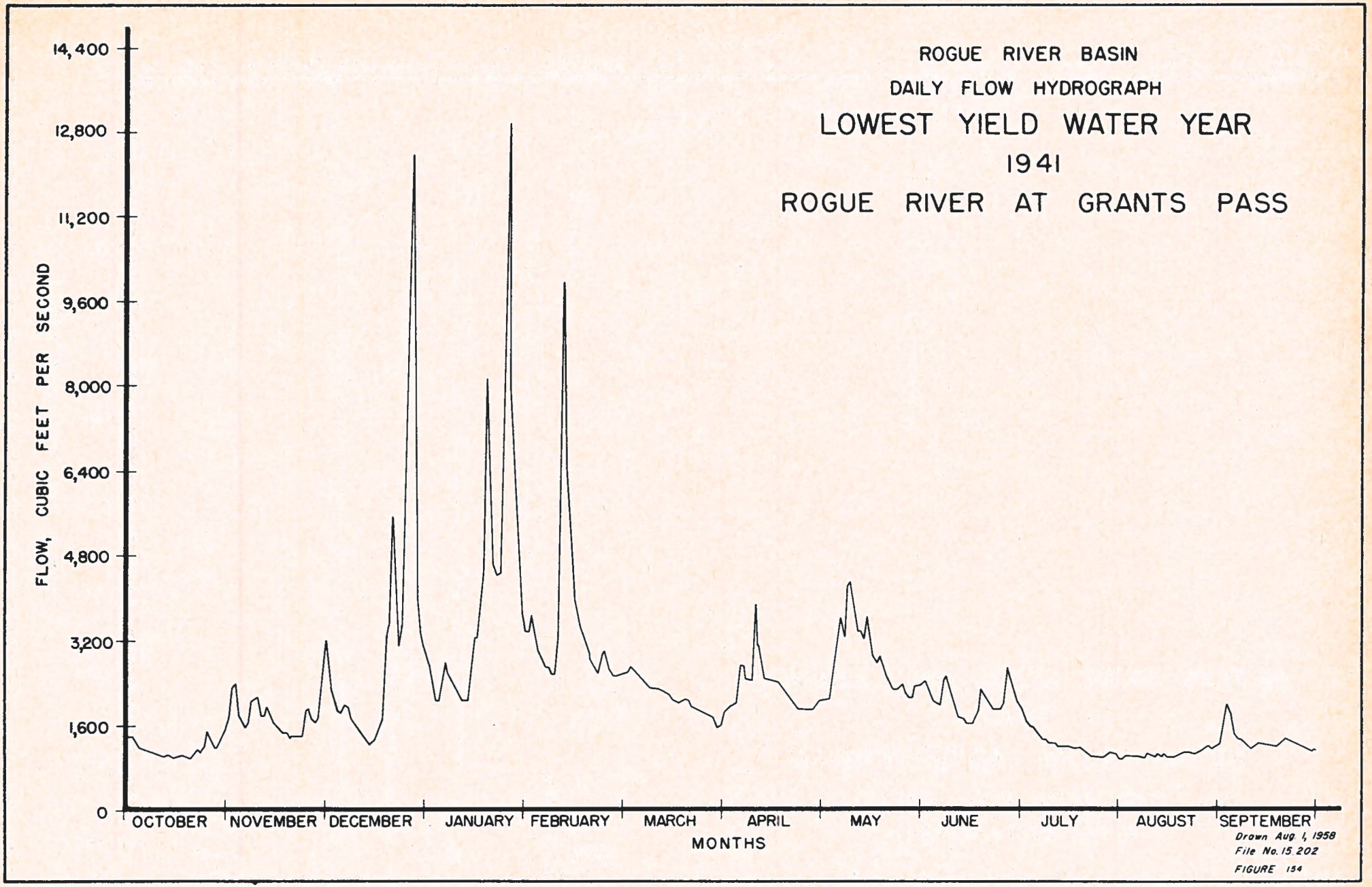


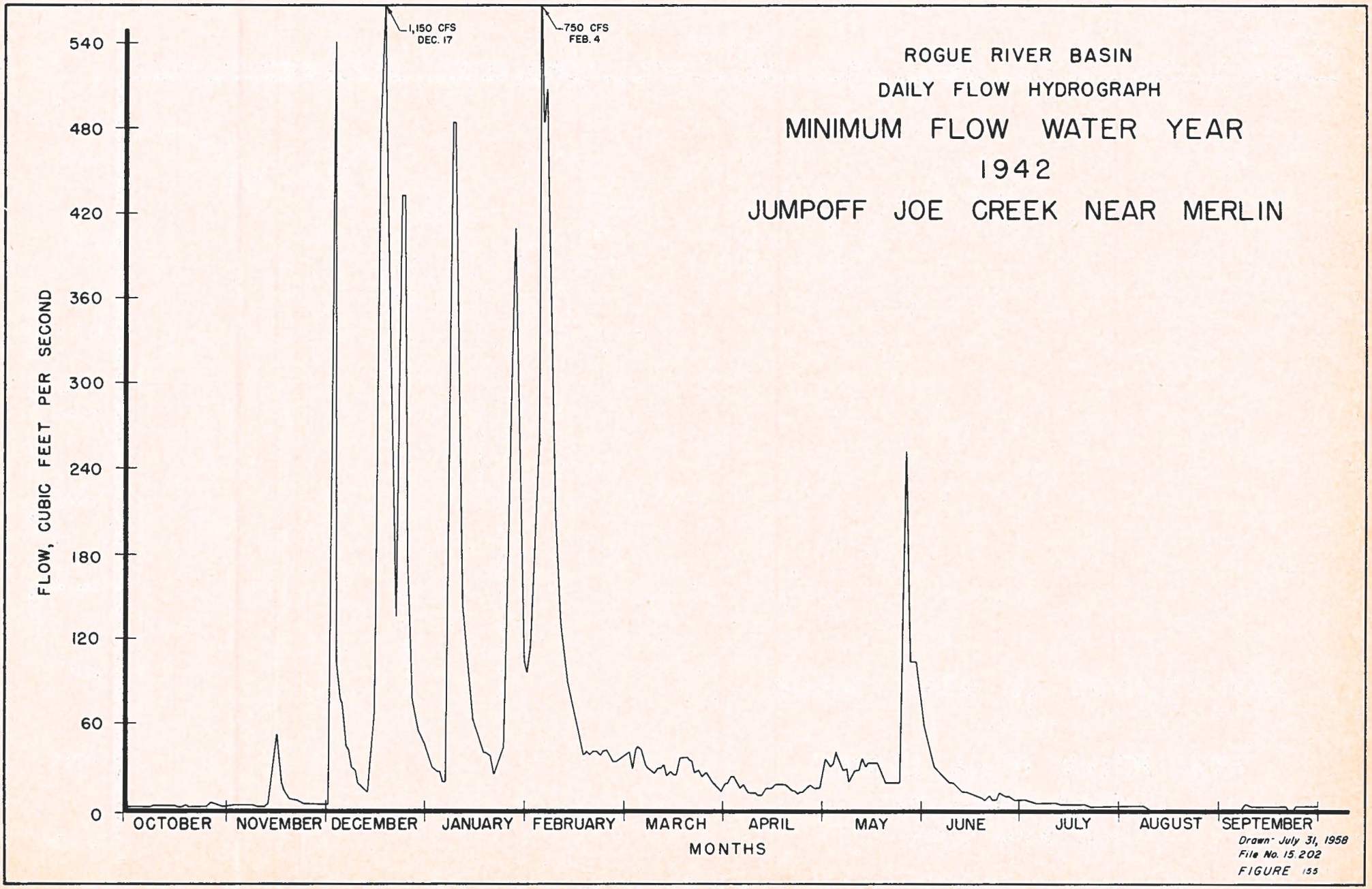
Drawn Aug. 1, 1958
File No. 15.202

FIGURE 151


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1926
EVANS CREEK AT BYBEE SPRINGS
1,080 CFS
JAN. 29
1,970 CFS
FEB. 4
FLOW, CUBIC FEET PER SECOND
720
640
560
480
400
320
240
160
80
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 30, 1958
File No. 15.202
FIGURE 152


19,000 CFS
FEB. 28
19,600 CFS
FEB. 29
19,000 CFS
MAR. 27
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1940
ROGUE RIVER AT GRANTS PASS
FLOW, CUBIC FEET PER SECOND
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn- Aug. 1, 1958
File No. 15 202
FIGURE 153


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1941
ROGUE RIVER AT GRANTS PASS
FLOW, CUBIC FEET PER SECOND
14,400
12,800
11,200
9,600
8,000
6,400
4,800
3,200
1,600
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 1, 1958
File No. 15.202
FIGURE 154


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1942
JUMPOFF JOE CREEK NEAR MERLIN
1,150 CFS
DEC. 17
750 CFS
FEB. 4
FLOW, CUBIC FEET PER SECOND
540
480
420
360
300
240
180
120
60
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 31, 1958
File No. 15.202
FIGURE 155

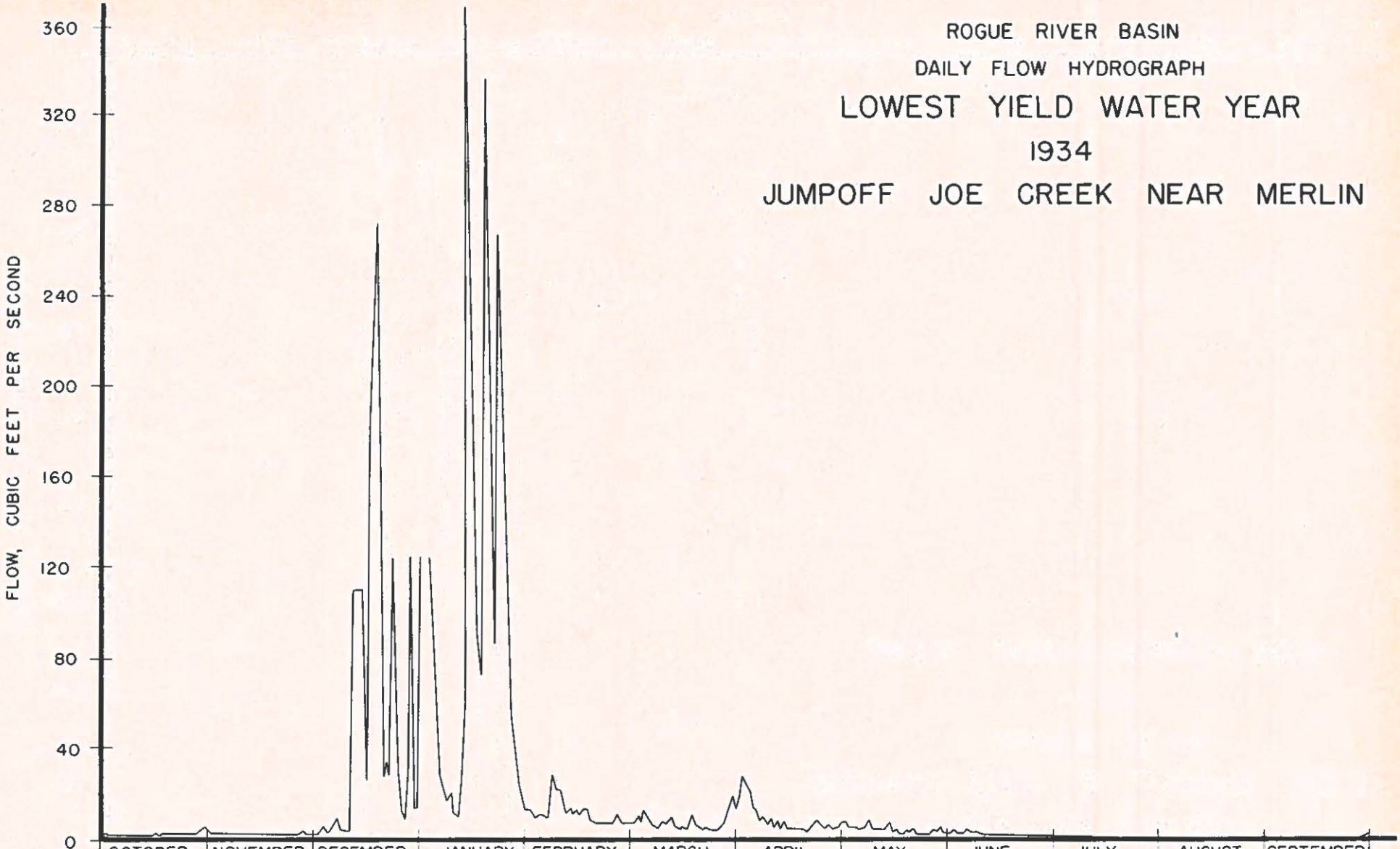
ROGUE RIVER BASIN

DAILY FLOW HYDROGRAPH

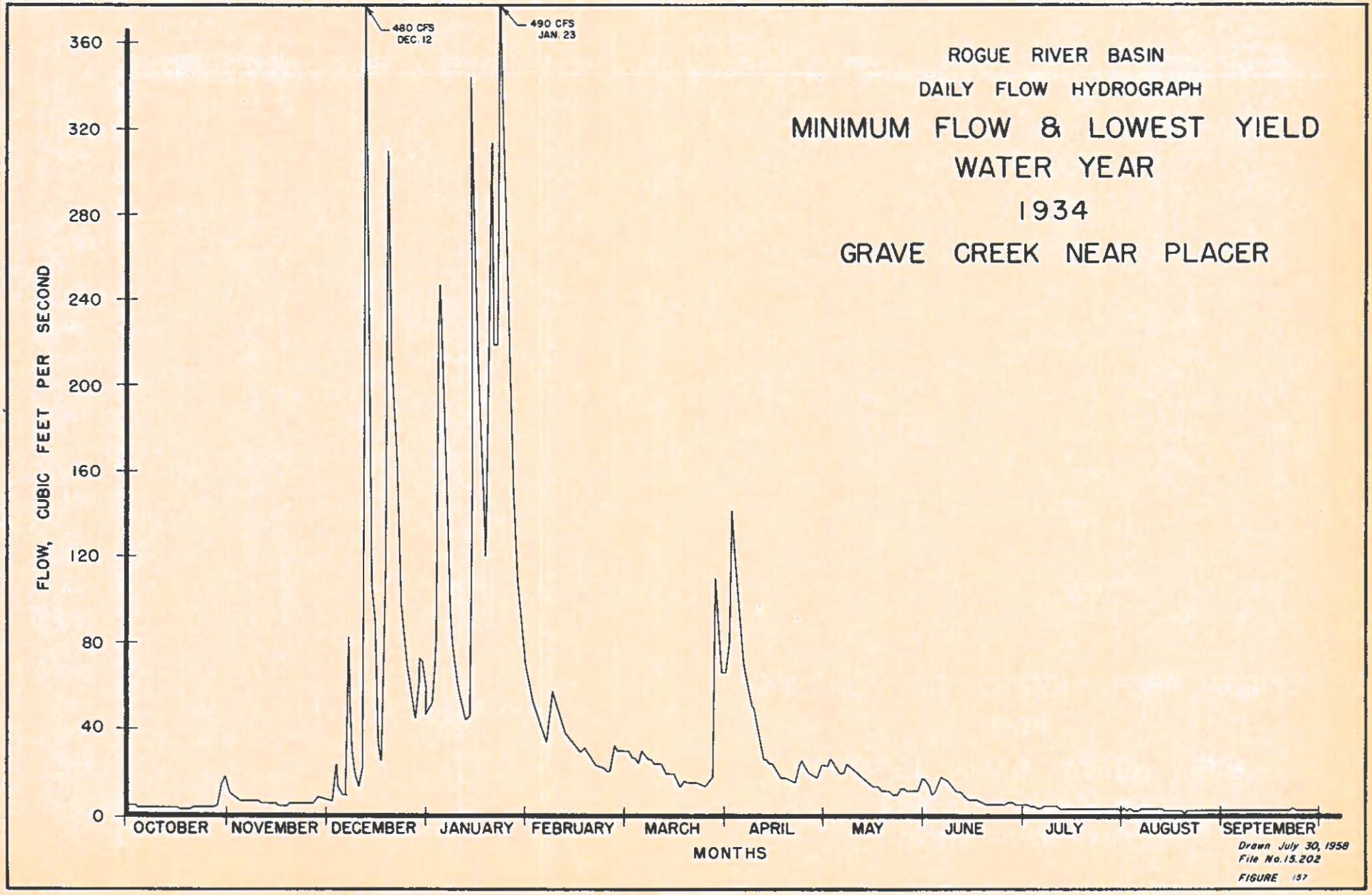
LOWEST YIELD WATER YEAR

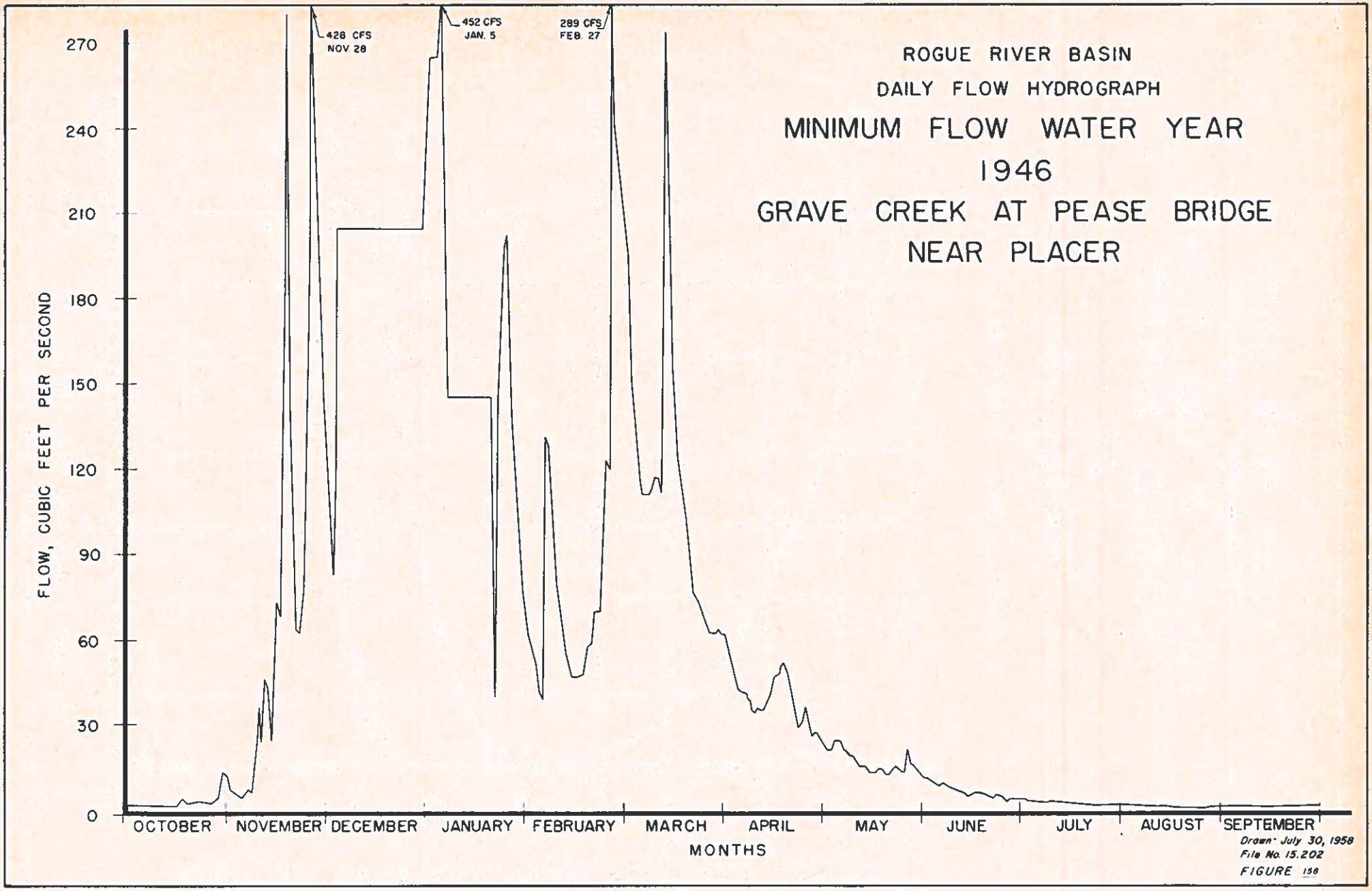
1934

JUMPOFF JOE CREEK NEAR MERLIN



Drawn July 31, 1958
File No 15 202
FIGURE 156


480 CFS
DEC. 12
490 CFS
JAN. 23
ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1934
GRAVE CREEK NEAR PLACER
FLOW, CUBIC FEET PER SECOND
360
320
280
240
200
160
120
80
40
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 30, 1958
File No. 15.202
FIGURE 157


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1946
GRAVE CREEK AT PEASE BRIDGE
NEAR PLACER
428 CFS
NOV. 28
452 CFS
JAN. 5
289 CFS
FEB. 27
FLOW, CUBIC FEET PER SECOND
270
240
210
180
150
120
90
60
30
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn: July 30, 1958
File No. 15.202
FIGURE 158

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
ROGUE RIVER AT RAYGOLD

(DRAINAGE AREA = 2,020 SQ. MILES)

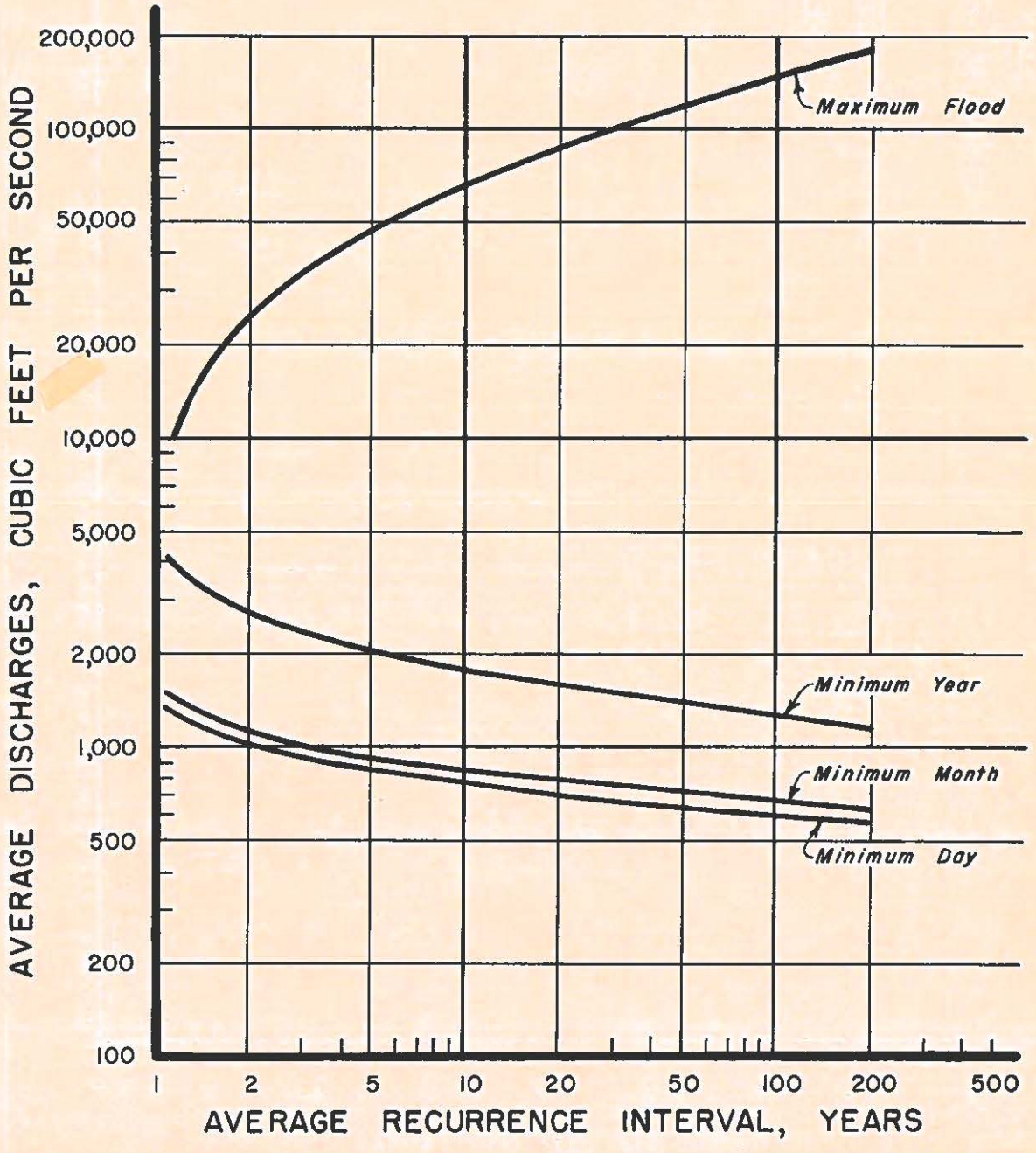


FIGURE 159

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
ROGUE RIVER AT GRANTS PASS

(DRAINAGE AREA = 2,420 SQ. MILES)

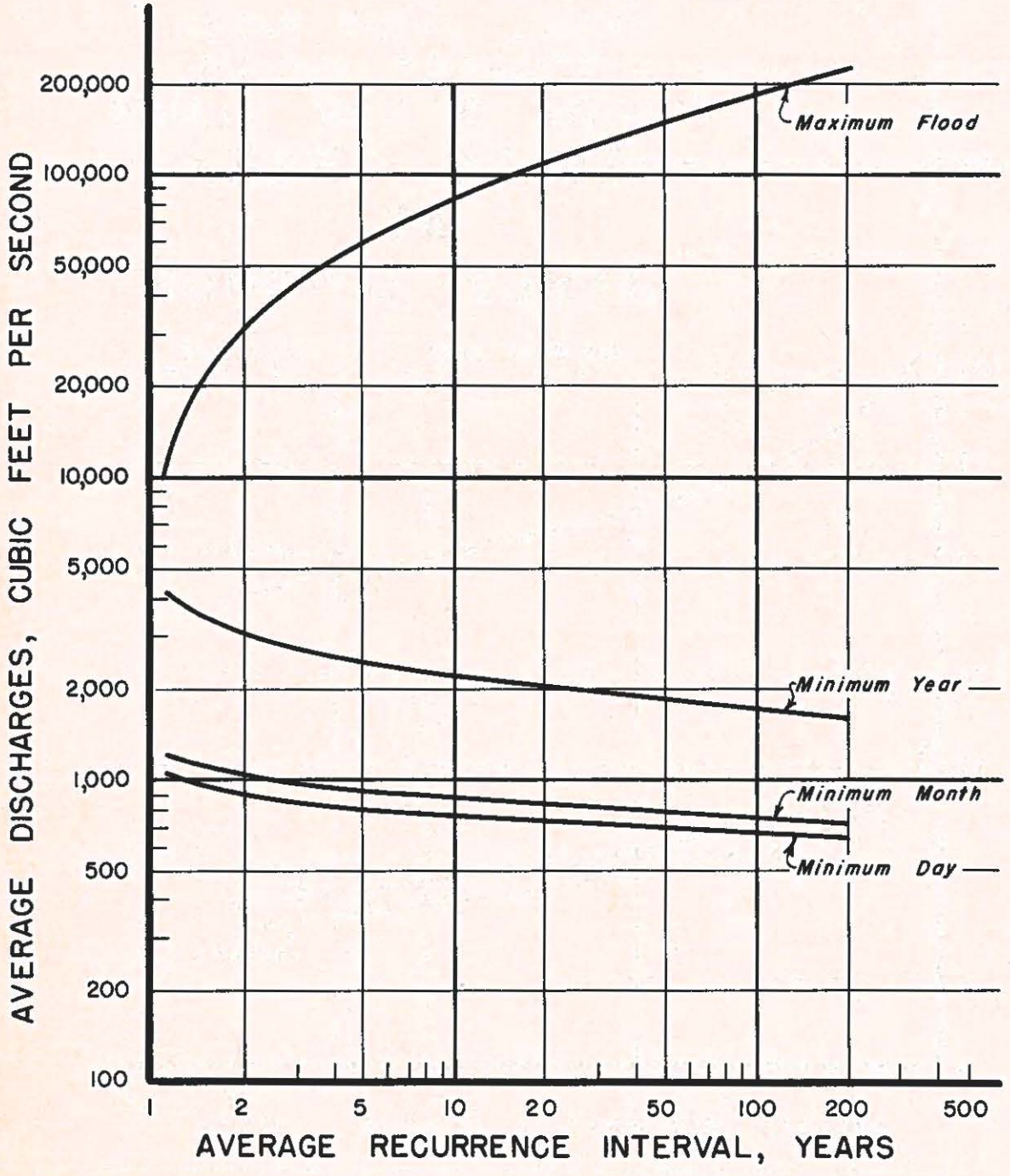


FIGURE 160

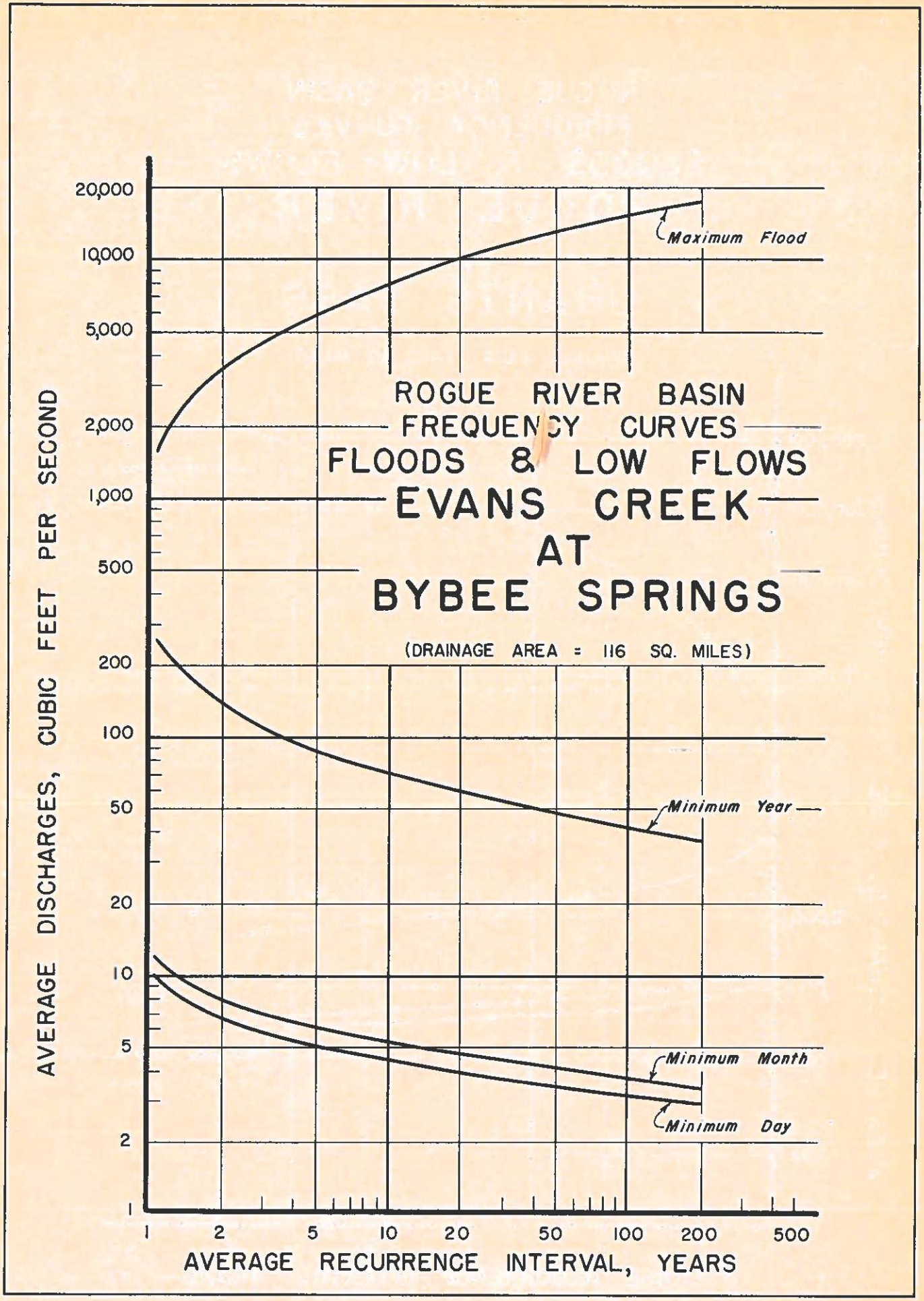

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS
EVANS CREEK
AT
BYBEE SPRINGS
(DRAINAGE AREA = 116 SQ. MILES)
Maximum Flood
Minimum Year
Minimum Month
Minimum Day
AVERAGE DISCHARGES, CUBIC FEET PER SECOND
20,000
10,000
5,000
2,000
1,000
500
200
100
50
20
10
5
2
1
1
2
5
10
20
50
100
200
500
AVERAGE RECURRENCE INTERVAL, YEARS

FIGURE 161

ROGUE RIVER BASIN

DEPLETION DIAGRAM

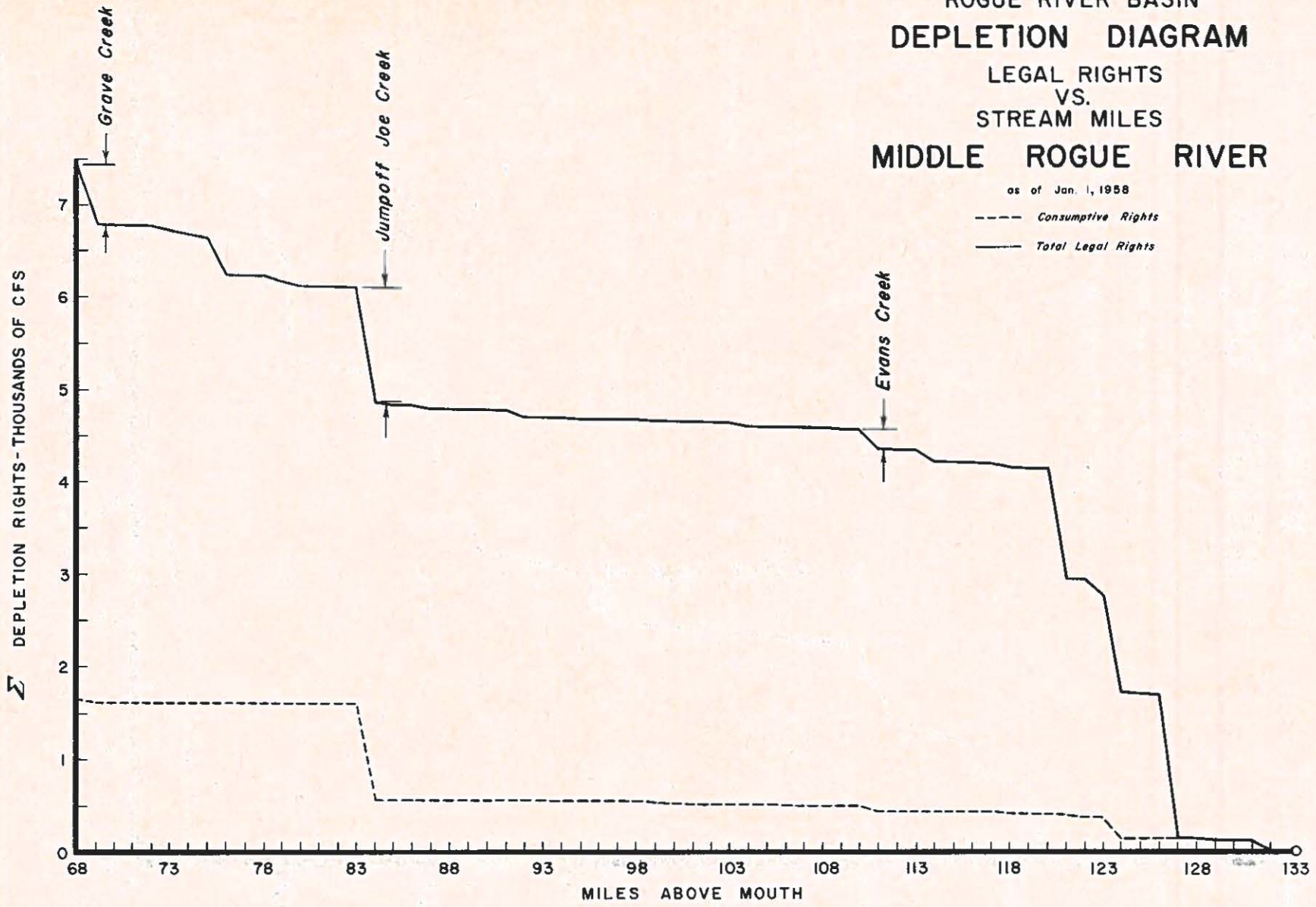
LEGAL RIGHTS
VS.
STREAM MILES

MIDDLE ROGUE RIVER

as of Jan. 1, 1958

---- Consumptive Rights

—— Total Legal Rights



Drawn: Nov. 4, 1958
File No. 15.302
FIGURE 162

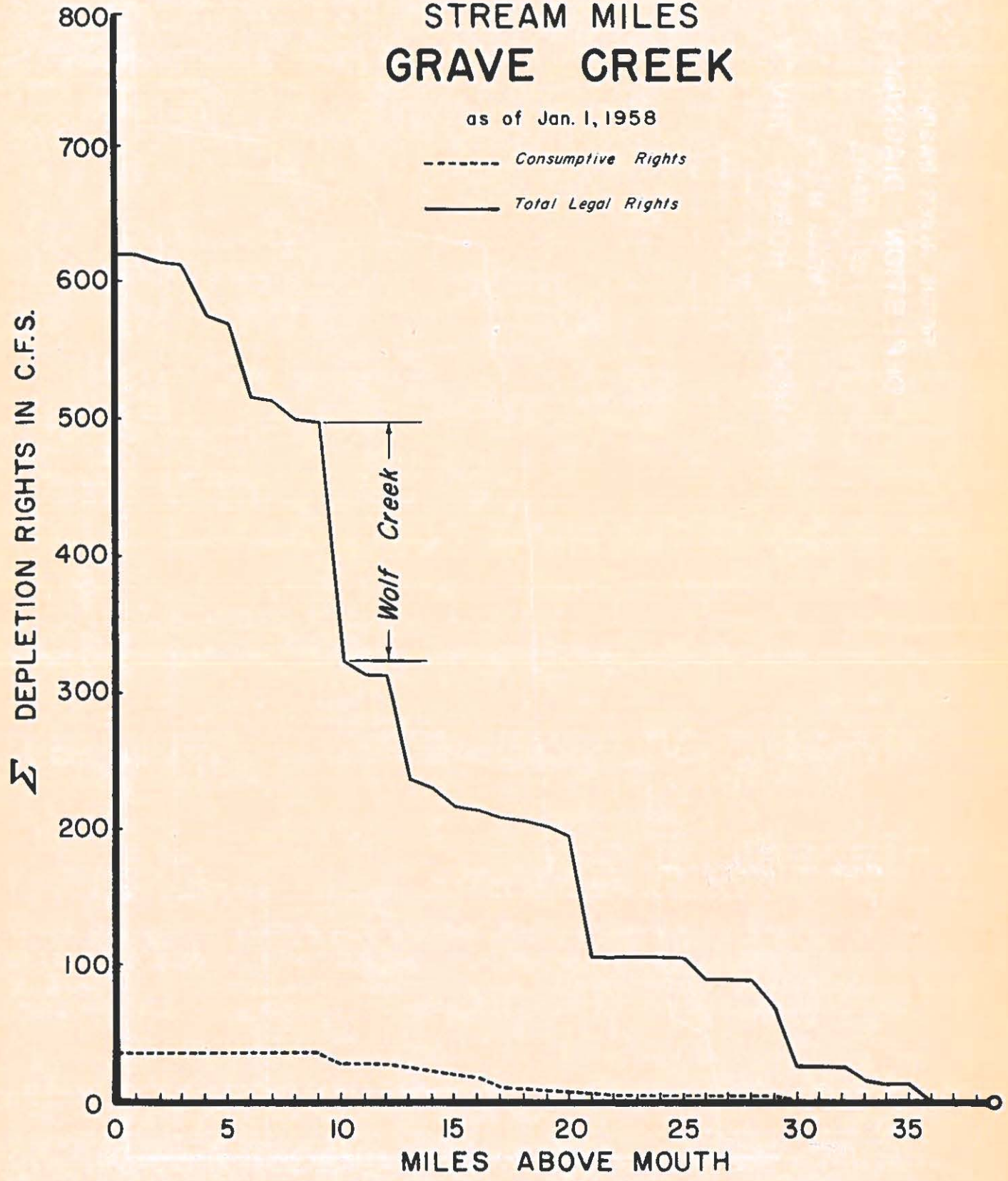
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

GRAVE CREEK

as of Jan. 1, 1958



Drawn - Oct. 31, 1958
File No. 15.302

FIGURE 163

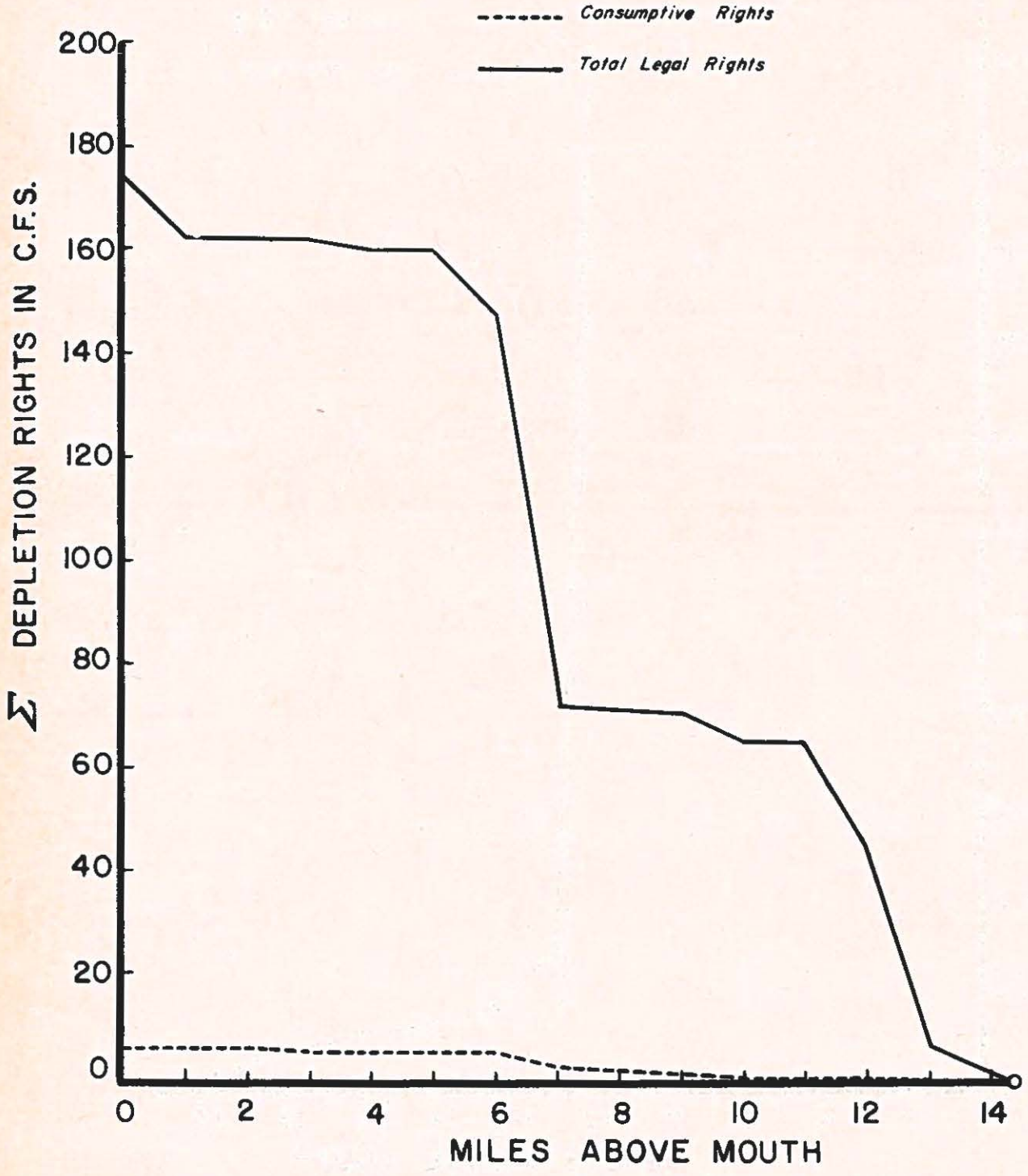
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

WOLF CREEK

as of Jan. 1, 1958



Drawn-Oct. 27, 1958
File No. 15.302
FIGURE 164

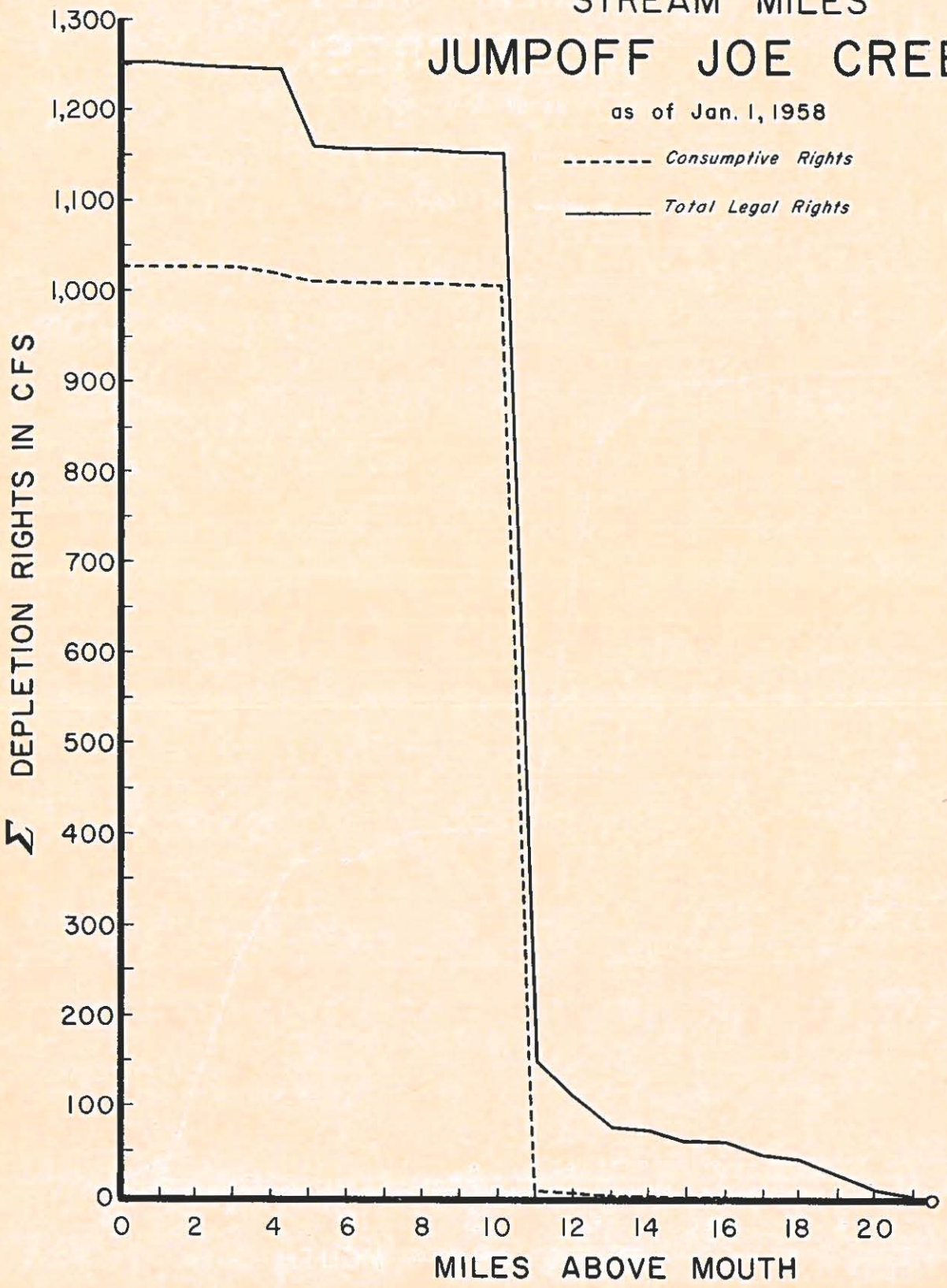
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

JUMPOFF JOE CREEK

as of Jan. 1, 1958



Drawn: Oct. 31, 1958
File No. 15.302
FIGURE 165

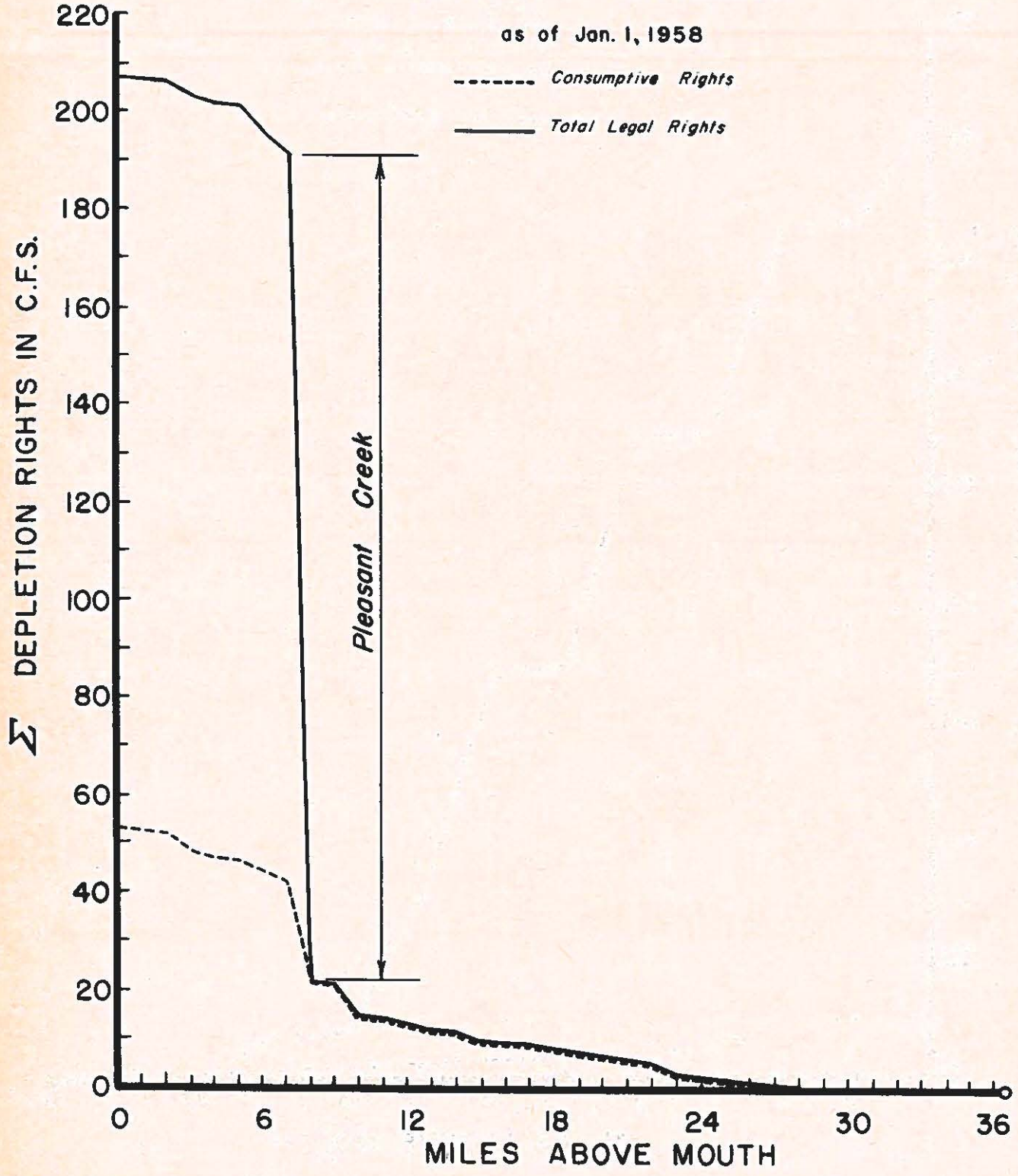
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

EVANS CREEK

as of Jan. 1, 1958



Drawn Oct. 31, 1958
File No 15.302

FIGURE 166

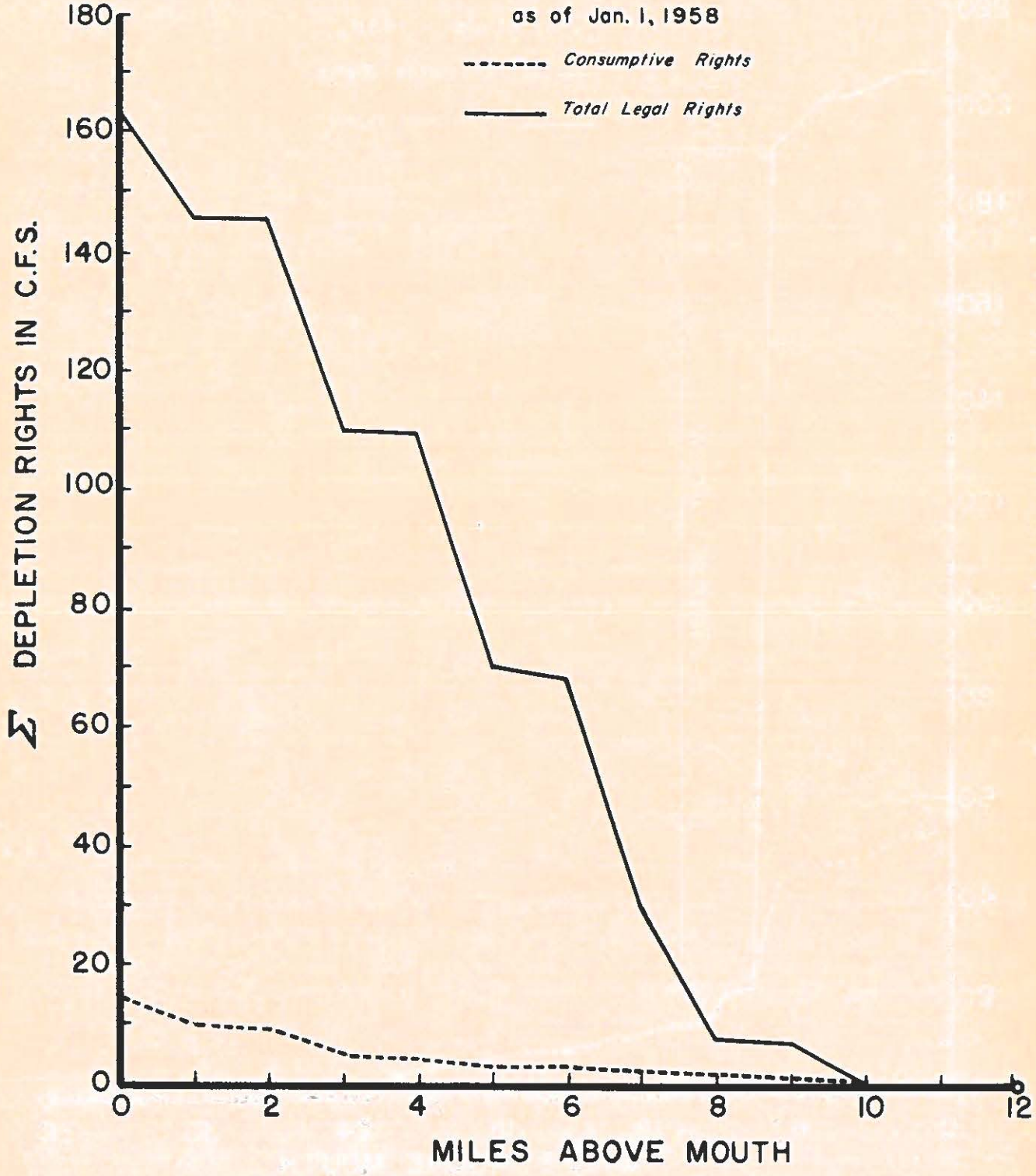
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

PLEASANT CREEK

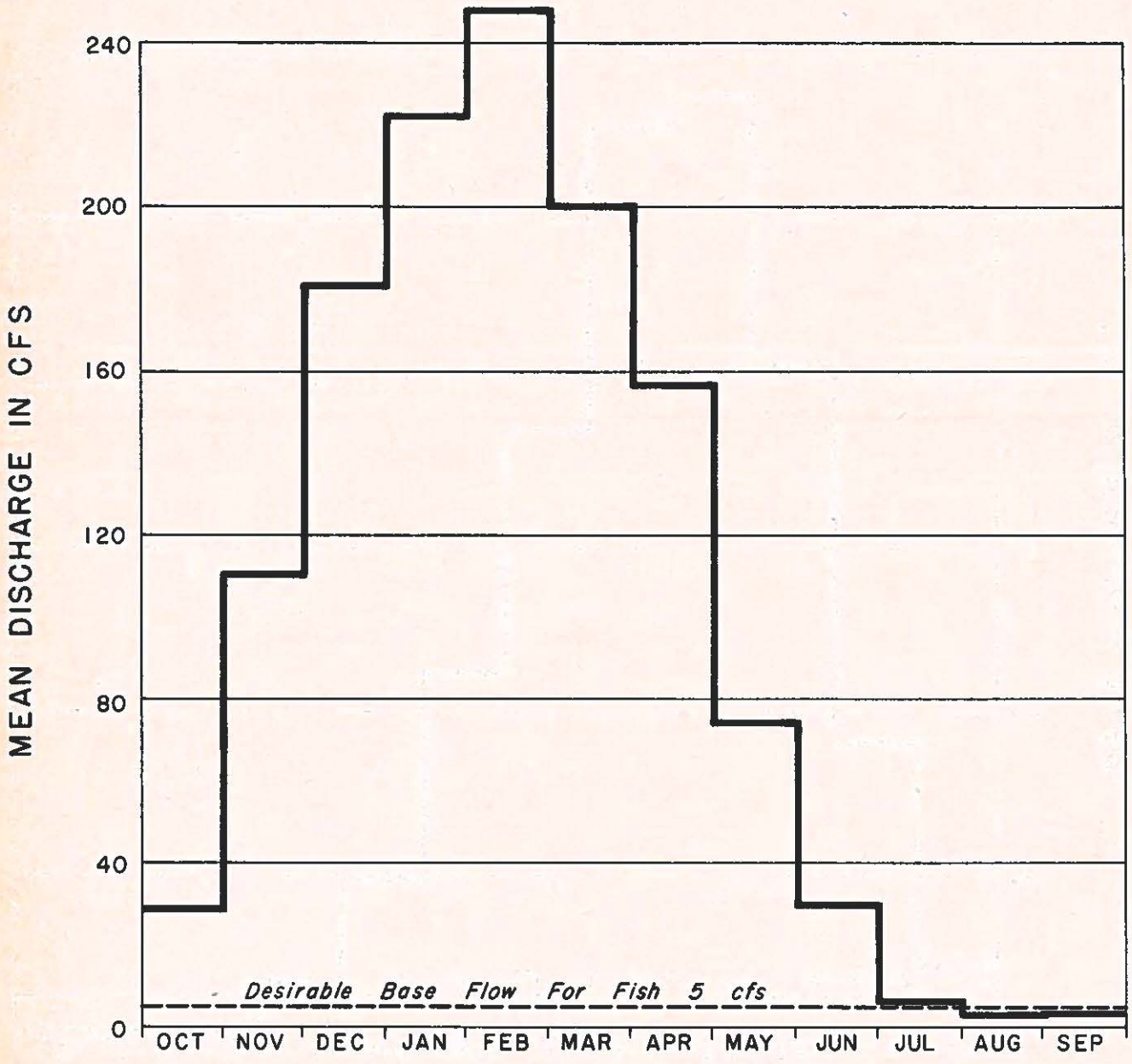
as of Jan. 1, 1958



Drawn June 4, 1958
File No 15.302

FIGURE 167

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
GRAVE CREEK - MILE 20.1
1932-1955



Drawn Sept. 4, 1958
File No. 15.202
FIGURE 168

ROGUE RIVER BASIN

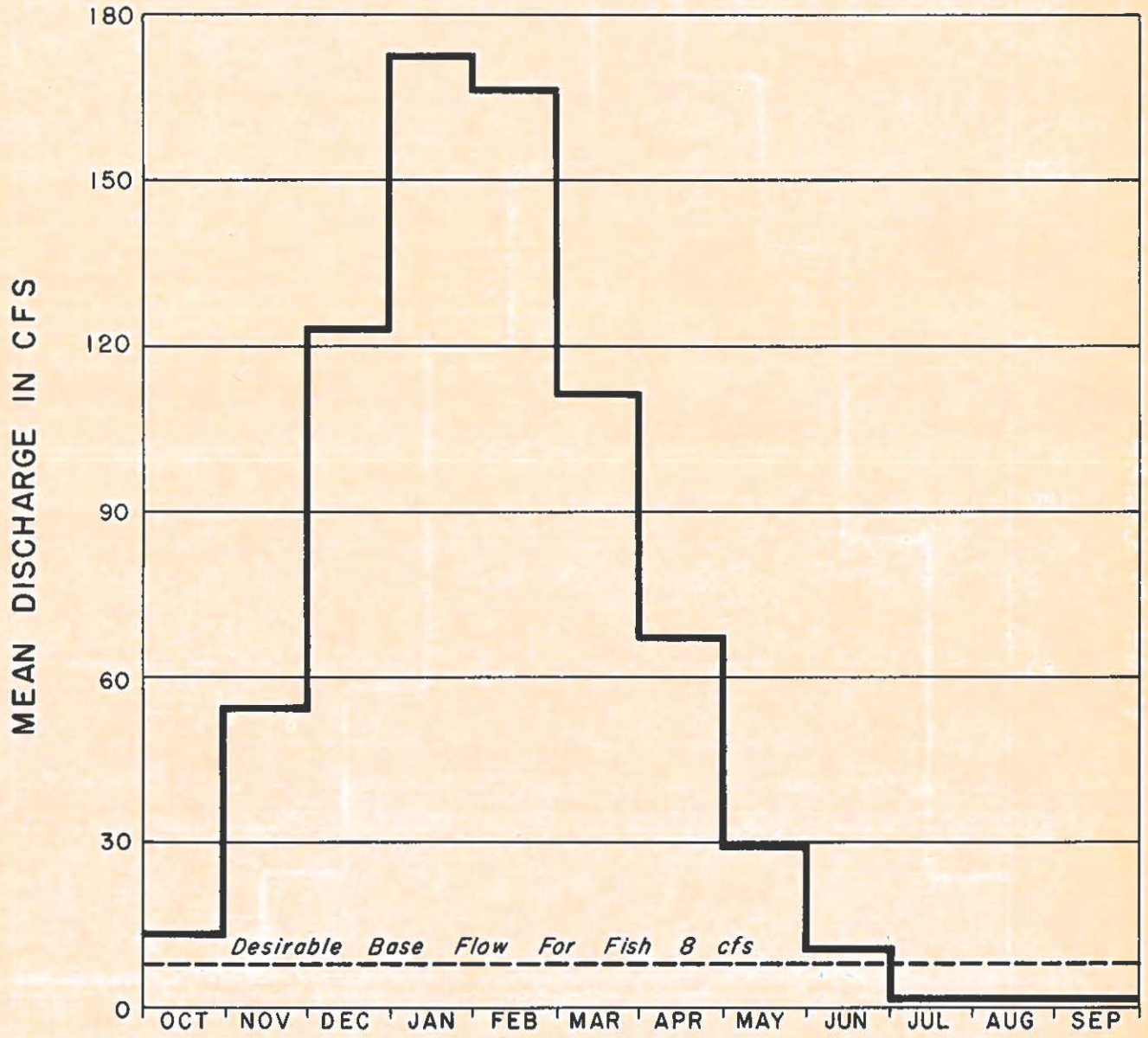
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

JUMPOFF JOE CREEK - MILE 7.3

1932-1955



Drawn Sept. 3, 1958
File No 15.202

FIGURE 169

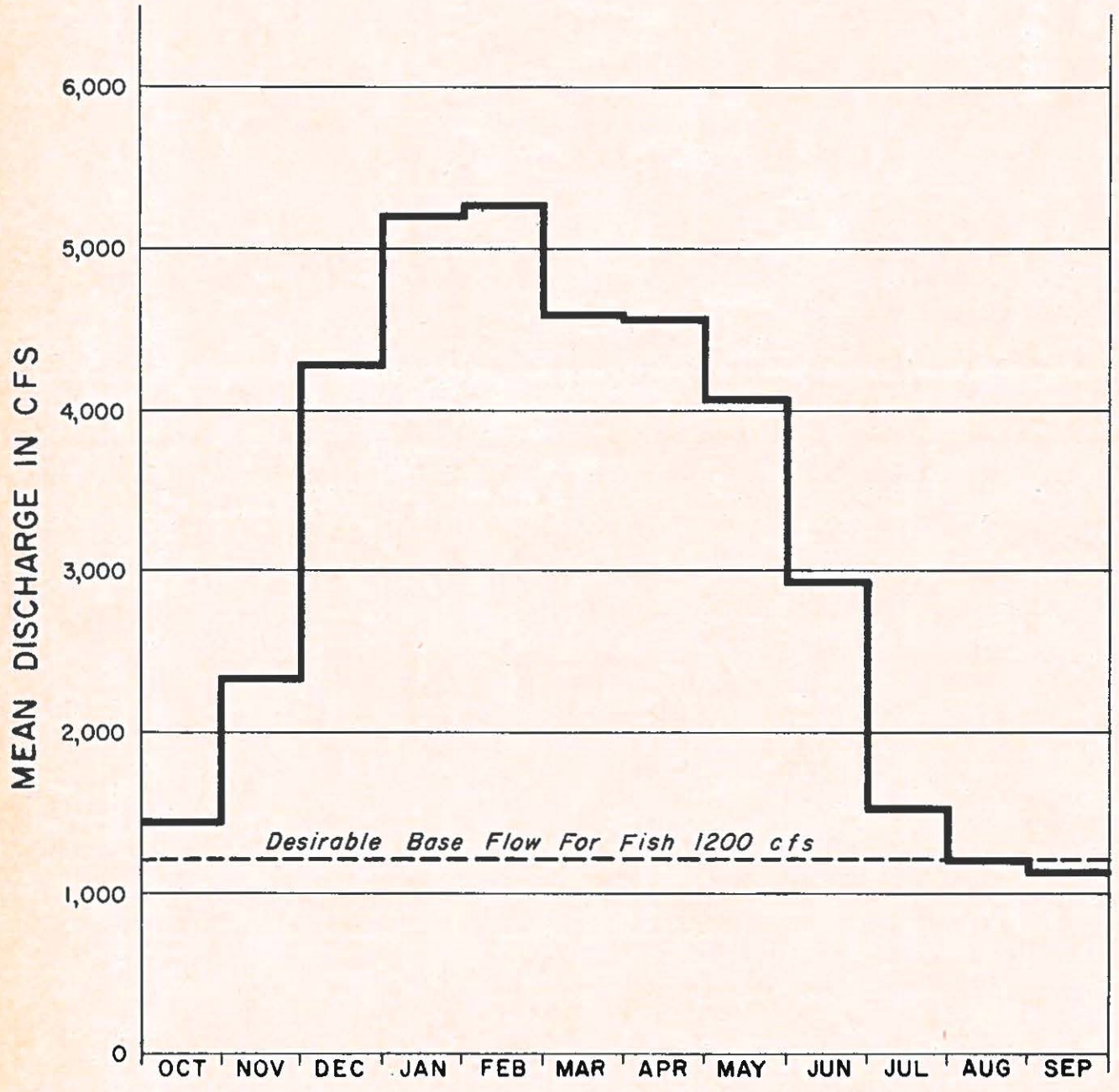
ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER ABOVE GRANTS PASS

1929 - 1956

WITH FISH WATER REQUIREMENTS



Drawn Aug. 18, 1958
File No. 15.202

FIGURE 170

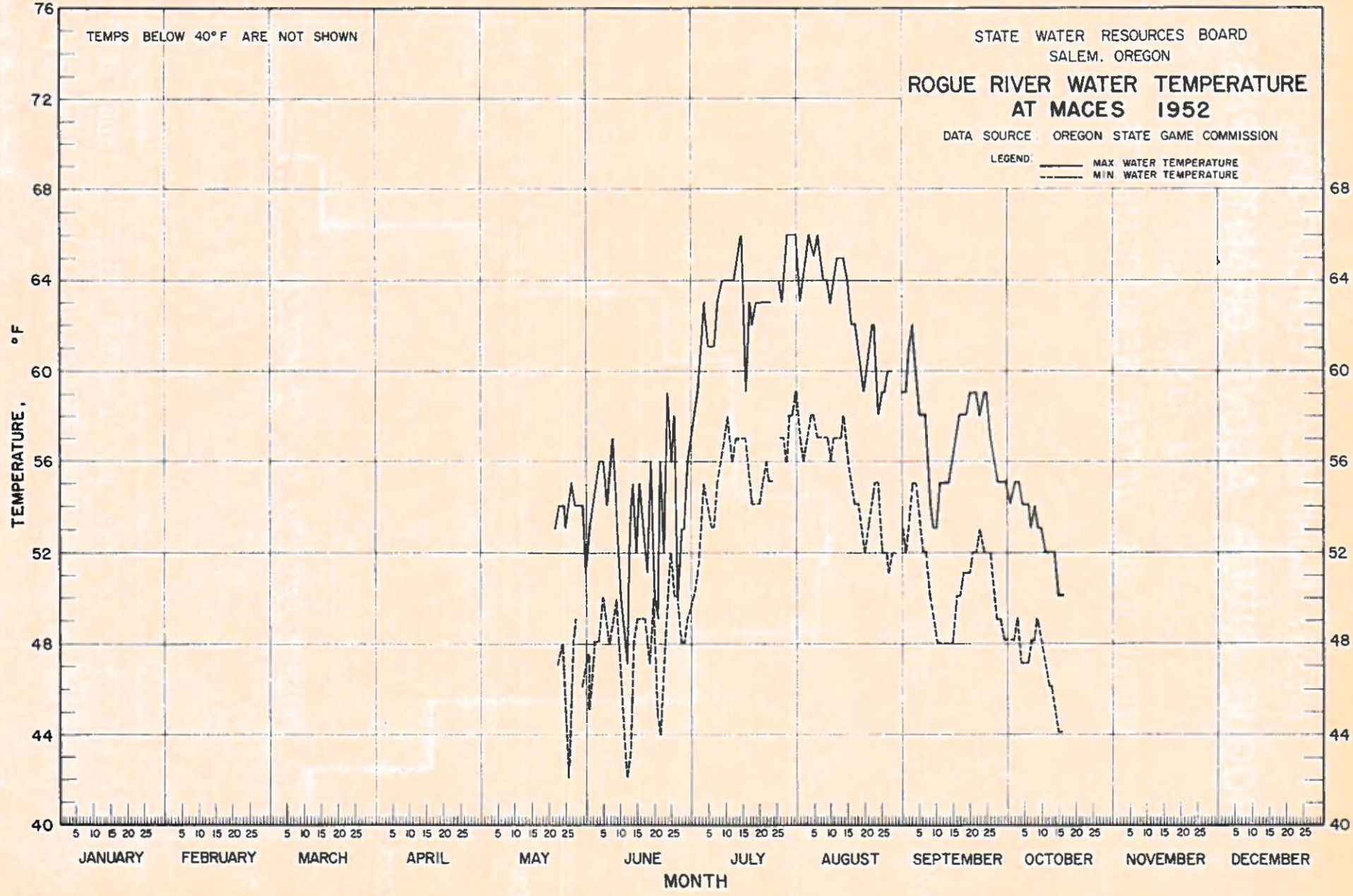

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AT MACES 1952
DATA SOURCE OREGON STATE GAME COMMISSION
LEGEND
MAX WATER TEMPERATURE
MIN WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 171

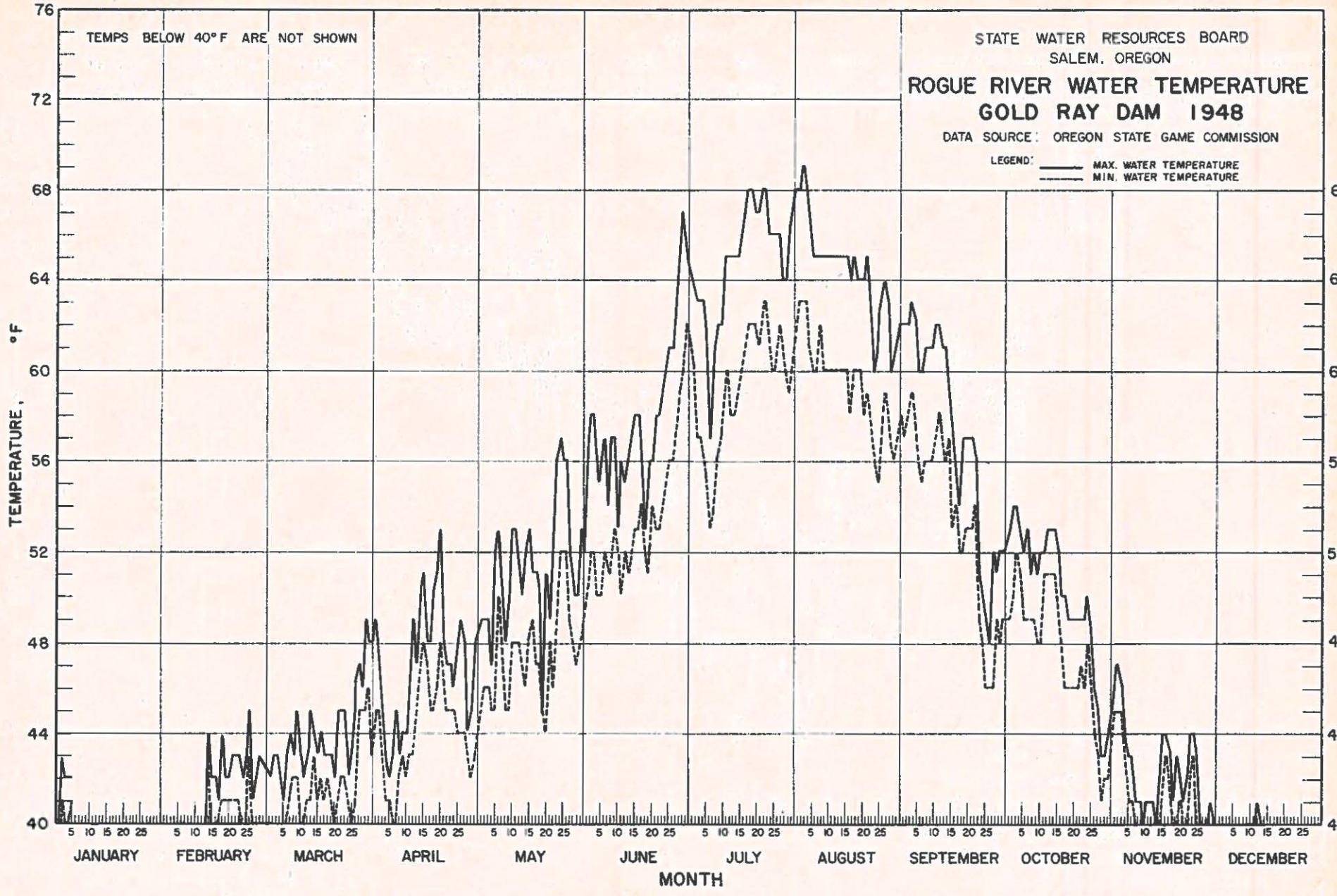

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
GOLD RAY DAM 1948
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
9-57

FIGURE 172

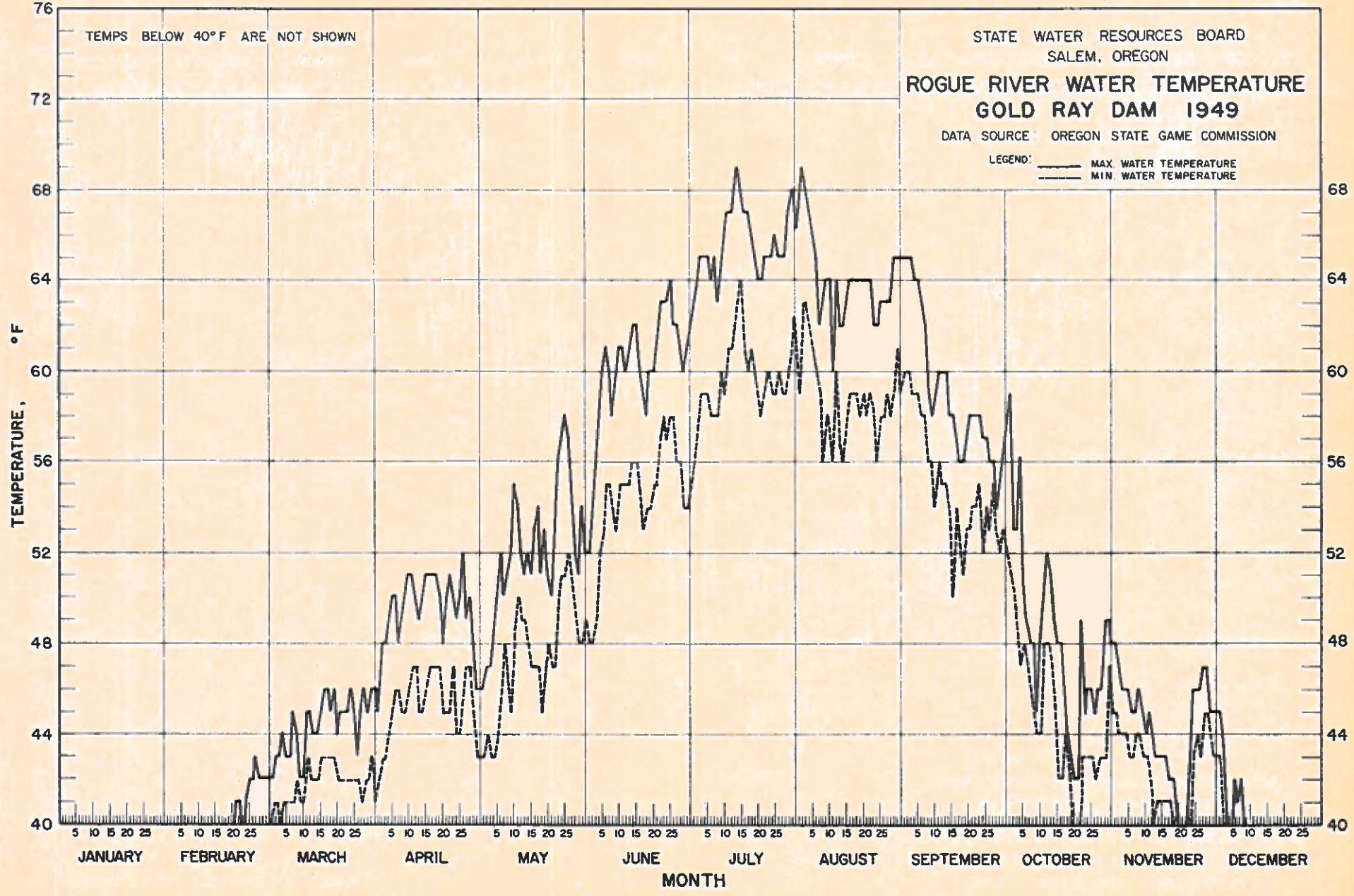

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
GOLD RAY DAM 1949
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
9-57

FIGURE 173

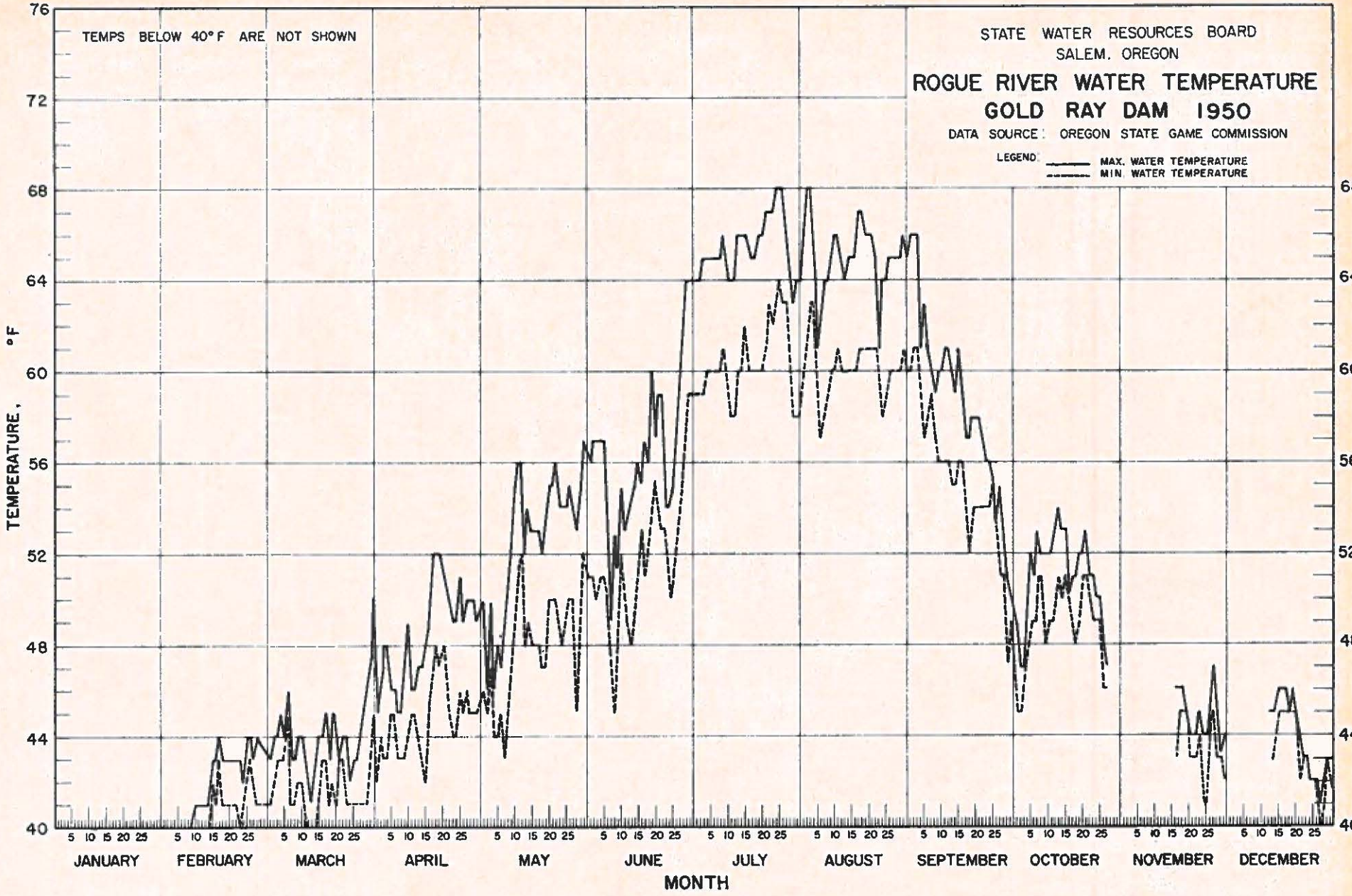

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FIGURE 174

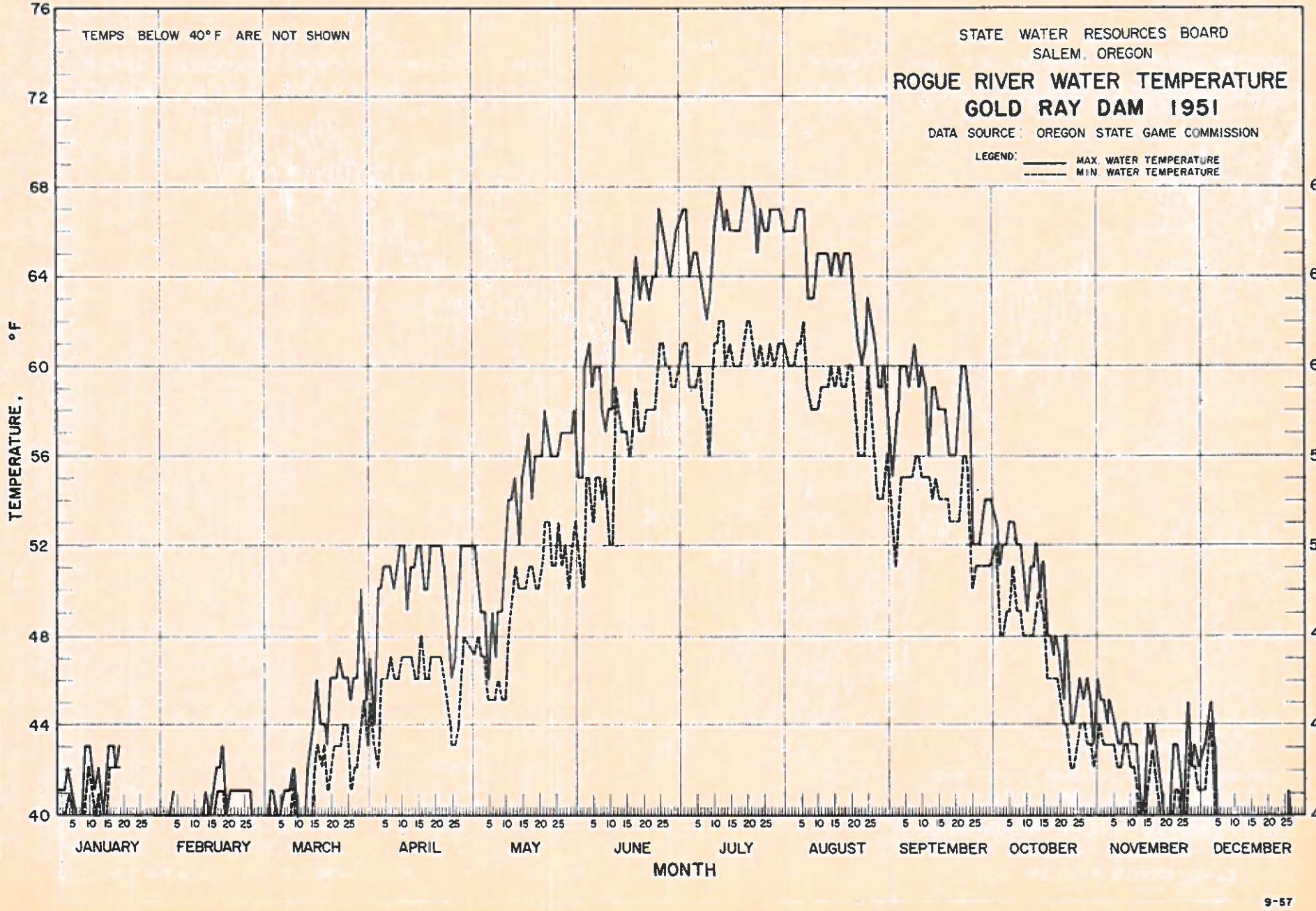
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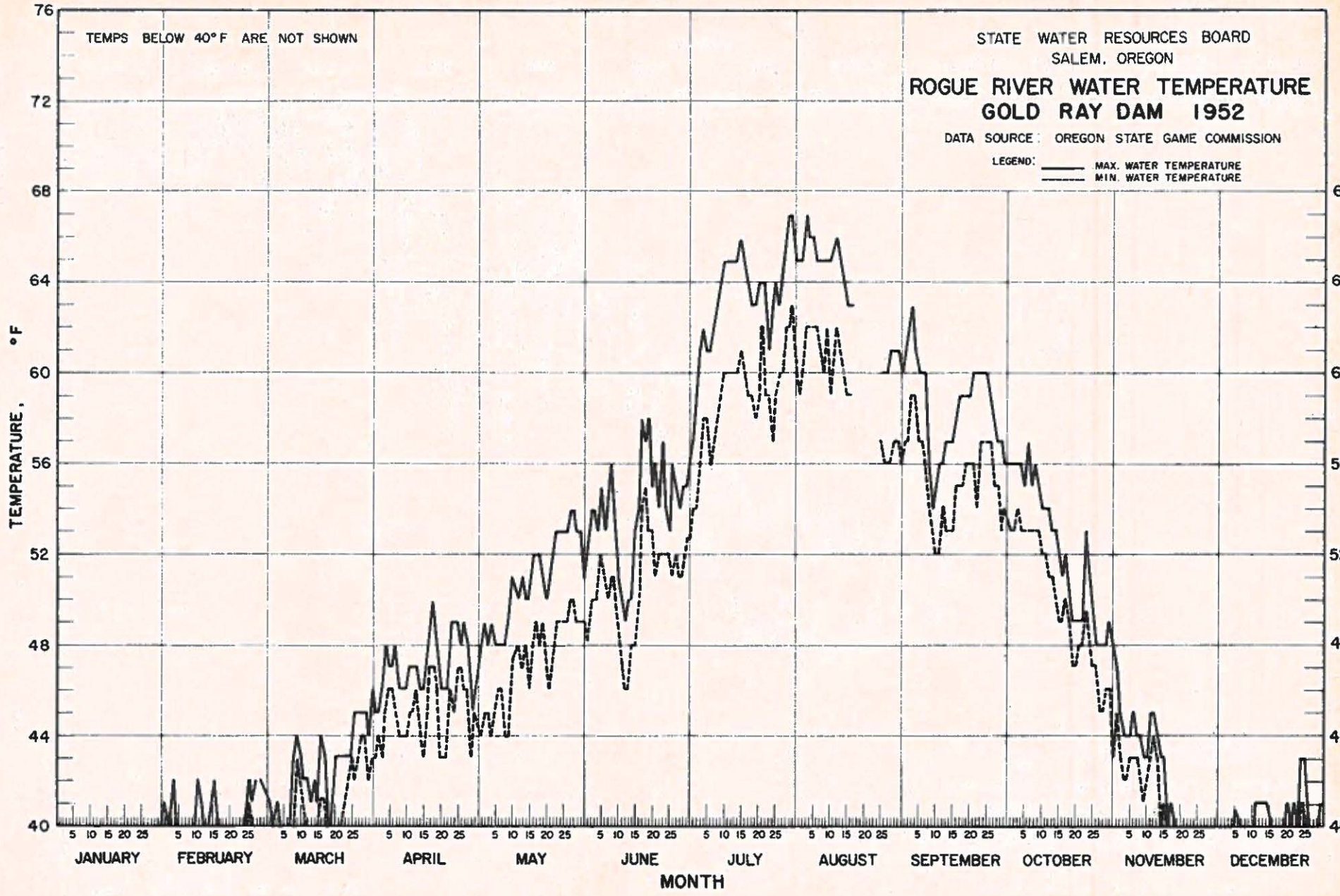
FIGURE 175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GOLD RAY DAM 1952
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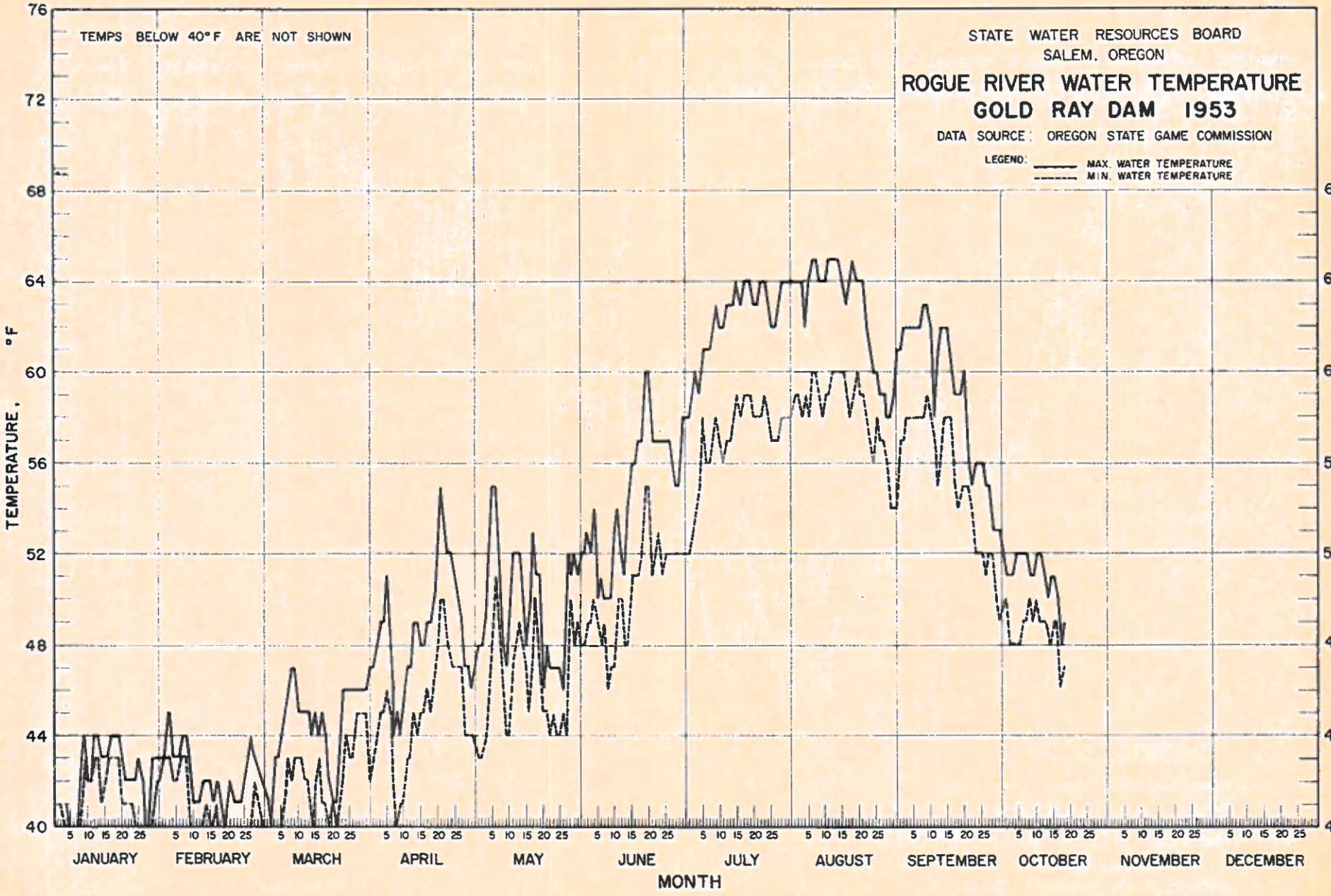
FIGURE 176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GOLD RAY DAM 1953
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
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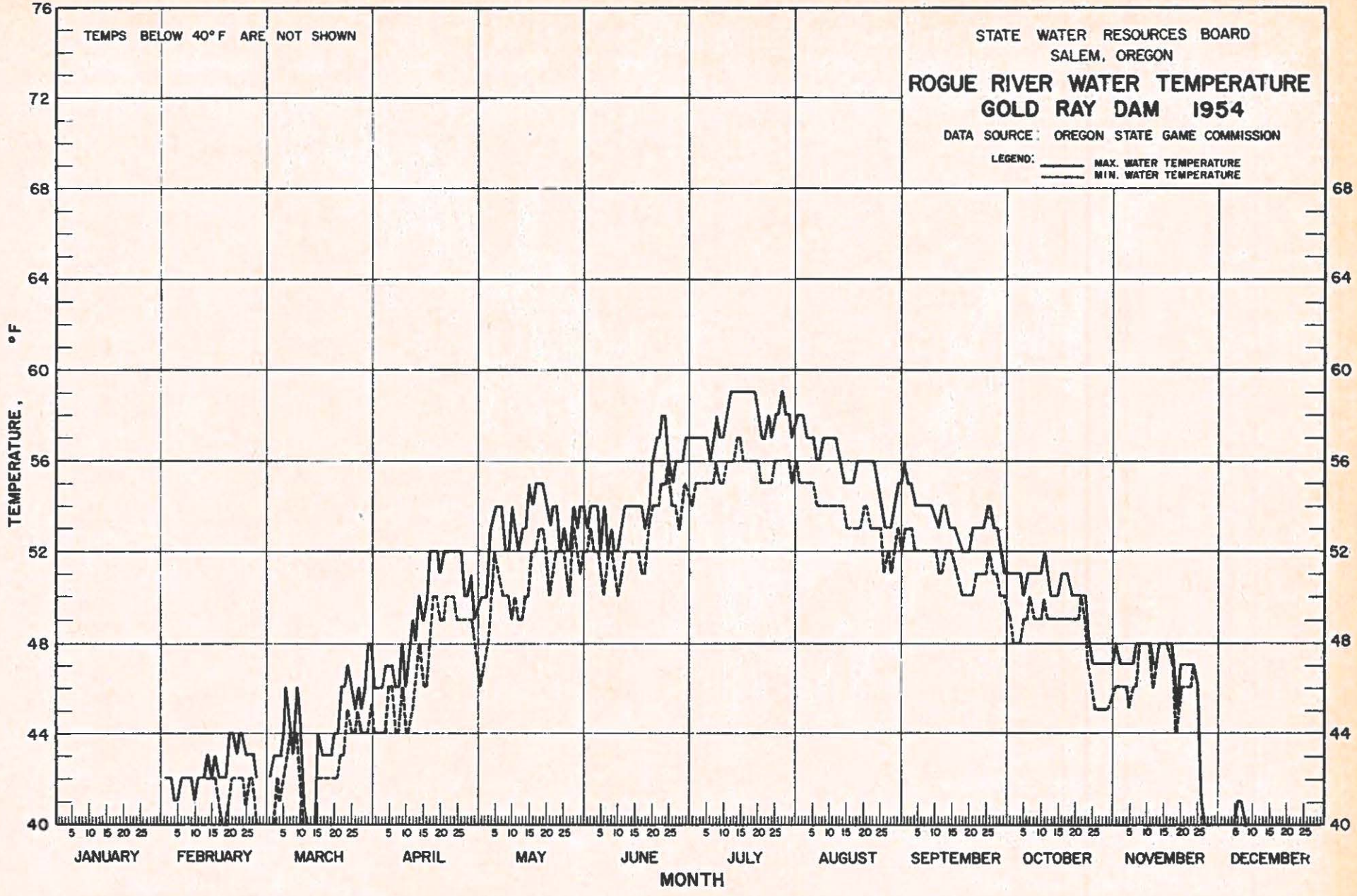
9-57

FIGURE 177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GOLD RAY DAM 1954
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LEGEND: MAX. WATER TEMPERATURE
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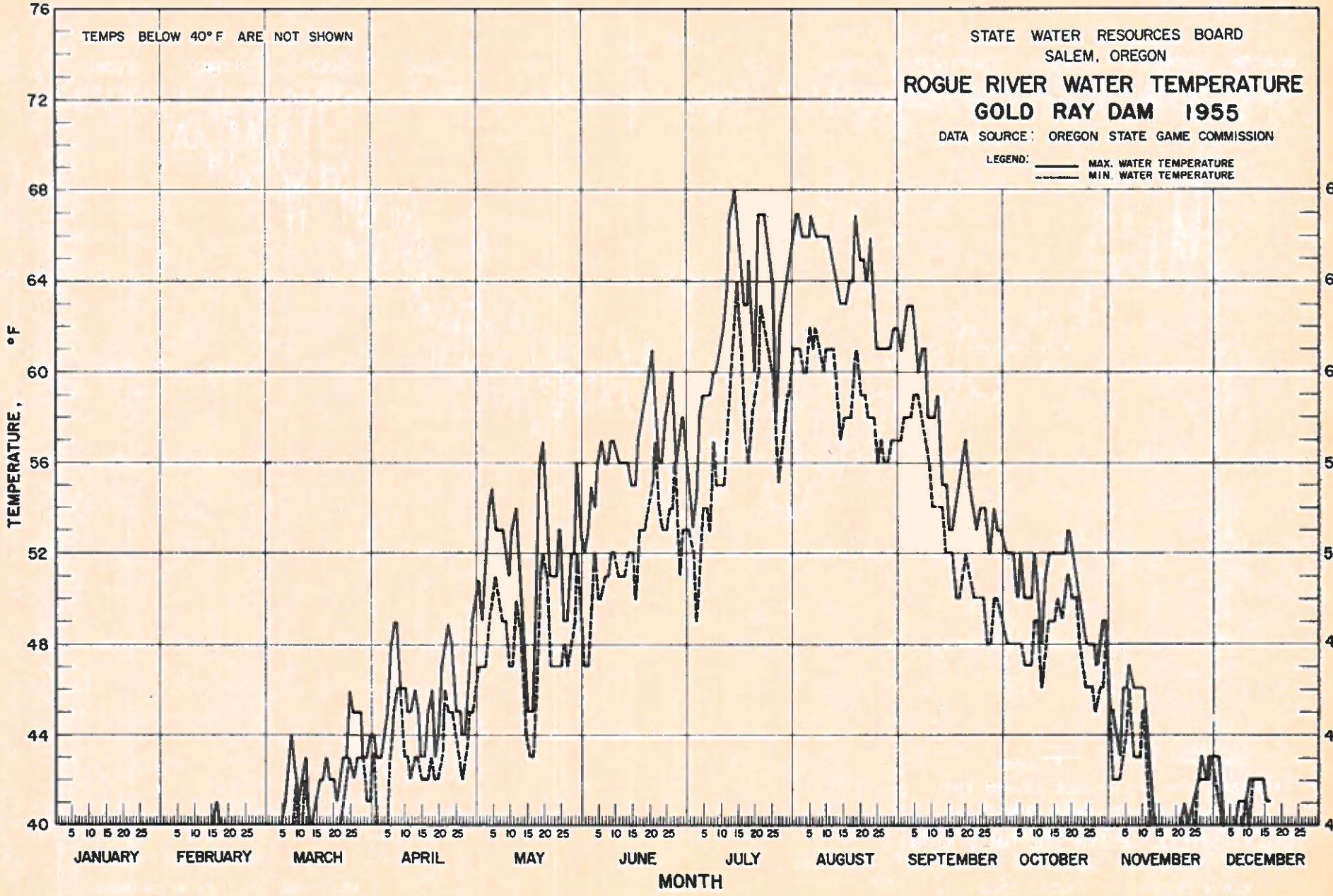
FIGURE 178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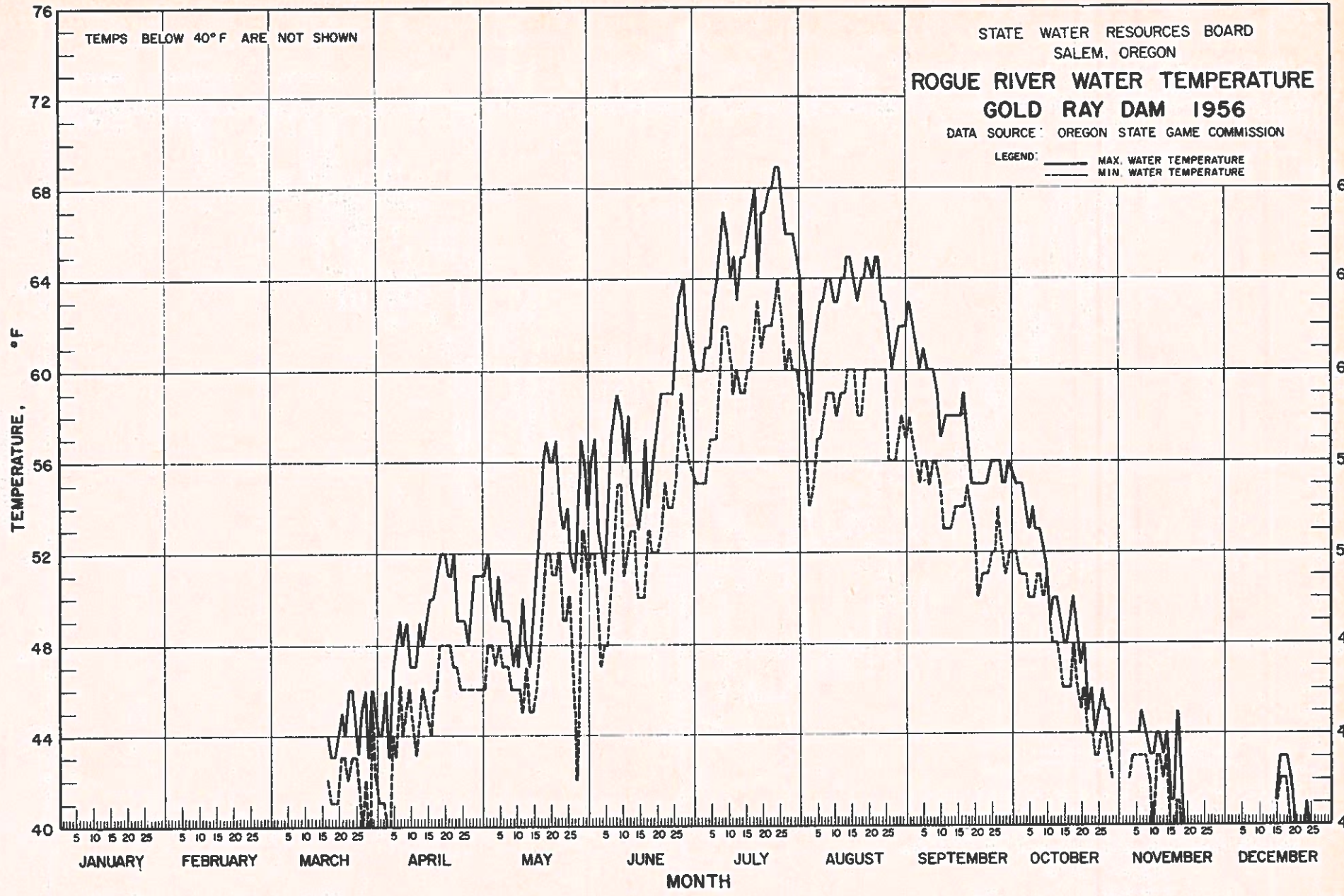
9-57

FIGURE 179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ROGUE RIVER WATER TEMPERATURE
GOLD RAY DAM 1956
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LEGEND: MAX. WATER TEMPERATURE
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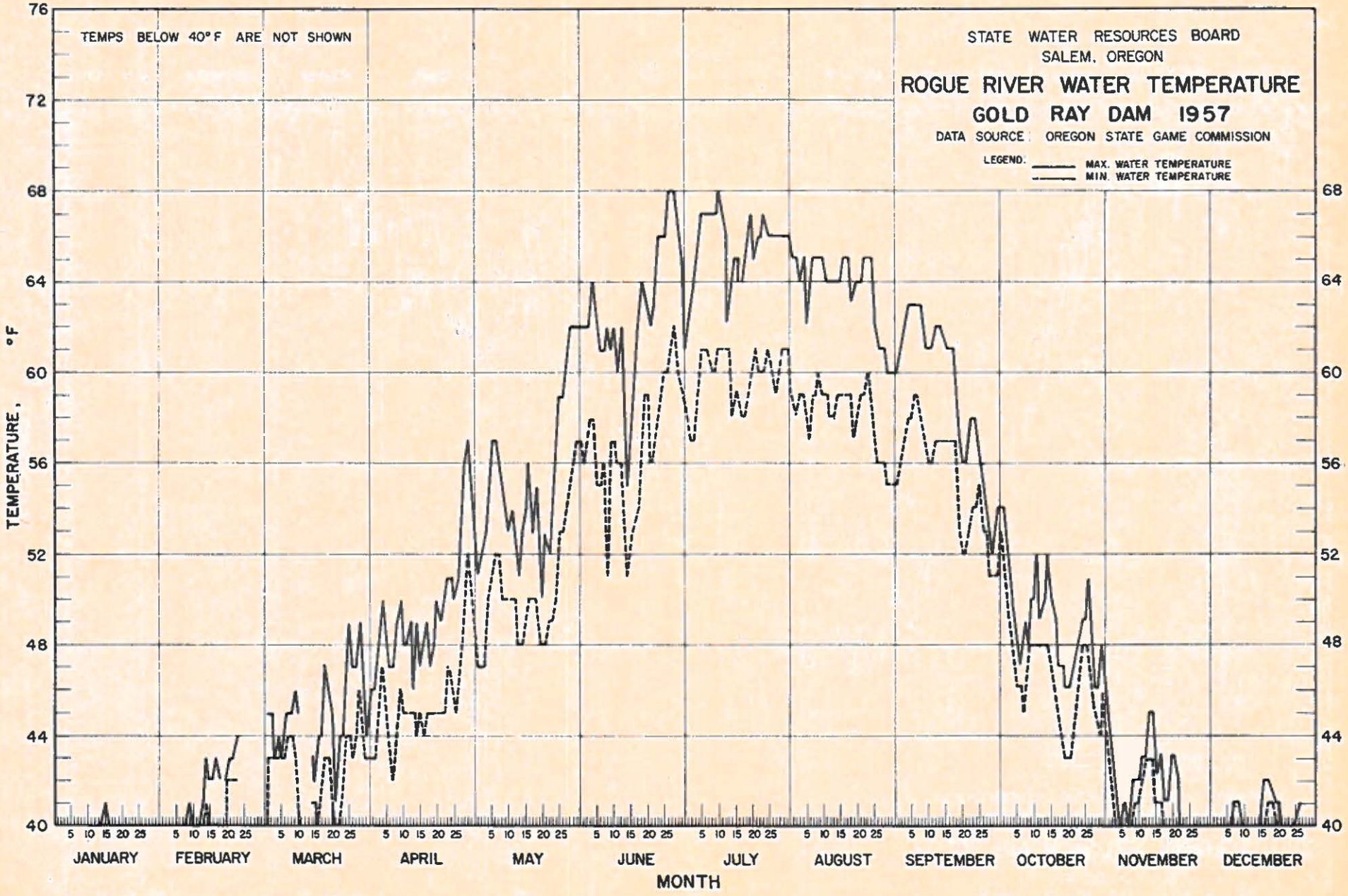
9-57

FIGURE 180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GOLD RAY DAM 1957
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LEGEND: MAX. WATER TEMPERATURE
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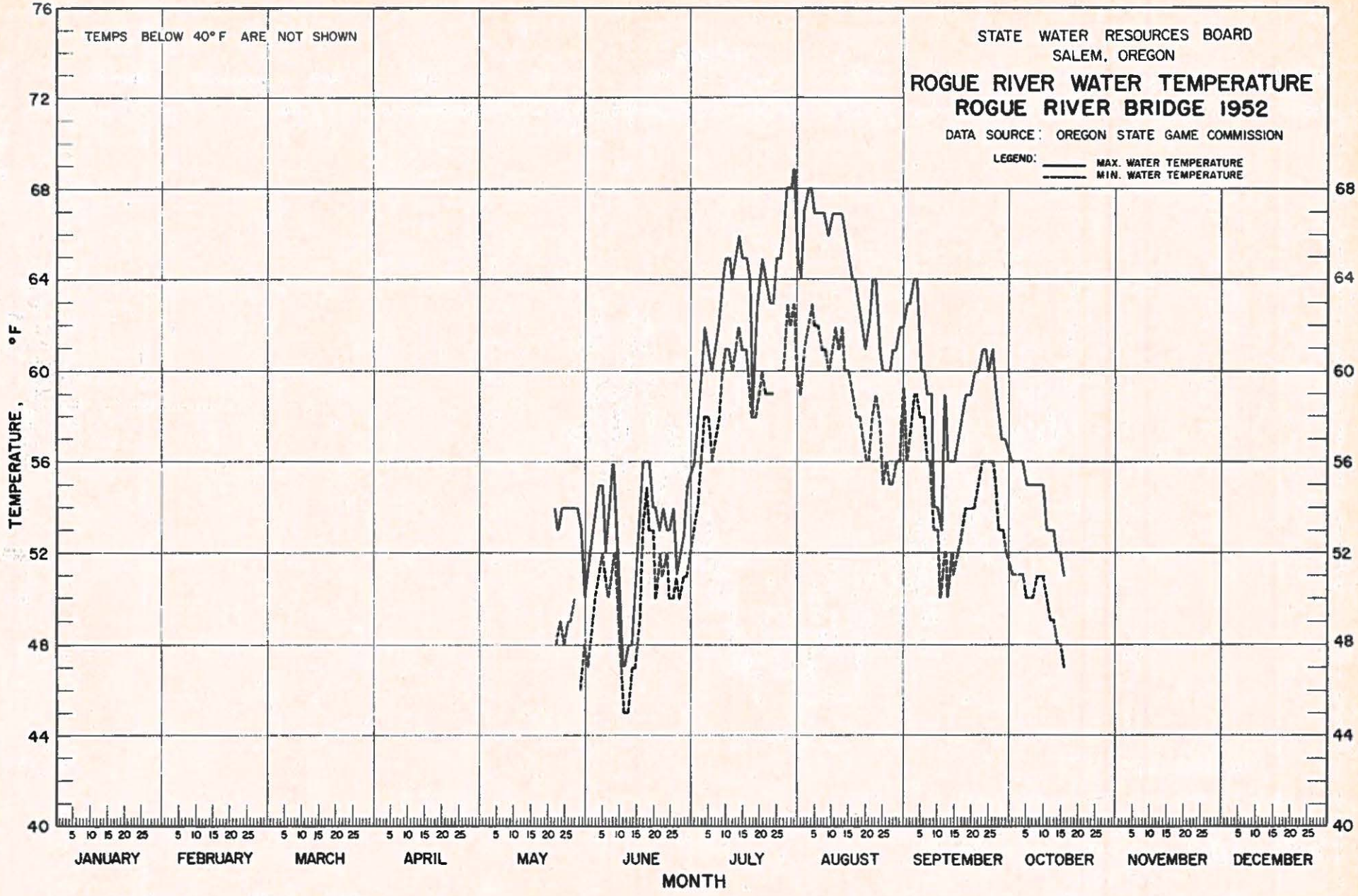
FIGURE 181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SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
ROGUE RIVER BRIDGE 1952
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MIN. WATER TEMPERATURE
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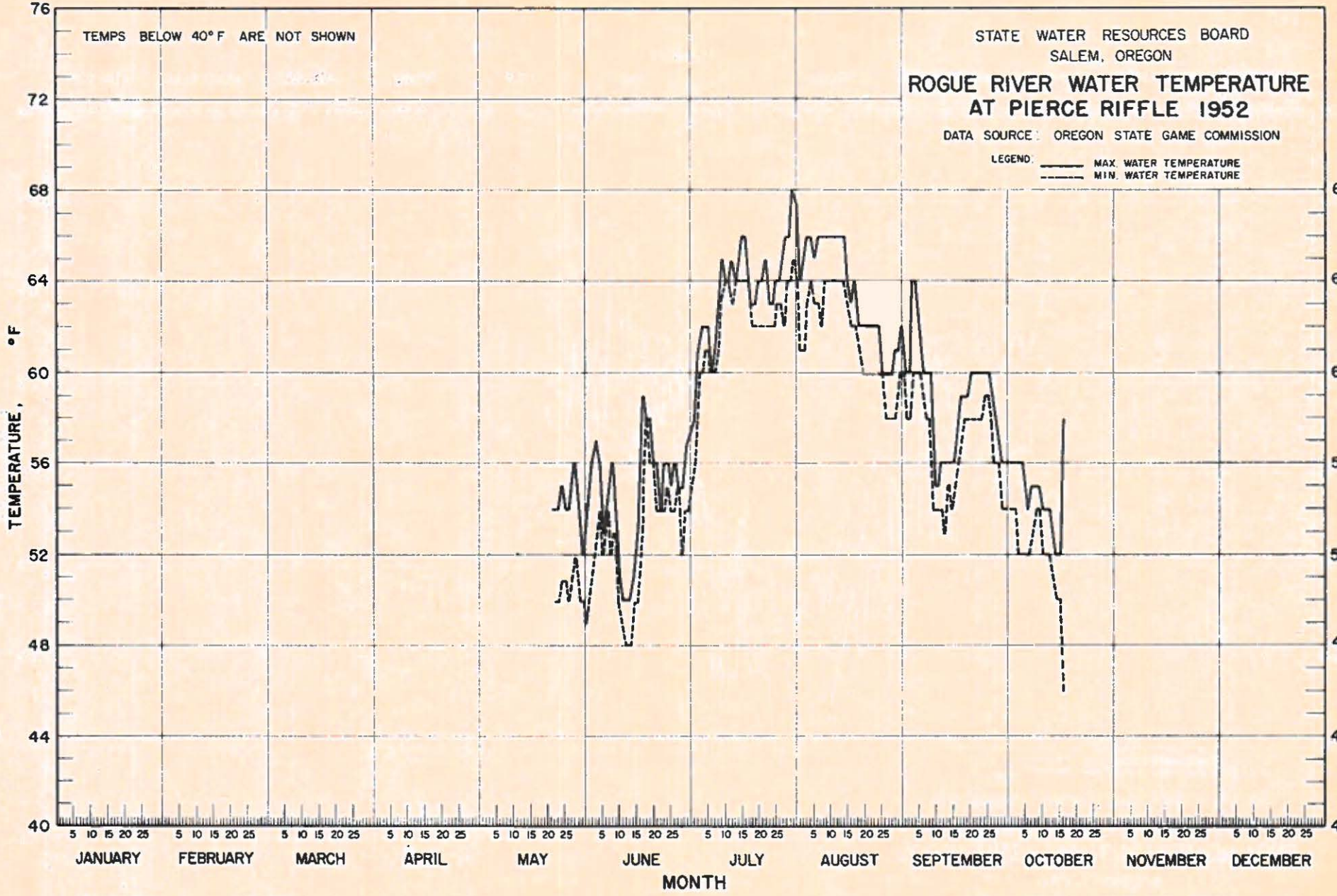
FIGURE 182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SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AT PIERCE RIFFLE 1952
DATA SOURCE: OREGON STATE GAME COMMISSION
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MAX. WATER TEMPERATURE
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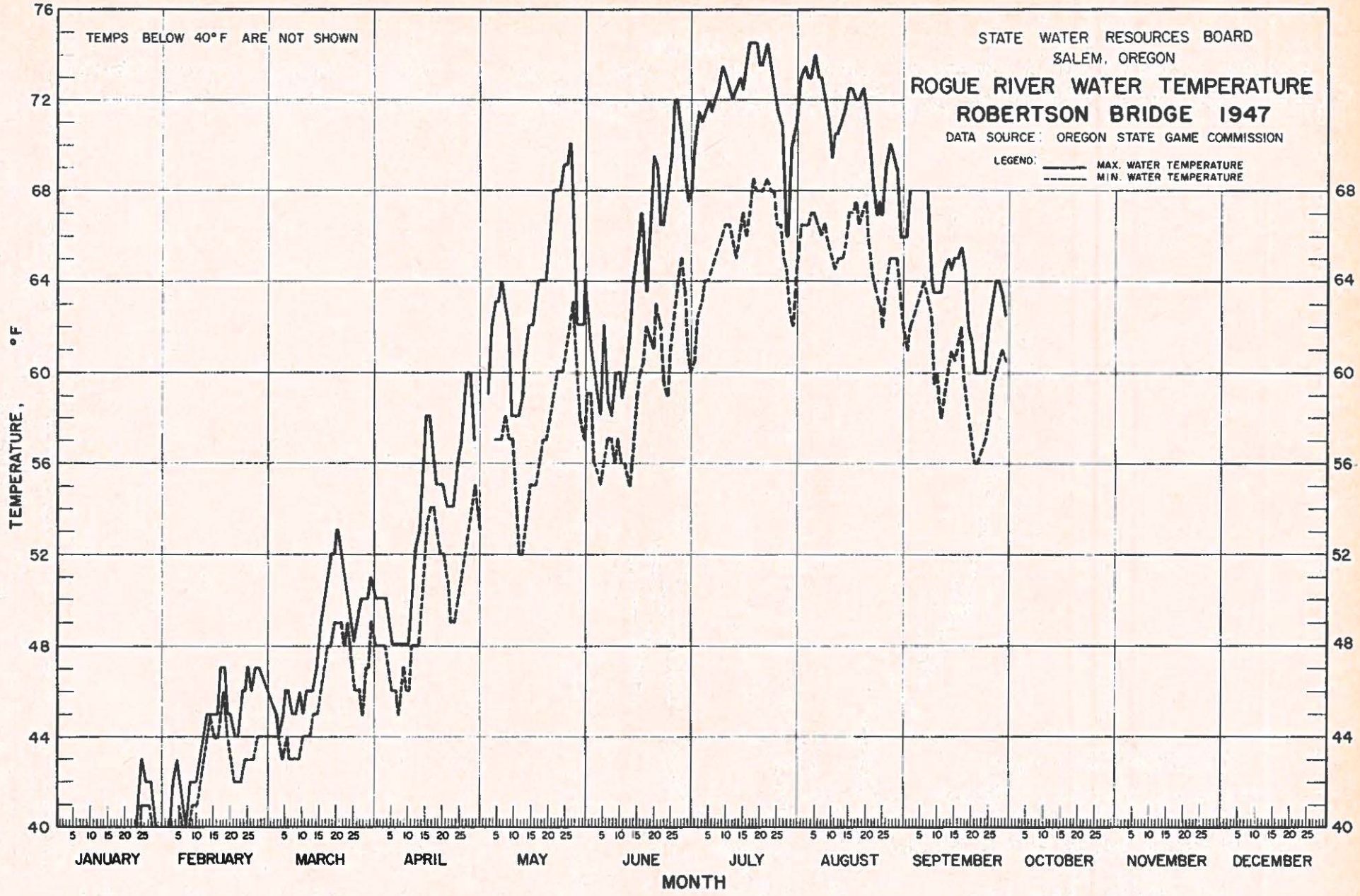
FIGURE 183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MIN. WATER TEMPERATURE
TEMPERATURE, °F
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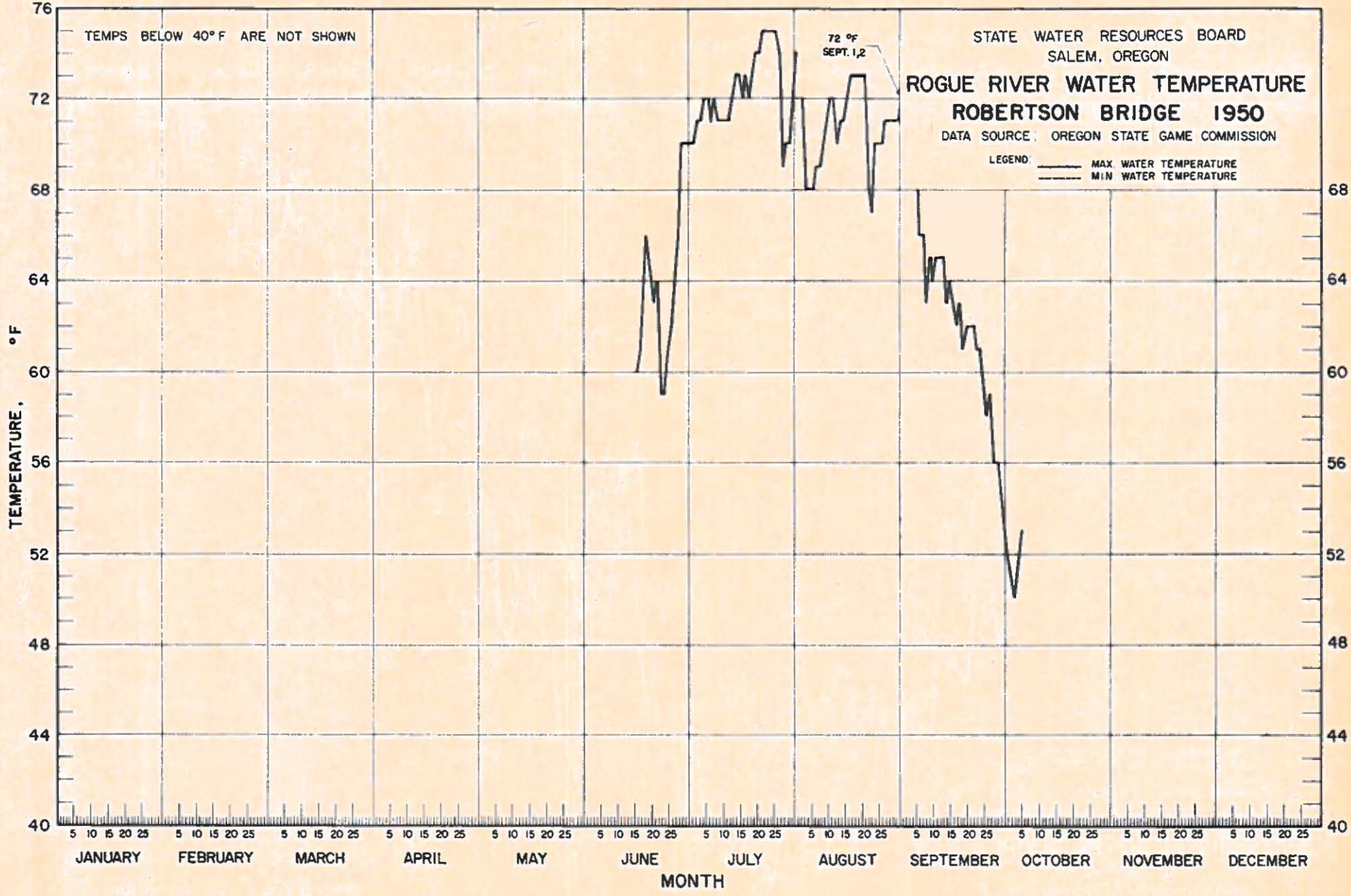
FIGURE 184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STATE WATER RESOURCES BOARD
SALEM, OREGON
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ROBERTSON BRIDGE 1950
DATA SOURCE: OREGON STATE GAME COMMISSION
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MIN WATER TEMPERATURE
TEMPERATURE, °F
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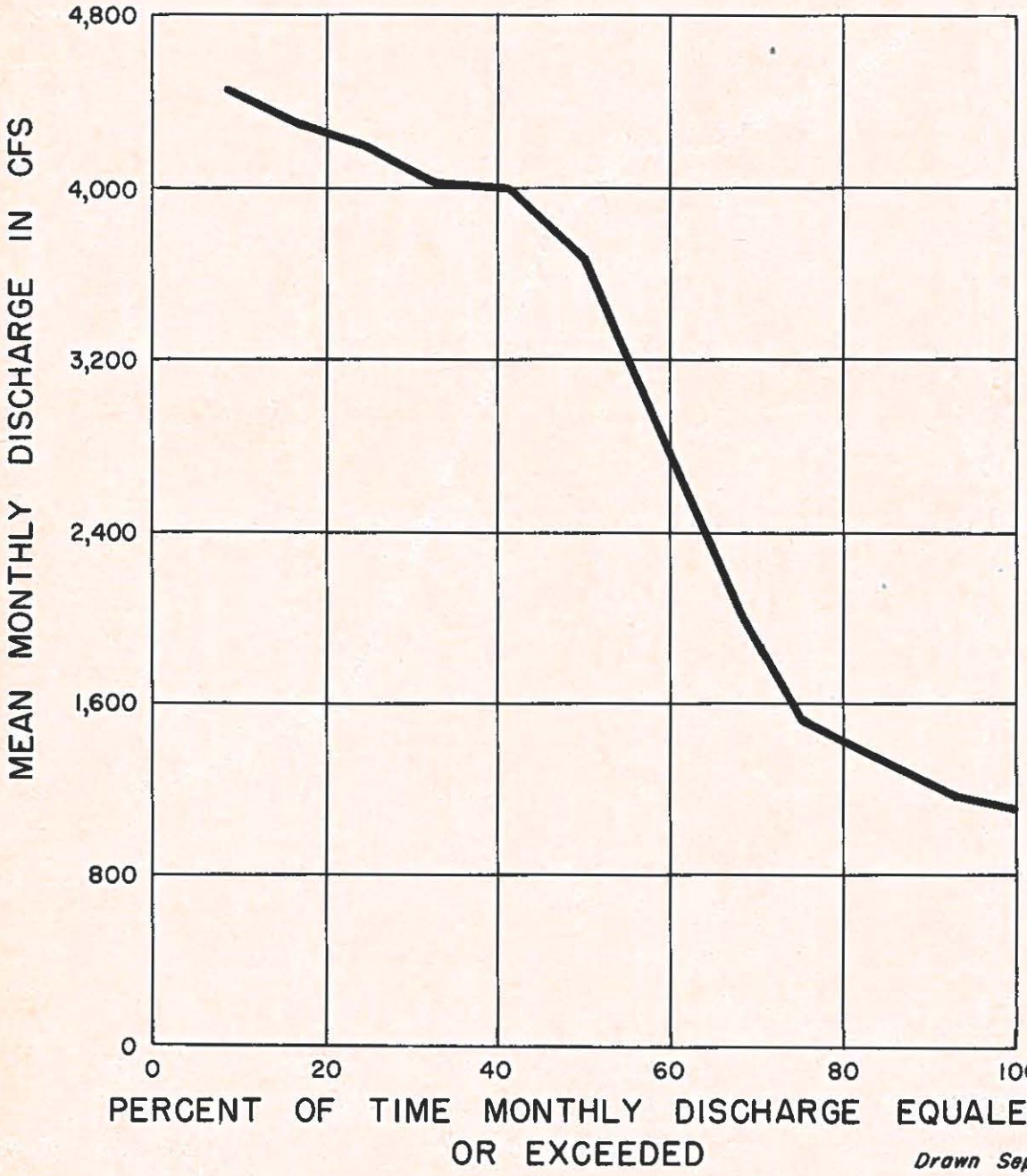
FIGURE 185

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

GOLD HILL SITE



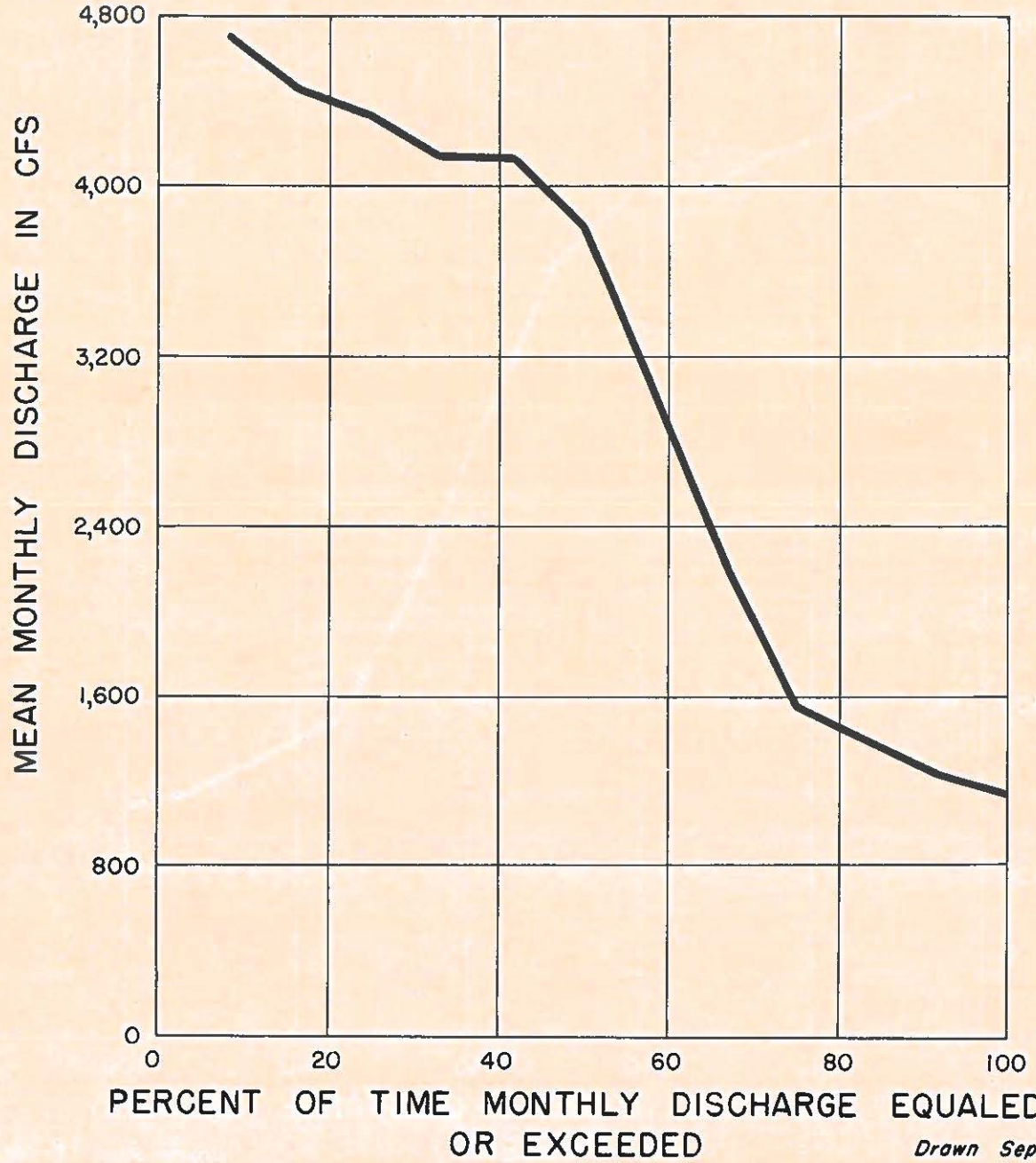
Drawn Sept. 19, 1958
File No.
FIGURE 186

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

ROCK POINT SITE



Drawn Sept. 19, 1958
File No.

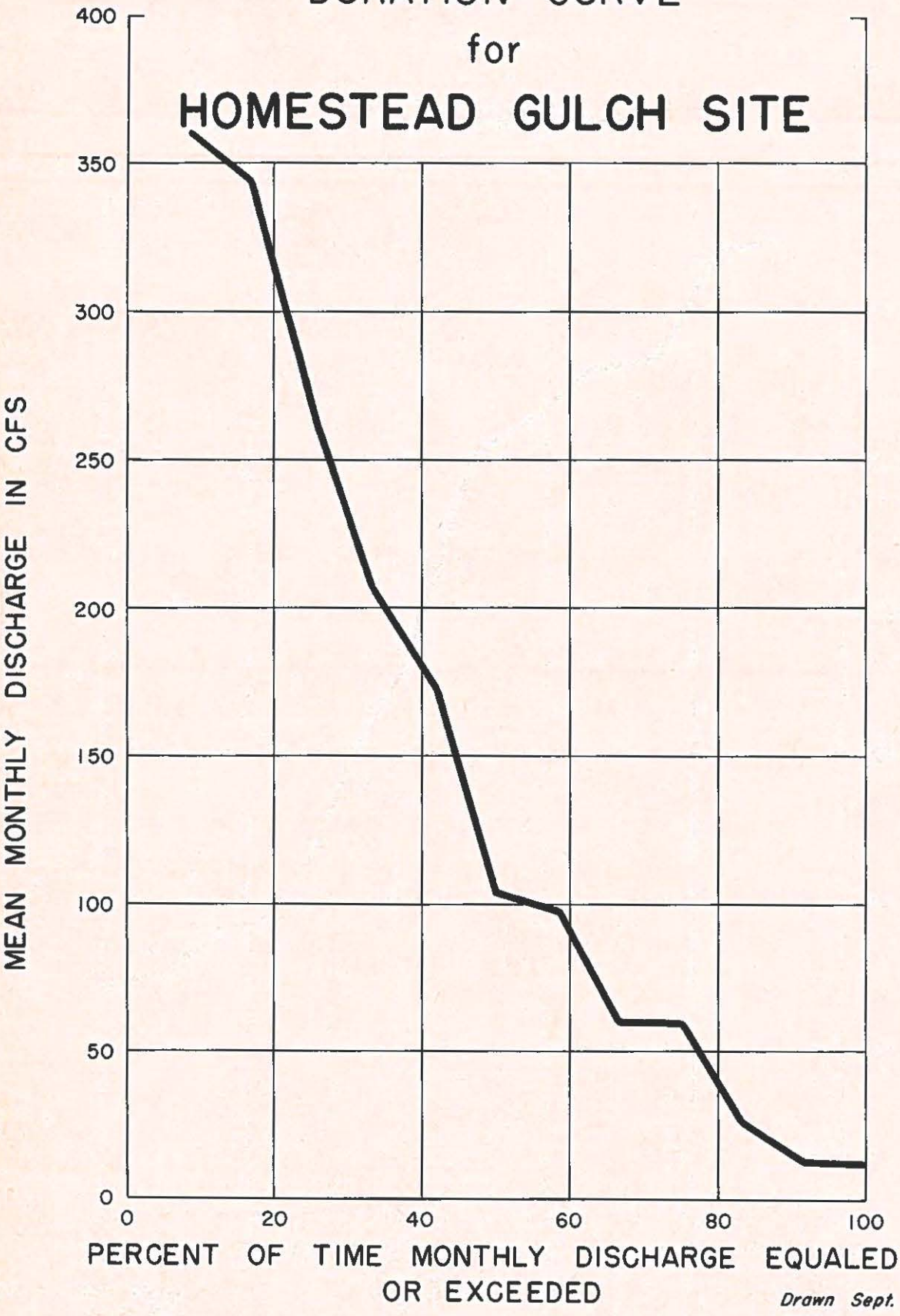
FIGURE 187

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

HOMESTEAD GULCH SITE



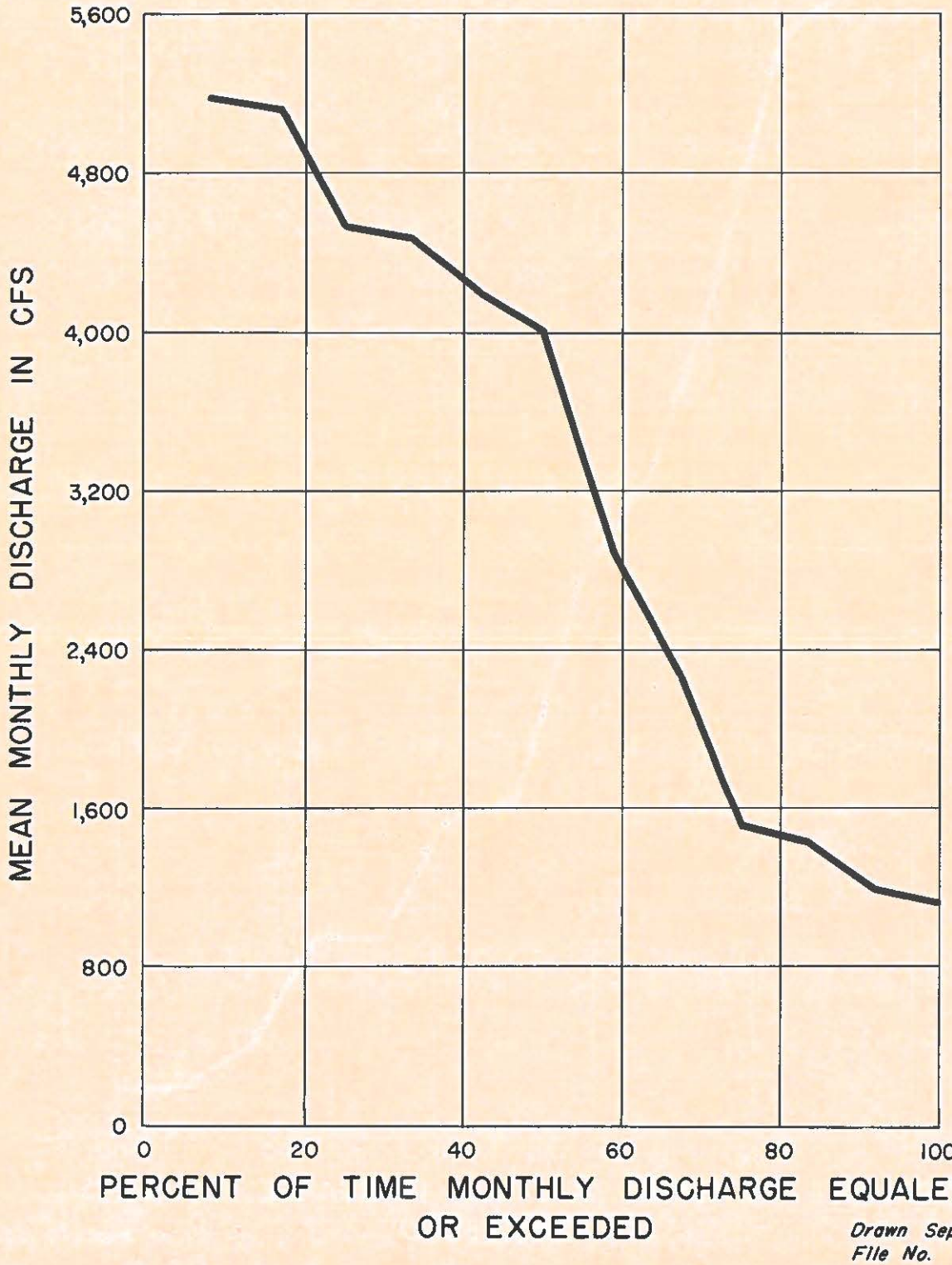
Drawn Sept. 17, 1958
File No.
FIGURE 188

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

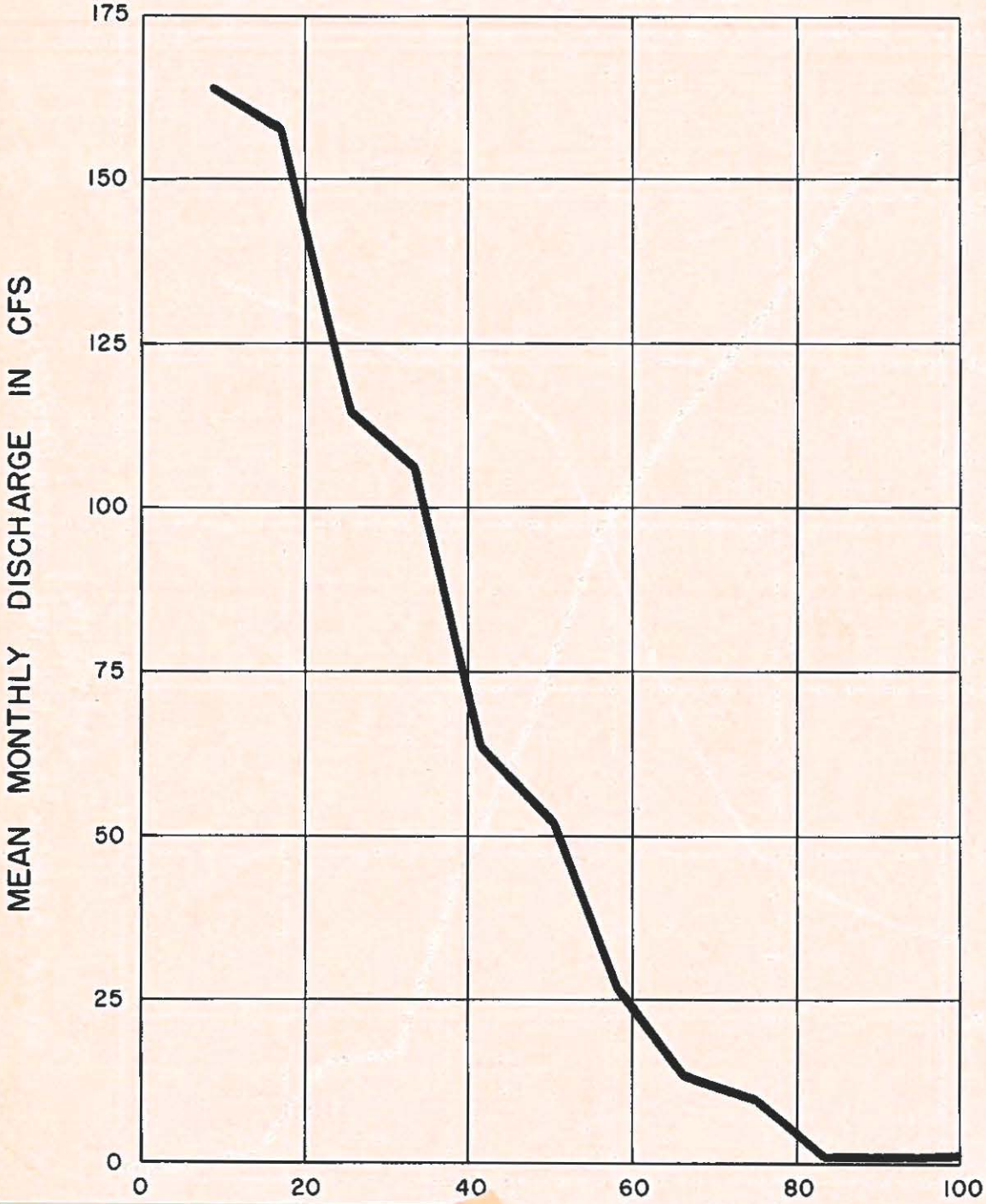
AMENT SITE



Drawn Sept. 18, 1958
File No.

FIGURE 189

ROGUE RIVER BASIN
MEAN MONTHLY DISCHARGE DURATION CURVE
for
SEXTON SITE



Drawn Sept. 22, 1958
File No.

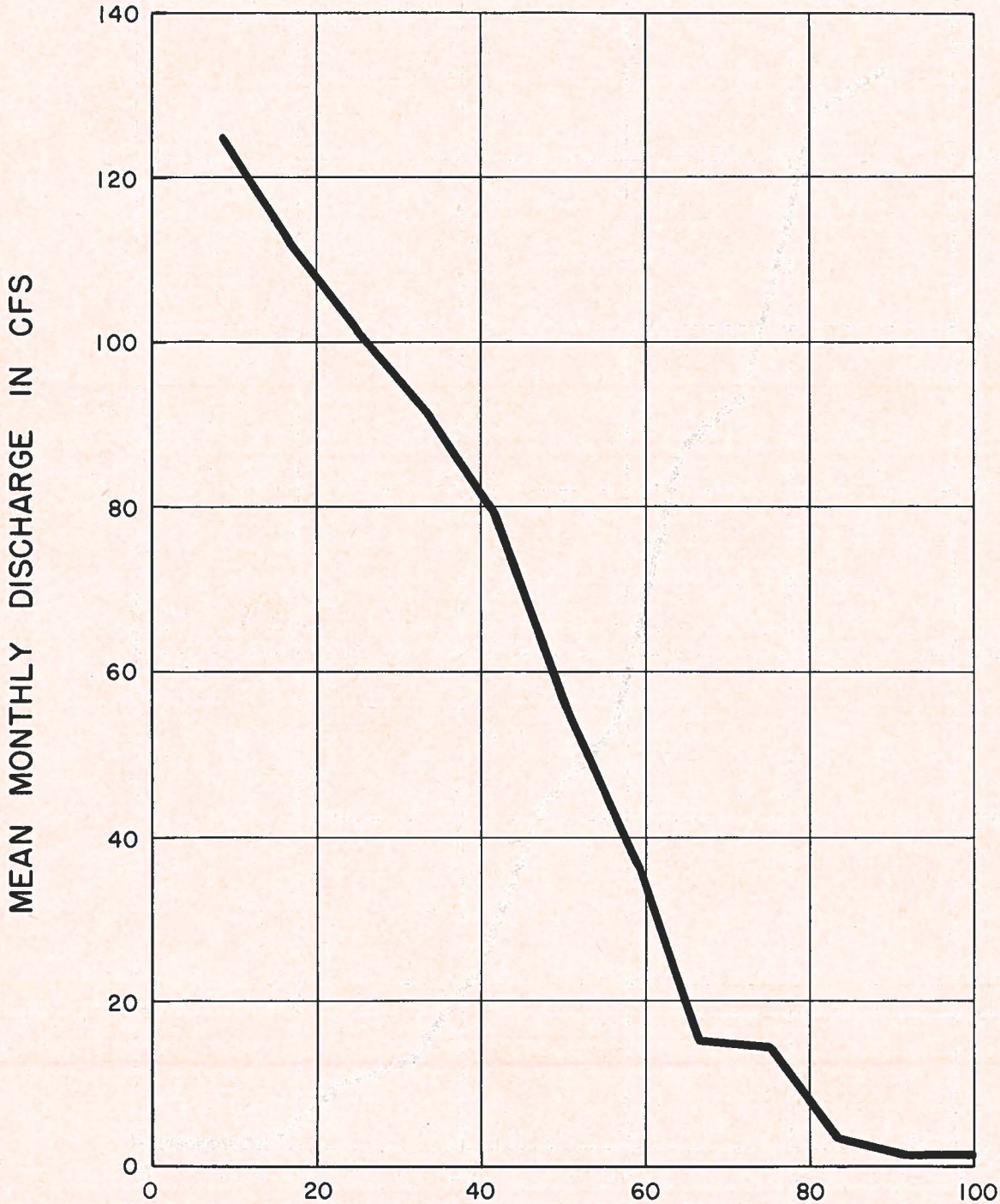
FIGURE 190

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

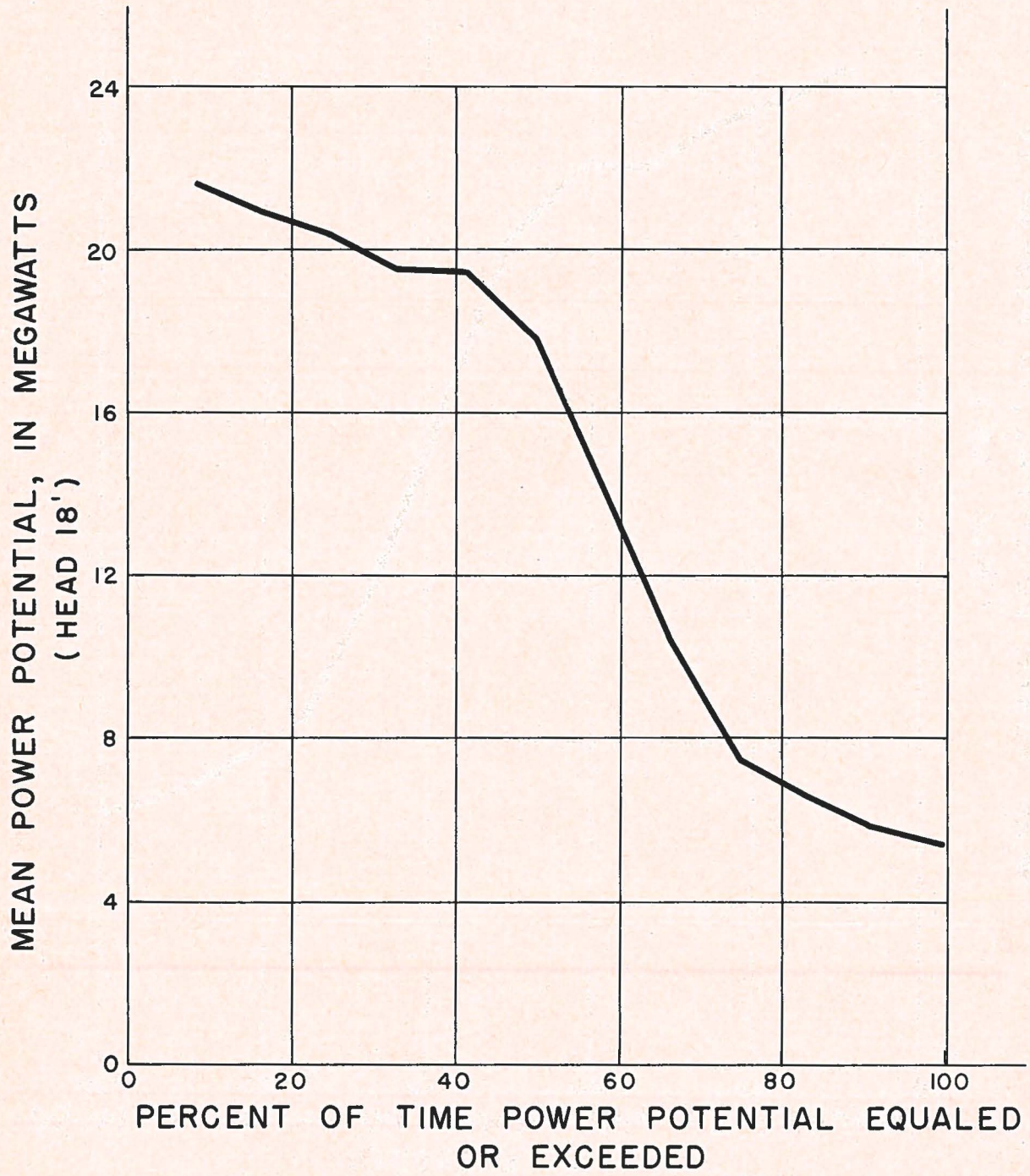
PEASE BRIDGE SITE



Drawn Sept. 17, 1958
File No.
FIGURE 191

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for GOLD HILL SITE



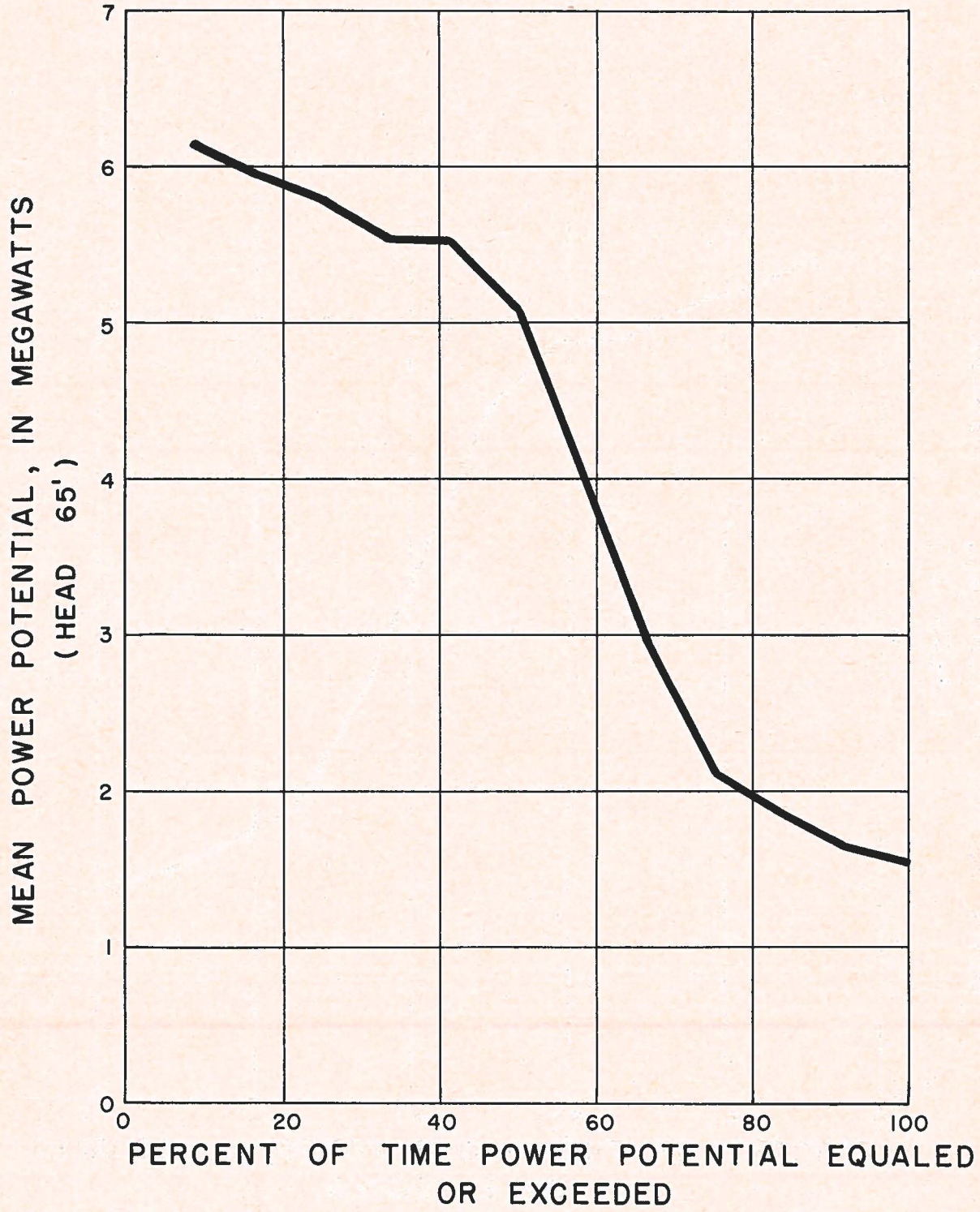
Drawn Sept. 5, 1958
File No.
FIGURE 192

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE

for

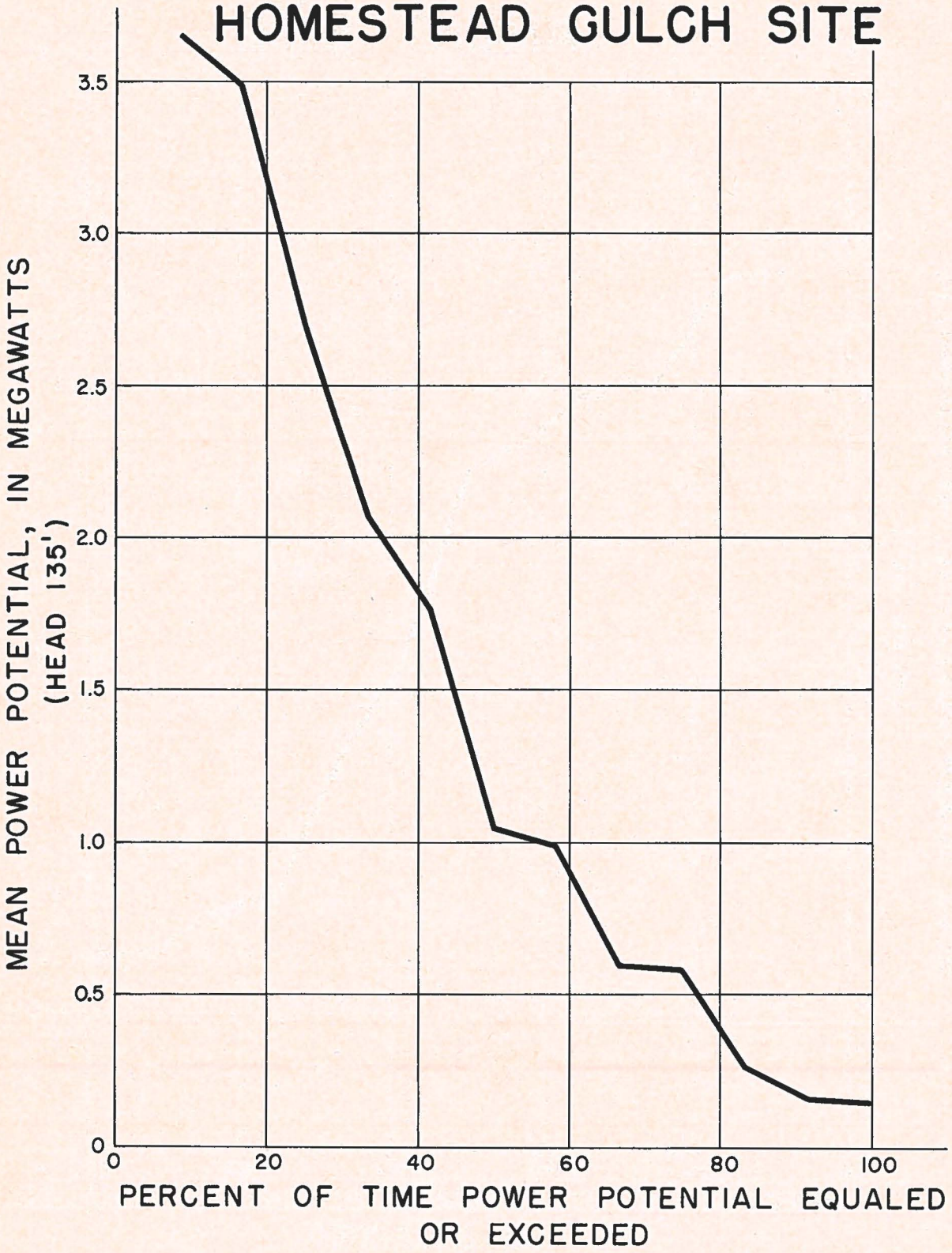
ROCK POINT SITE



Drawn Sept. 19, 1958
File No.
FIGURE 193

ROGUE RIVER BASIN

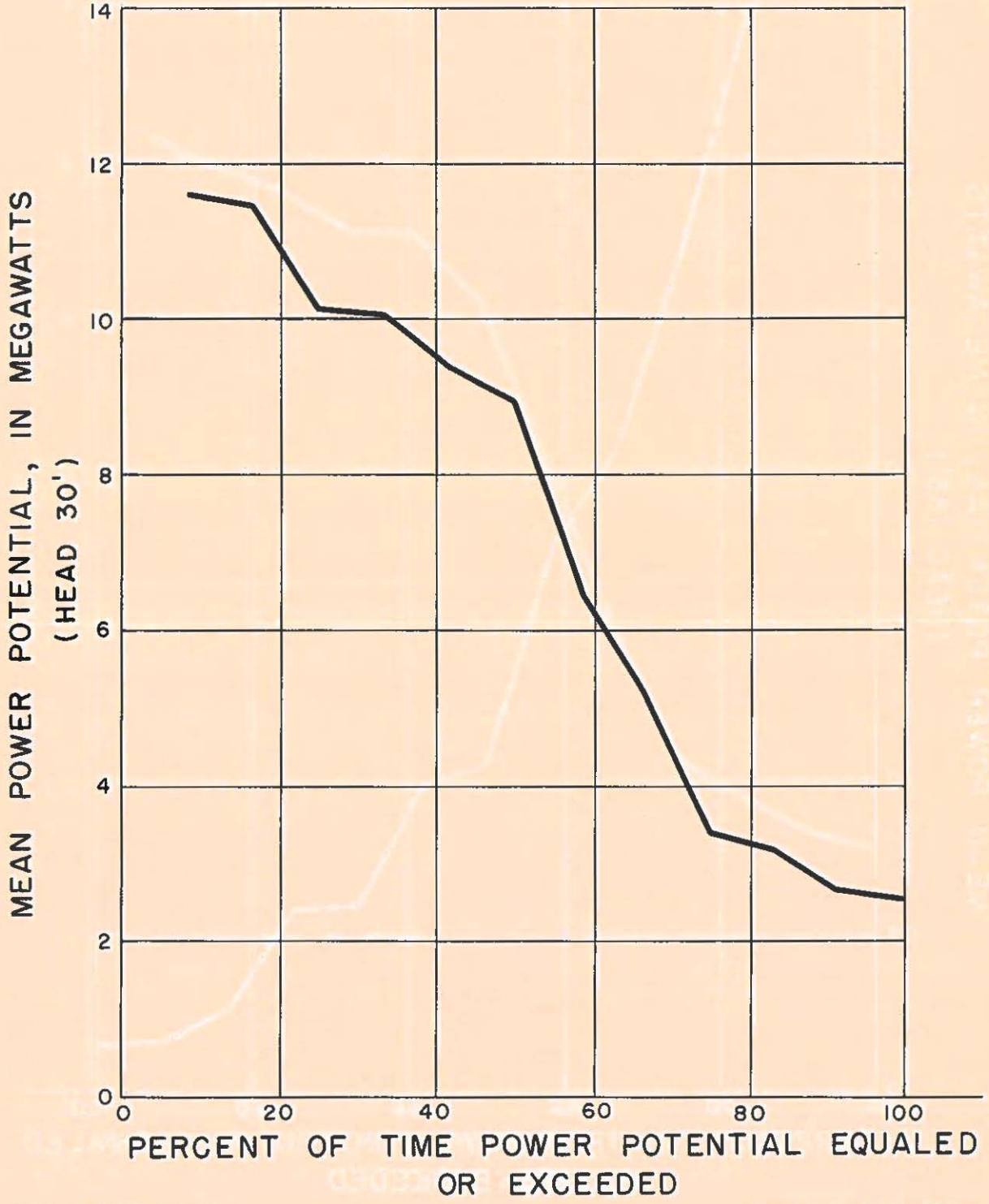
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for HOMESTEAD GULCH SITE



Drawn Sept. 8, 1958
File No.
FIGURE 194

ROGUE RIVER BASIN

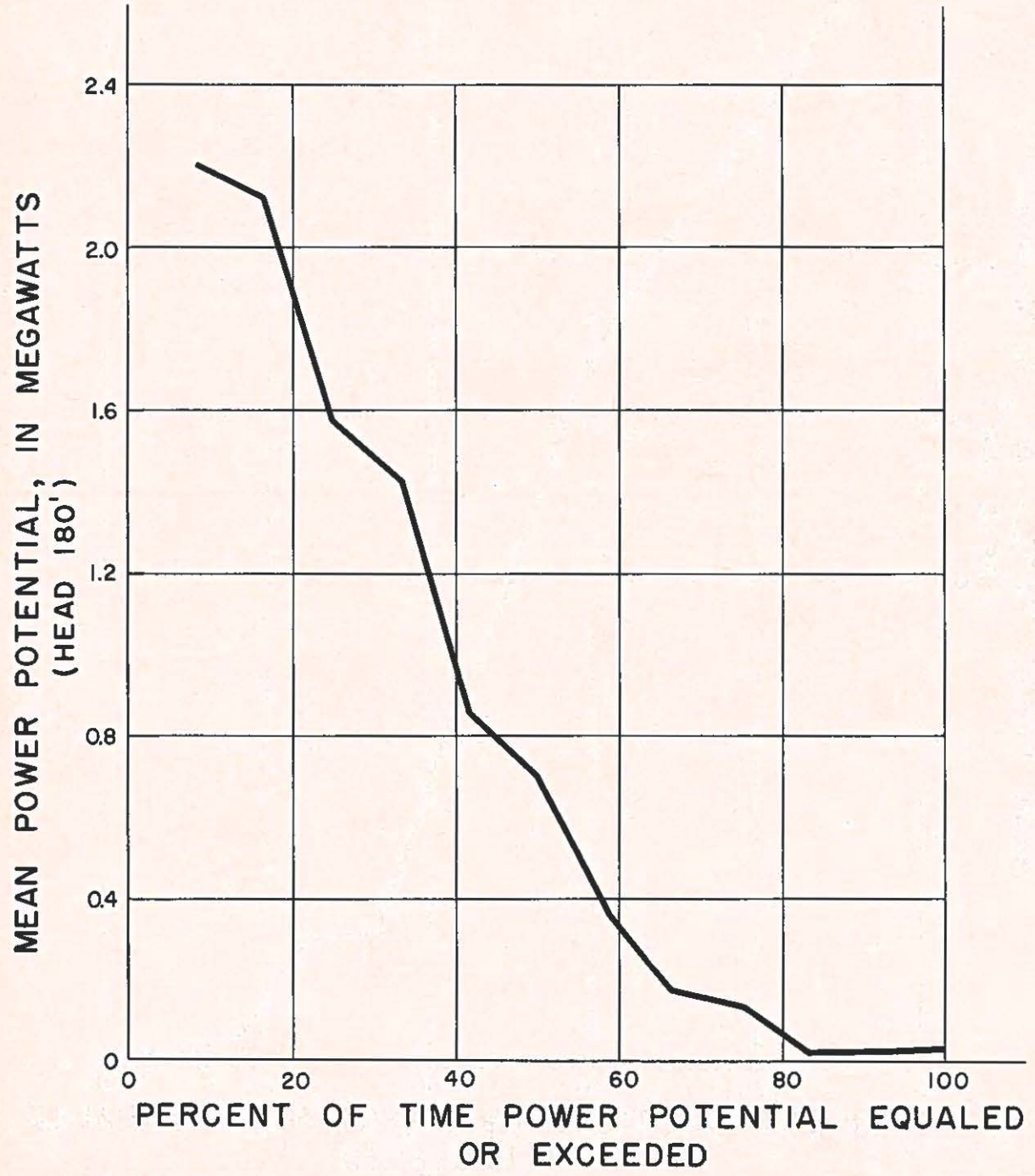
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for AMENT SITE



Drawn Sept. 5, 1958
File No.
FIGURE 195

ROGUE RIVER BASIN

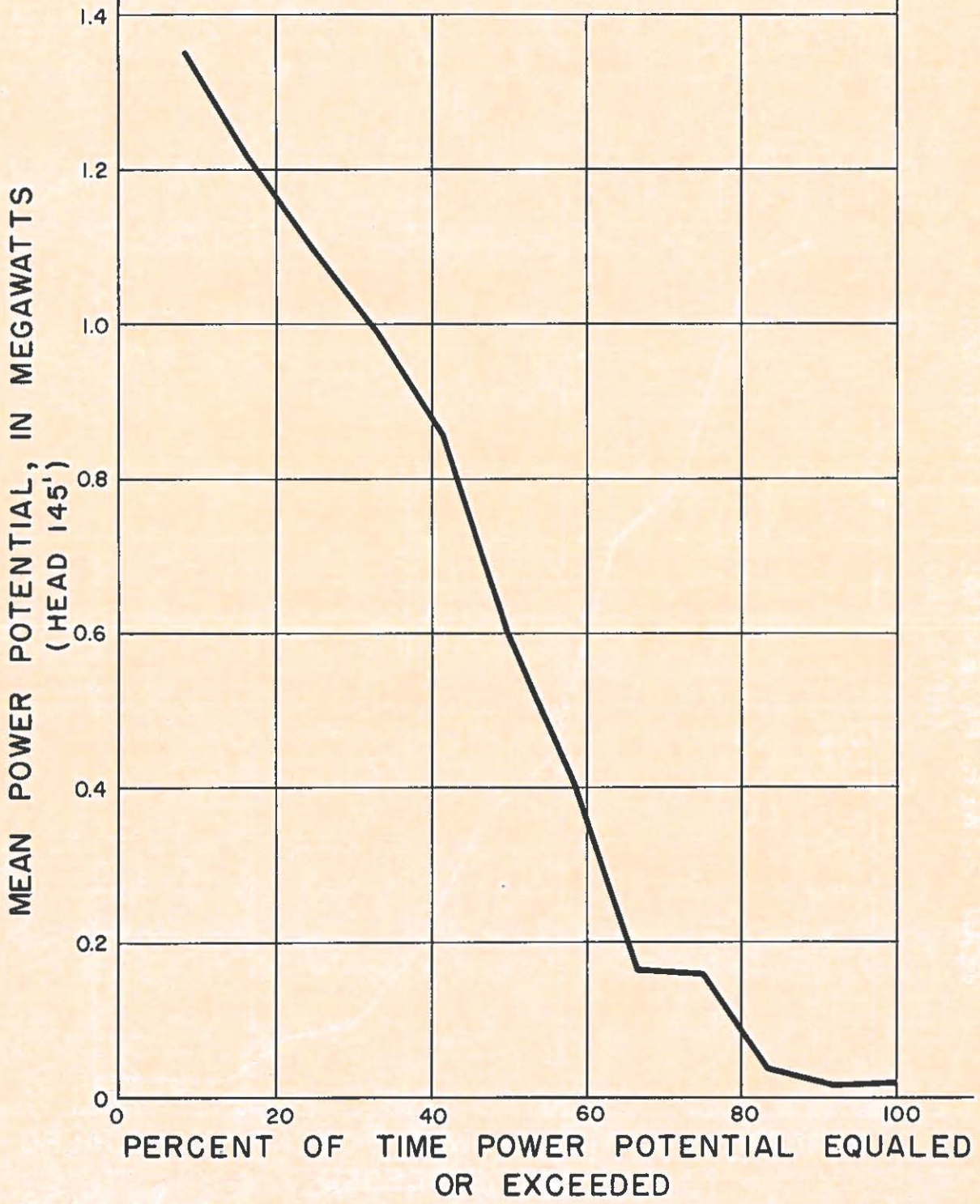
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for SEXTON SITE



Drawn Sept. 7, 1958
File No.
FIGURE 196

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for PEASE BRIDGE SITE



Drawn Sept. 8, 1958
File No.
FIGURE 197

SECTION 6 ILLINOIS VALLEY

GENERAL DATA

Location

This section includes all of the Illinois River drainage system from the mouth of the Illinois, located at river mile 27.2 on the Rogue, to its headwaters in the Siskiyou Range of mountains in California. Major tributaries in this Basin are Deer Creek, starting at mile 46.5 on the Illinois; Sucker Creek, at mile 4.5 of the Illinois East Fork; and Althouse Creek at mile 4.6 also of the Illinois East Fork. The East Fork and West Fork join at mile 56.3 of the main stem.

The Siskiyou Mountains form the western and southern boundary of this sub-basin while the eastern boundary separates Illinois River drainage from that of the Applegate River, and the northern boundary is the Rogue River. Figure 198 shows the complete stream system for this section.

Size

Second in size among the seven sub-basins, the Illinois Valley contains 982 square miles, one-fifth of the Rogue Basin, of which 788 square miles are in Josephine County, 135 in Curry County, and the remaining 59 in Del Norte County, California. About 20 percent of the sub-basin area is drained by the East Fork, 11 percent by Deer Creek, 10 percent by Sucker Creek, and the remainder by many other small tributaries.

There are 1,140 miles of streams in the Illinois Valley with the Illinois main stem making up five percent of this total, Sucker Creek two percent, and Deer, Althouse, East Fork and West Fork each a little better than one percent, and the remainder made up by the many small tributaries.

Topography and Geology

Ninety percent of the area is mountainous and unsuitable for farming and the remaining 10 percent is mostly agricultural land located primarily in the drainage basins of Deer, Sucker, and Althouse Creeks, along the Illinois East Fork, and on its main stem above mile 50.

Most of the agricultural lands lie near elevation 1,200 although

the Illinois at its confluence with the Rogue is at elevation 100. Headwater elevations start at about 1,600 feet and the highest point in the sub-basin is Grayback Mountain, elevation 7,055, located at the head of Grayback Creek. There are eight other peaks in this region with elevations greater than 5,000 feet.

Stream gradients vary from 20 feet of drop per mile on the Illinois main stem to 248 feet per mile on Grayback Creek. Other stream gradients are East Fork, 36 feet per mile; West Fork, 25 feet per mile; Sucker Creek, 106 feet per mile; and Althouse Creek, 197 feet per mile. The Rogue Basin stream system profile was shown in Figure 2.

Generally speaking, the larger geologic units in the Illinois Valley consist of bands of sedimentary volcanic and intrusive rocks. From east to west across the sub-basin the rocks are meta-volcanic, meta-sedimentary, slates, sandstones, and a complex of other intrusive rocks. Some alluvium of recent age is found in the broader parts of the stream valleys. The stream beds of the major tributaries of the Illinois consist of alluvium deposits while the main stem bed is composed of massive sandstone and thin layers of black or dark gray shale for the first 20 miles and then 11 miles of dark-colored rock containing bluish feldspar, pyroxens, and olivine. Above mile 35 the stream bed consists of a granitoid light-colored rock containing hornblende, biotite, and visible quartz. From mile 37 to 44 the stream bed consists of dark gray to black, fine grained to dense, thinly-layered rocks generally with slaty cleavage, and a few medium-grained sandstone beds up to three feet in thickness. From mile 44 to mile 50 the stream bed is composed of green medium-grained rock. From mile 50 to the confluence of the East and West Forks, the stream bed consists of alluvium.

The Illinois River main stem flows in a generally west, northwest, or north direction while its major tributaries enter on the east bank after flowing from their headwaters located near the eastern boundary of the sub-basin.

Climate

Average annual precipitation is approximately 60 inches in the vicinity of Kerby; 55 inches in the southern portion of the Basin; and 45 inches in the Sucker Creek area. About 20 percent of the annual precipitation occurs during the irrigation season, May 15 - October 15,

except in the Kerby area where this period's precipitation is near 27 percent. Average annual snowfall at the Takilma station is 68 inches.

Average air temperature variations are from 44 to 76 degrees Fahrenheit in the summer and 31 to 51 in the winter at elevations near 1,650 feet.

According to the Bureau of Reclamation's climatological map, annual growing seasons vary from 220 to 240 days.

Population

With approximately 5,000 residents in the sub-basin, Kerby, 1950 census population of 500, is the largest town in the area and only three other towns have populations greater than 100; Cave Junction, 1950 census and 1958 certified population 300; Dryden, 1950 census population 350; and O'Brien, 1950 census population 350. The location of all towns in the valley is shown on the sub-basin stream system map, Figure 198.

Land Ownership

Seventy percent of the Illinois Valley is government timber land managed by either the Forest Service or the Bureau of Land Management; two percent public domain lands; one-tenth of one percent under the control of the State Land Board; and most of the remainder privately owned. Seventy-one percent of the Sucker Creek drainage area is government timber land as is 54 percent of Illinois East Fork drainage area and 43 percent of Deer Creek drainage area. Major land ownership divisions by sub-basins for the Rogue Valley were summarized in Table 2.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19. The major highway in this region is U. S. 199 which passes through Selma, Kerby, Cave Junction, O'Brien, and into California. Oregon 46 leaves U. S. 199 at the town of Cave Junction and goes to Oregon Caves National Monument.

There are many gravel roads in the valley which follow the major tributaries and there are 200 miles of unimproved dirt roads.

There is a small landing strip for light planes located three miles south of Cave Junction near U. S. 199. There are no railroad transportation facilities in this area.

Western Greyhound operates regular bus schedules on U. S. 199 and regular freight truck service is maintained over the same route.

The lower 33 miles of the Illinois main stem is accessible only by trail and all of this area is extremely rugged.

Present Economy

Agriculture is the economy base for this region. Some dairy cattle and a few hundred head of beef cattle are raised along with various types of agricultural crops in the major valley areas. There are approximately 180 farms in the area.

Logging is carried on to some extent but the relative inaccessibility of the majority of the lands has limited the development of this resource.

Tourist trade is of some importance, particularly since the highway to Oregon Caves National Monument starts from the Redwood Highway at Cave Junction, and there is considerable traffic on the Redwood Highway from and to California passing through the central portion of this sub-basin and following the main stem of the Illinois River near the towns of Cave Junction and Kerby.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

Precipitation data are collected at the climatological station located in the town of Kerby while both precipitation and temperature data are taken at the station at Elk Valley in California; Figure 30. Average annual precipitation for the Rogue Basin was shown in Figure 3 and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

There are four active stream gaging stations in this sub-basin. These,

along with inactive stations, are located as shown in Figure 29. Stream gaging records are published in Water-Supply Papers by the U. S. Geological Survey.

Yields

Average annual yields for the years 1929 to 1956 for the Illinois River at its mouth are shown in Figure 199. The average annual yield at this location for all years of record is 1,986,000 acre-feet.

Mean monthly discharges for the same point are shown in Figure 200. This plot shows the distribution of the average annual yield with respect to time. Peak runoff in this sub-basin occurs in the month of January as the result of winter rains. Flows are also relatively high in December and February of the average year.

Minimum flow and minimum yield hydrographs for the critical year of record at the gaging stations existing in the area are shown in Figures 201-207. Records of sufficient length indicate that the critical flow period in this area occurred in the early 1930's. Table 7 summarized the critical flow and yield conditions which have occurred in the Rogue Basin.

Drought frequency curves for the Illinois River at Kerby, along with the flood frequency curve for the same location, are shown in Figure 208. The maximum flood curve was prepared from work by the Corps of Engineers and minimum curves were computed independently by the State Water Resources Board using data from water-supply papers. The curves show that for a 10-year average recurrence interval a flood at Kerby of 42,000 cubic feet per second could be expected or low flows averaging 670 cfs for 365 consecutive days, 24 cfs for 30 consecutive days, and 16 cfs for one day. This does not mean that flows of this magnitude will occur once every every 10 years but rather that over a long-term period, say 100 years, such flows will probably occur 10 times at irregular intervals which average once every 10 years.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

The distribution of the location of water rights in the Rogue Basin

was shown in Figure 20 and Table 19 is a summary of the water rights by classification existing at present in the Illinois Valley. Mining rights, the largest group, total 1,048 cfs and there is a total of 645 cfs for irrigation. All of the rights in this section total 1,713 cfs of which 38 percent are consumptive in nature.

There are no legislative or State Engineer's withdrawals applicable to the Illinois Valley. However, the State Engineer issued an ORDER dated July 27, 1934, which stated that no further permits to appropriate water from Sucker Creek or Althouse Creek or their tributaries for any purpose other than domestic use, or for power or mining developments where such may be made without actual consumption of water or injury to existing rights, would be granted.

Depletions

Depletion diagrams of legal rights versus stream miles for the Illinois River and two of its tributaries, Deer Creek, and the East Fork, as well as for Sucker and Althouse Creeks which are tributaries of the Illinois East Fork, are shown in Figures 209-213. The plots show the total of all rights but do not indicate the actual water use because of the complexity of consumptive depletions and the availability of water used non-consumptively for other use at downstream locations. Ordinate values on the plots do not include supplemental rights and these are not part of the totals in Table 19. Supplemental rights permit alternate sources of supply but do not add to original rights.

Rights on Deer Creek and Sucker Creek are almost entirely consumptive in nature while the reverse is true for Althouse Creek. The rights for the East Fork of the Illinois River, including Althouse and Sucker Creeks, are about half consumptive and half nonconsumptive. Runoff of the Illinois River stream system is of such a nature that there is water in excess of rights for the months of November through May.

EXISTING NEEDS

Domestic

Existing rights for surface water from the streams for domestic use is a little greater than 2 cfs in the Illinois Valley.

TABLE 19

WATER RIGHTS SUMMARY

ILLINOIS VALLEY

USE	STREAM		TOTAL RIGHTS CFS
Domestic	All		2.2
Municipal	All		1.0
Irrigation	Althouse Creek	11.6	
	Deer Creek	28.1	
	East Fork Illinois River	17.3	
	Illinois River	24.2	
	Sucker Creek	502.8	
	Others	61.0	
	Total - Irrigation		645.0
Industrial	All		4.8
Power	Sucker Creek	6.0	
	Others	1.1	
	Total - Power		7.1
Mining	Althouse Creek	163.8	
	Deer Creek	3.0	
	Illinois River	68.8	
	Sucker Creek	14.5	
	Others	798.2	
	Total - Mining		1,048.3
Recreation	None		
Wildlife	None		
Fish Life	All		4.8
Pollution Abatement	None		
	TOTAL ILLINOIS VALLEY		1,713.2

Municipal

Only one right exists for municipal use of water in the Illinois Valley and this is for one cfs from the East Fork of the Illinois River in the name of the City of Cave Junction. This is an adequate amount to meet existing needs.

Irrigation

According to the Bureau of Reclamation, none of the agricultural lands in this sub-basin are adequately irrigated and much of the agricultural land is not developed by irrigation at present. Although irrigation rights are large, 450 cfs or 70 percent of the total for this purpose is in the form of an application with a priority date of 1954 for water from Sucker Creek storage in anticipation of a project by the Bureau of Reclamation in that area. This right is in the name of the Illinois Valley Irrigation Committee with the water to be used by the Illinois Valley Irrigation District, to be formed after the construction of the Illinois unit of the Bureau's Illinois Valley Division becomes certain. All of the remaining irrigation rights are small, from 1 cfs to a little greater than 3, and located throughout the agricultural area of the Illinois Valley. Irrigation Lands in the Rogue Basin were shown in Figure 15 and Irrigation Developments in Figure 16.

Power

Power rights total a little more than 7 cfs of which 6 is for one right on Sucker Creek. There is no electrical power production in the valley which serves the entire area. Existing power sites in the Rogue Basin along with their capacity and annual generation were listed in Table 5 and physical features; diversions, canals, powerhouses, etc., were shown in Figure 21.

Industrial

Industrial rights, which total less than 5 cfs, are for boilers, mill-ponds, milling and lumber production.

Mining

Mining rights, representing more than 60 percent of the total rights

in the Illinois Valley, were for the most part to develop mineral deposits which have since been depleted. These rights are still on the books and valid but many are no longer exercised for beneficial use. The location of mineral deposits and active mining operations in the Rogue Basin was shown in Figure 17.

Recreation

There are no recreation water rights in the area and recreational activity involving water is almost entirely that of fishing. Lakes and reservoirs about 5 acres in size in this sub-basin total 60 acres surface area.

Oregon Caves National Monument is the major scenic attraction. Recreation areas in this section and in the Rogue Basin were shown in Figure 18.

Wildlife

Wildlife needs for water in the Illinois Valley are small and easily satisfied due to the low level of development by man in this area.

Fish Life

About five percent of the fall chinook spawn in the Illinois stream system, nearly all on the main stem. Approximately 10 percent of the steelhead trout spawn in this region using Deer Creek and Sucker Creek for the most part, and about 10 percent of the silver salmon, most of which also utilize Deer Creek. Fish spawning areas in the Rogue Basin were shown in Figures 22-24.

Sufficient water to adequately cover the spawning gravel in some of the smaller tributaries is not always available. Mean monthly discharge hydrographs with desirable base flows for fish, as recommended by the State Game Commission for critical points in the Illinois Valley, are shown in Figures 214-219. These plots show that, for average flow conditions, there is insufficient water to satisfy requirements for proper management of the fishery resources during the month of September on Deer Creek at mile 5.0 and the Illinois East Fork at its mouth, during

August and September on the Illinois main stem at mile 30.8; during July, August and September on the Illinois East Fork at mile 11.0; and during July, August, September, and October on Althouse Creek, mile 0.3, and Sucker Creek, mile 11.6.

Fish water requirements for the Rogue Basin stream system were shown in Figure 42. Water temperatures above 65 degrees Fahrenheit which sometimes accompany the low flows occurring during warm, dry summers, is detrimental to fish life. No water temperature data is available for this sub-basin.

It is estimated by the State Game Commission that a total of 115 stream miles available to migratory fish with 173,000 square yards of spawning gravel exist in the Illinois Valley.

Pollution Abatement

Pollution abatement problems are not serious in this section although the needs are not completely satisfied on some of the smaller tributaries which have low summer flows.

There are no sewage treatment plants in the area.

Flood Control

Streams in this sub-basin are flashy in nature with runoff occurring rapidly after rainfall and most floods occur during the heavy rain periods of December, January, and February. Runoff patterns at representative locations in the sub-basin are shown in Figures 214-219 which were discussed under Yields.

Flood damages are primarily agricultural in nature and occur in Deer, Sucker, and Althouse Creeks Basins, along the Illinois East Fork and along the main stem in the vicinity of Cave Junction and Kerby. Total flood damages in the Illinois Valley during the 1955 flood amounted to $174,000 or 4.3 percent of the total for the Rogue River Basin. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 listed damages which occurred during the 1955 flood.

Bank-full stages of the streams often create as much damage as flooding;

in some cases more damage. This was particularly true in the 1955 flood and was again evident during December, 1957, and January, 1958, where high water created as much damage along Sucker Creek and the East Fork of the Illinois as occurred during the 1955 flood.

FUTURE NEEDS

Domestic

The overall potential of this sub-basin is not sufficiently large to cause an appreciable gain in population and domestic needs for water. In the future such needs can probably be met from surface water supplies.

Municipal

Municipal gains should not be large in this region and there is sufficient water to meet future requirements.

Irrigation

The irrigation potential of the Illinois Valley was sufficiently large to warrant an investigation by the Bureau of Reclamation and the publication of a feasibility report in July of 1955. This report covers development of the Illinois unit of the Illinois Valley Division which includes lands in the vicinity of Kerby and Cave Junction along the main stem and the continuous valley lands of Sucker and Althouse Creeks and the Illinois East Fork. Lands lying along Deer Creek, called the Selma Unit, have been deferred as being economically undevelopable at present. There are sufficient existing water rights and applications, including an application for 450 cfs for stored water on Sucker Creek, to meet the needs of the project and attempts are now being made to form an irrigation district which would offer assurance to the Bureau that the people in this area want and will back such a project. Physical features of the Illinois unit, including the Sucker Creek Reservoir and supply canals, were shown in the Rogue Basin irrigation development plot, Figure 16.

Power

Figure 41 was a profile showing the location of sites, along with heads,

used in the power potential computations. Those in this sub-basin included in the study were Clear Creek and Bald Mountain.

Average discharges for each month were determined for every site and discharge duration curves were prepared from this information. These are shown in Figures 220 and 221.

With the use of heads and discharges, monthly power potentials were determined for each site and duration curves were prepared from this information. With the use of these plots, Figures 222 and 223, the power potential at individual sites can be determined.

Due to low summer flows and high winter flows in the Illinois Valley stream system, there is only enough water in the month of September to develop an average of 5,000 kilowatts of power (3,600,000 KWH of energy per month) if the head shown in Figure 41 were utilized. The average power which can be developed during the heavy winter flows, for the month of January, is 231,000 kilowatts (167,244,000 KWH of energy per month), giving an average for the mean discharge for all years of record of approximately 100,000 kilowatts (876,000,000 KWH of energy annually). None of this potential has been developed at present.

An application from the Coos-Curry Electric Cooperative is before the Federal Power Commission for a license to build a power project at the Bald Mountain site. This project would develop about 75 percent of the practical potential existing in the Illinois Valley.

Industrial

Future needs for water to provide for the expansion of the industrial potential of the Illinois sub-basin will stem primarily from the growth of the natural resource oriented operations. Three possibilities exist for growth, all of which have severe limitations including a lack of water resources under the conditions of existing or planned stream regimen.

The first and most limited potential lies in the expansion of food processing operations. With full development of irrigable lands in the Illinois Basin, most of which are concentrated in the vicinity of the communities of Selma, Kerby, and Cave Junction, it is possible that some

local food processing industries would be economically feasible. A primary problem faced in the establishment of a food processing industry in this area would be the problem of sufficient amounts of commodities to make such operations economically feasible.

While it is impossible to estimate the degree of food processing operations that might be established in the sub-basin, it is quite likely that the total water requirements for such operations would not exceed 10-15 cfs. Under the existing pattern of natural flow and contemplated storage in this sub-basin versus existing depletion potentials, it is probable that problems will be encountered in supplying industries with adequate amounts of water since they will be operating, to a major degree, during the critical flow periods of the summer. The establishment of food processing operations in this area will depend to a significant degree upon the economics of providing their water supply from storage within the Basin.

The second possibility for industrial expansion is related to the timber resources of this sub-basin and adjacent areas. All evidence indicates that the establishment of major pulp and paper operations in this sub-basin is unlikely. Rail transportation facilities are lacking and road facilities are not comparable with other locations within the Rogue River Basin. In consideration of the transportation problem and the inadequate access to timber of much of the Rogue River Basin, it would be unlikely that a mill of more than 200-tons capacity would be located in this area. Such an operation would require in the neighborhood of 20 cfs for its water supply which under conditions of depletion existing in the Basin would require storage for discharge during the low flow summer months. The lower section of this sub-basin, lying below the confluence of Deer Creek and the Illinois, is so rugged and inaccessible that any development of an industrial nature in this section is highly unlikely.

There is a possibility that some other type of secondary wood manufacturing operation could come into the sub-basin. The problems connected with composition board, plywood and similar operations lie in the field of pollution abatement and water supply. These operations would require storage for a guarantee of supplies during critical periods.

The third and most likely type of development which would come in this sub-basin is in the field of mineral industry. There are proven deposits

of cobalt and nickeliferous ores in the Illinois Basin. Preliminary investigations have been made and there is real possibility of future expansion when market situation for such minerals improves. Since the total mineral resources in the area are unknown, it is impossible to predict just what the water needs of such operations would be, but on a unit basis a comparison can be made with the nickel operations at Riddle, Oregon, in the Umpqua River Basin. Using this installation as a guide, it is assumed that the nickel output of twice that of the Riddle operation would require some 12 to 16 cfs for process and cooling water purposes. Operations of this size would probably result in the employment of some 800 to 1,000 people all of which would be contingent upon the availability of the 12 to 16 cfs for the basic water supply. This supply could probably not be provided under existing depletion potentials without the development of storage somewhere in the upper Illinois sub-basin watershed.

All evidence indicates that any major industrial expansion in the Illinois River sub-basin will be greatly dependent upon the economics of providing sufficient water for the various processes. Stable supplies for all additional industrial operations will probably have to come from the development of storage within the Basin.

Mining

According to the State Department of Geology and Mineral Industries, minerals of significance in the Illinois Valley besides nickel are chromite, copper, gold, clay brick and tile, and limestone. It is not likely that these will be developed to any great extent.

Recreation

The recreational needs of the immediate area are not large but the potential is great, particularly if irrigation developments such as the Sucker Creek Reservoir take place, and this would be of great help in supplying additional recreational facilities for the entire Rogue Basin, particularly since travel from the Grants Pass area into the Illinois Valley can be accomplished by means of a good highway.

Wildlife

Wildlife needs will probably remain static unless their habitat is appreciably changed by future developments which now seem unlikely.

Fish Life

If the existing characteristics of the stream system remain unaltered, the changes in the fishery resource will result primarily from increasing fishing pressure.

Construction of storage reservoirs in this region would enhance the fishery resource by making it possible to meet desirable base flow requirements but at the same time would reduce the miles of streams available to migratory fish. The area of spawning gravel within the reservoirs would be inundated but the area downstream would increase due to higher flows.

Pollution Abatement

Requirements for pollution abatement will not increase much over the present level.

Flood Control

Flood control needs will increase with increasing levels of development. Storage is necessary to provide adequate protection in this sub-basin but none of the many possible sites appear economically justifiable for flood control alone.

The Corps of Engineers' current study does not include flood control storage in the Illinois Valley and the proposed operation of the Sucker Creek Reservoir of the Bureau of Reclamation project provides little flood control space.

For the purpose of determining the optimum flood control potential of the Rogue Basin, storage sites in this sub-basin included in the study by the State Water Resources Board were Althouse Creek, Sucker Creek, Indian Hill on Woods Creek, and Kerby Peak on Deer Creek (Figure 43).

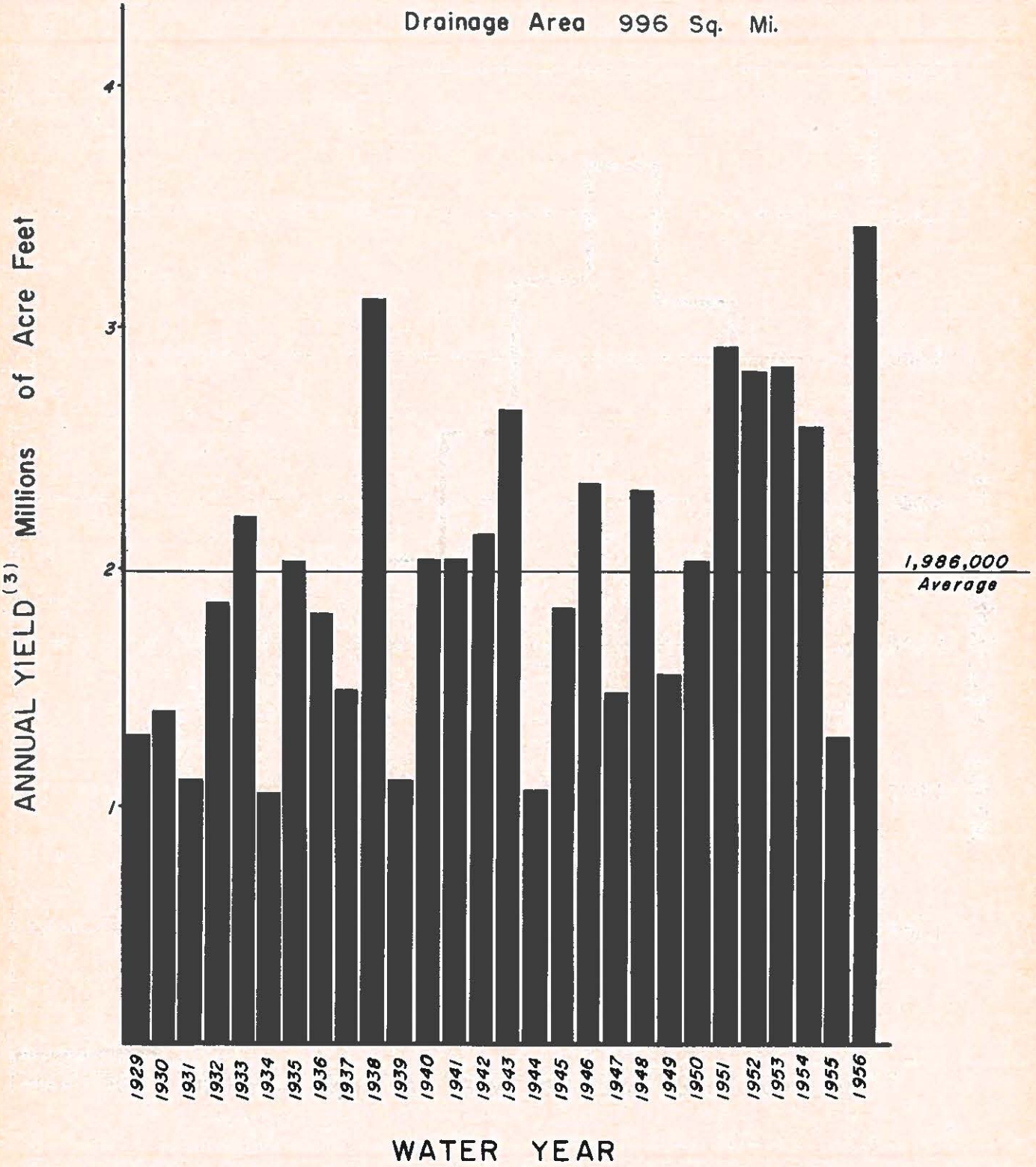
The regulated outflows for the floods considered and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potentia Flood Control, and were listed in Table 13.

ILLINOIS VALLEY

FIGURE 198

ROGUE RIVER BASIN
YIELD DIAGRAM
ANNUAL YIELD[3]
OF
ILLINOIS RIVER

Drainage Area 996 Sq. Mi.



(3) *Part of yield determined directly from USGS Water Supply Papers. Total yield computed from area-yield correlation with known part.*

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File No. 15.220

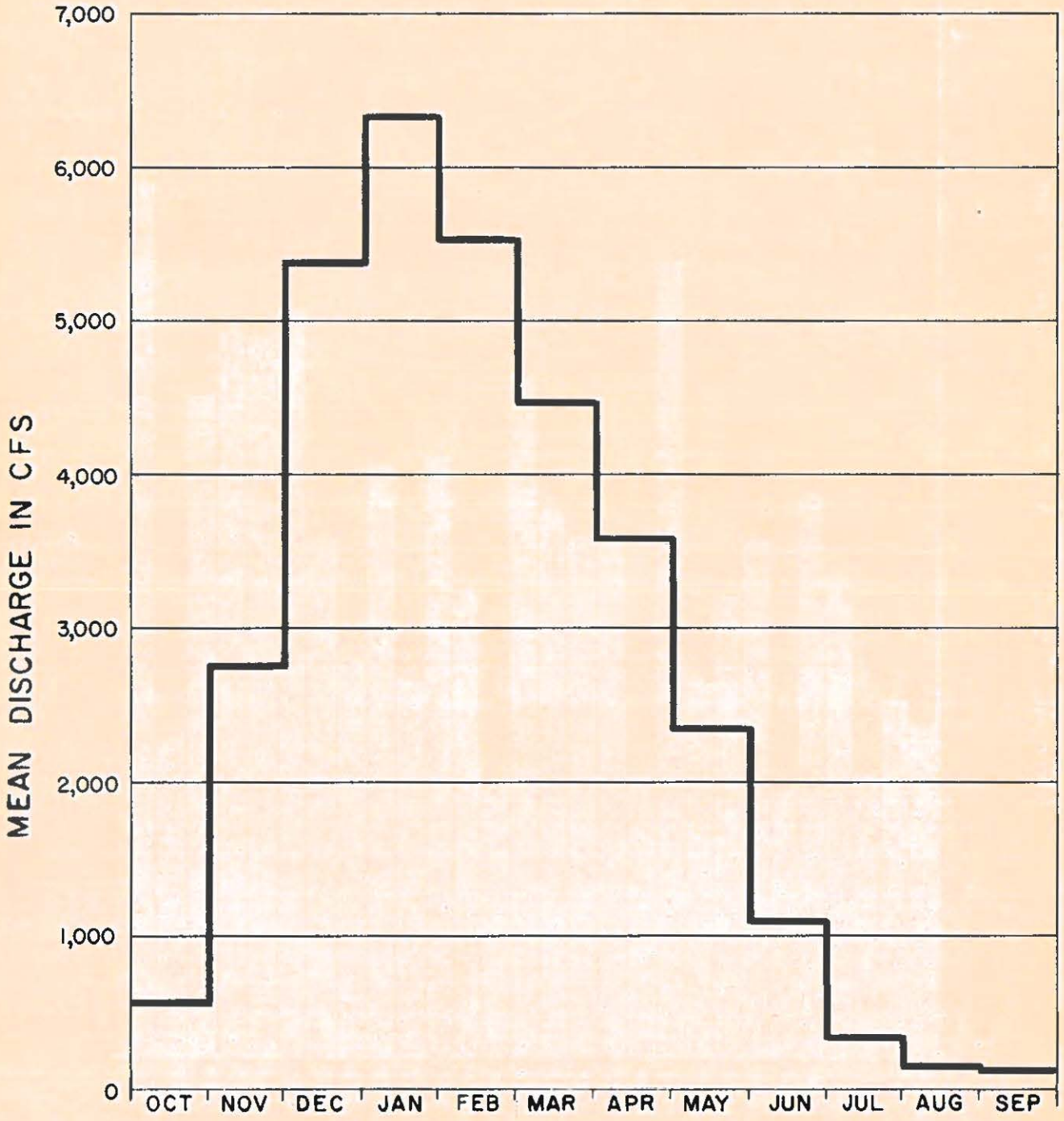
FIGURE 199

ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

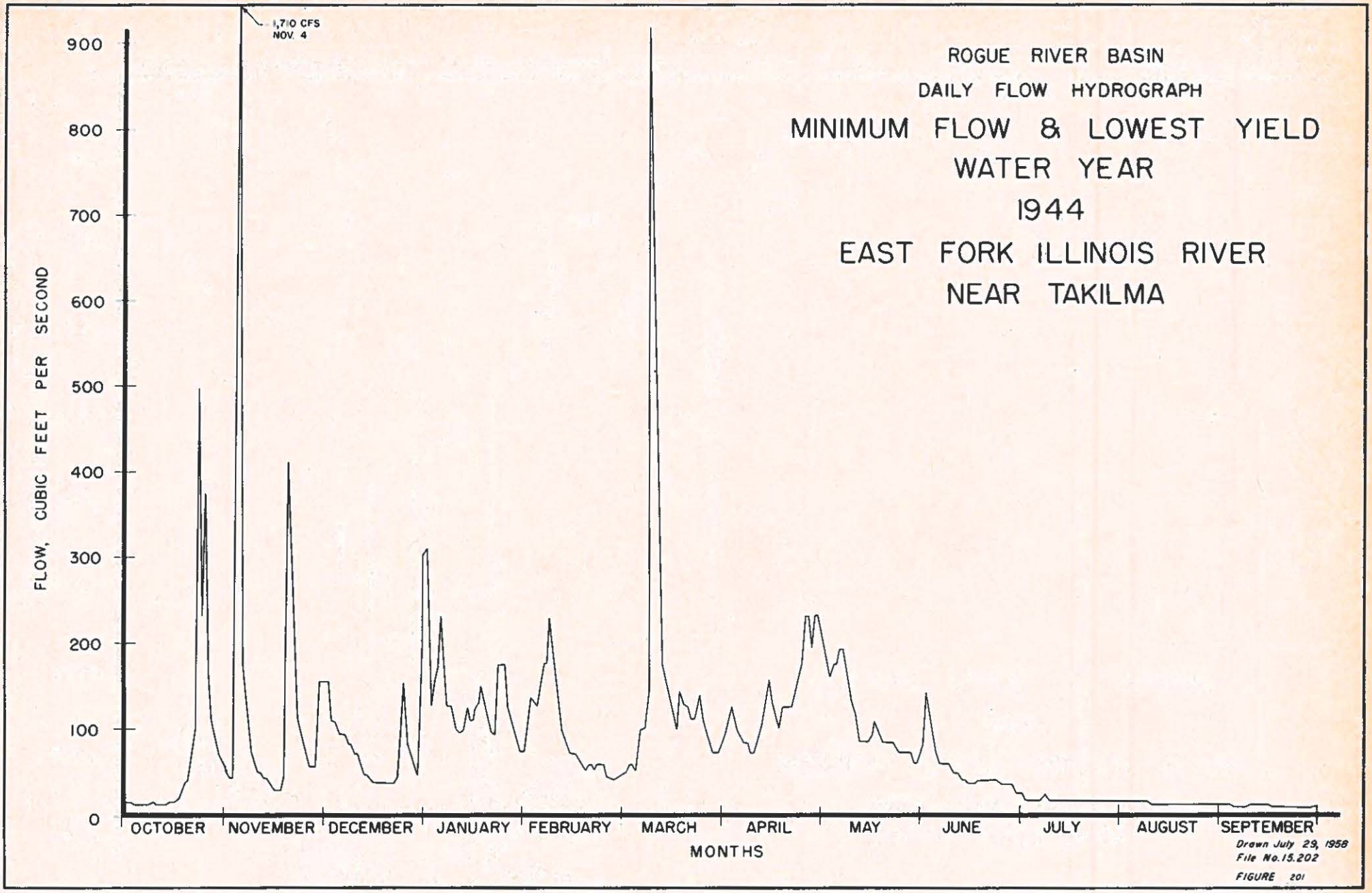
ILLINOIS RIVER

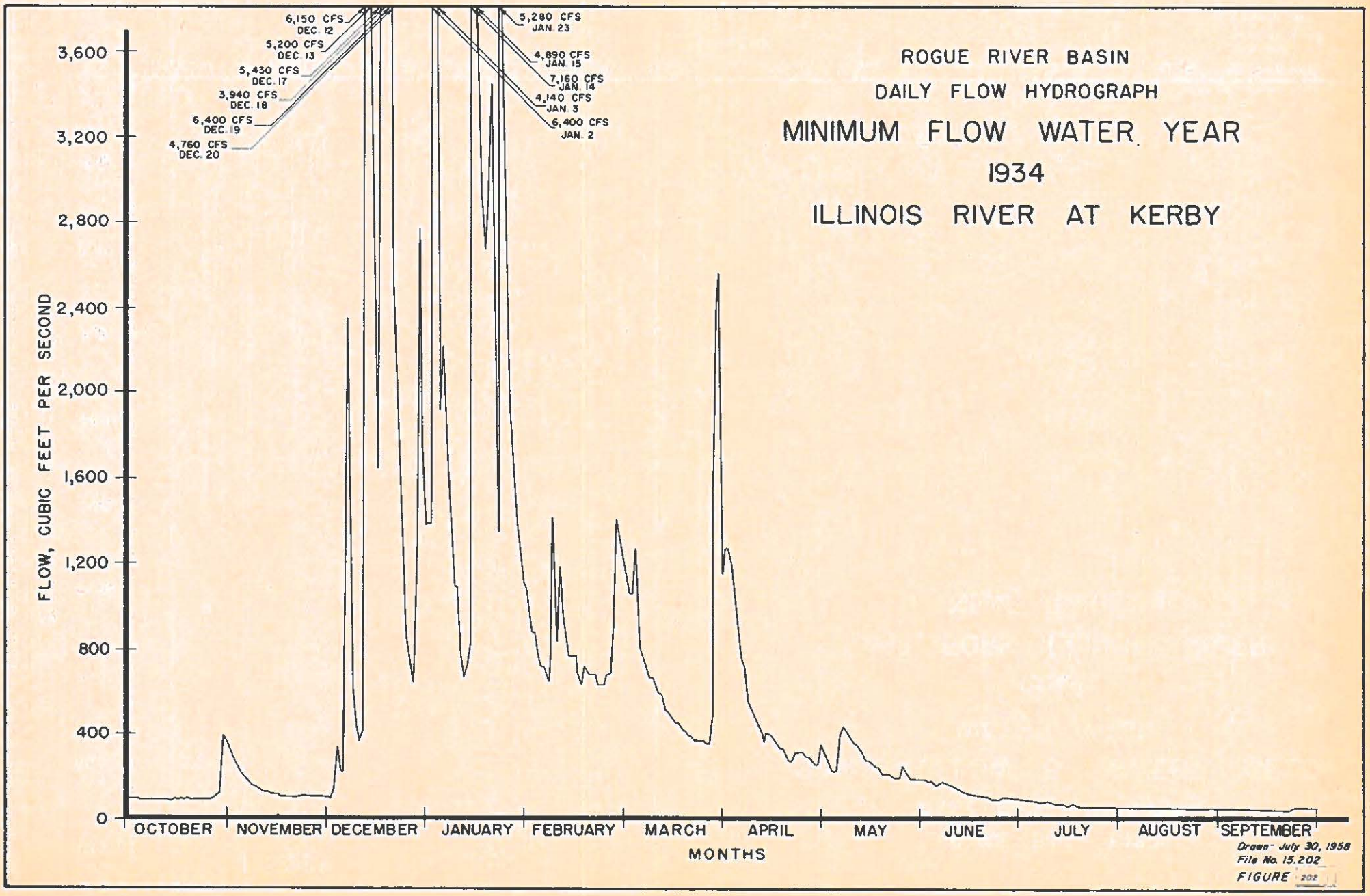
1929 - 1956

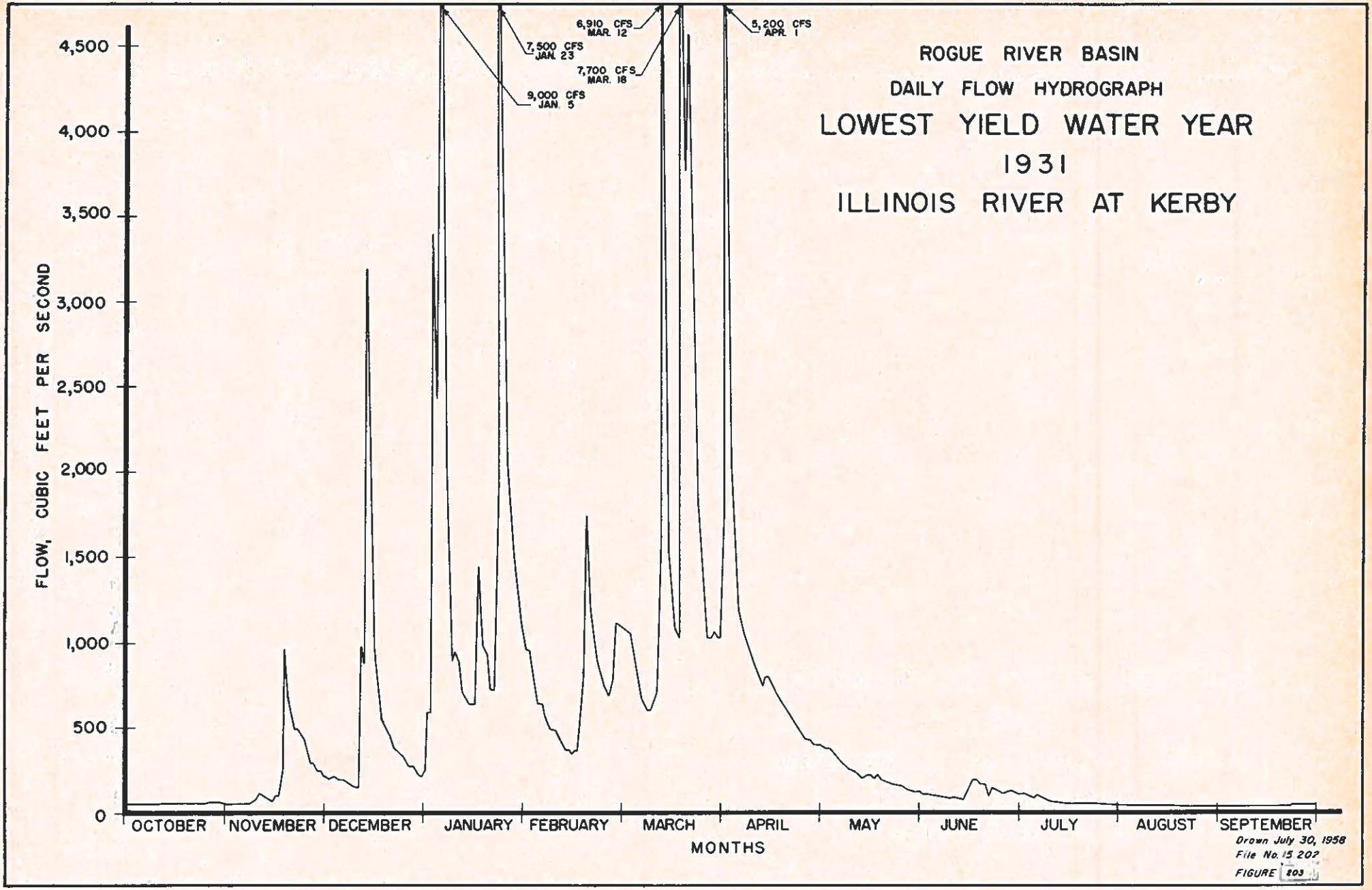


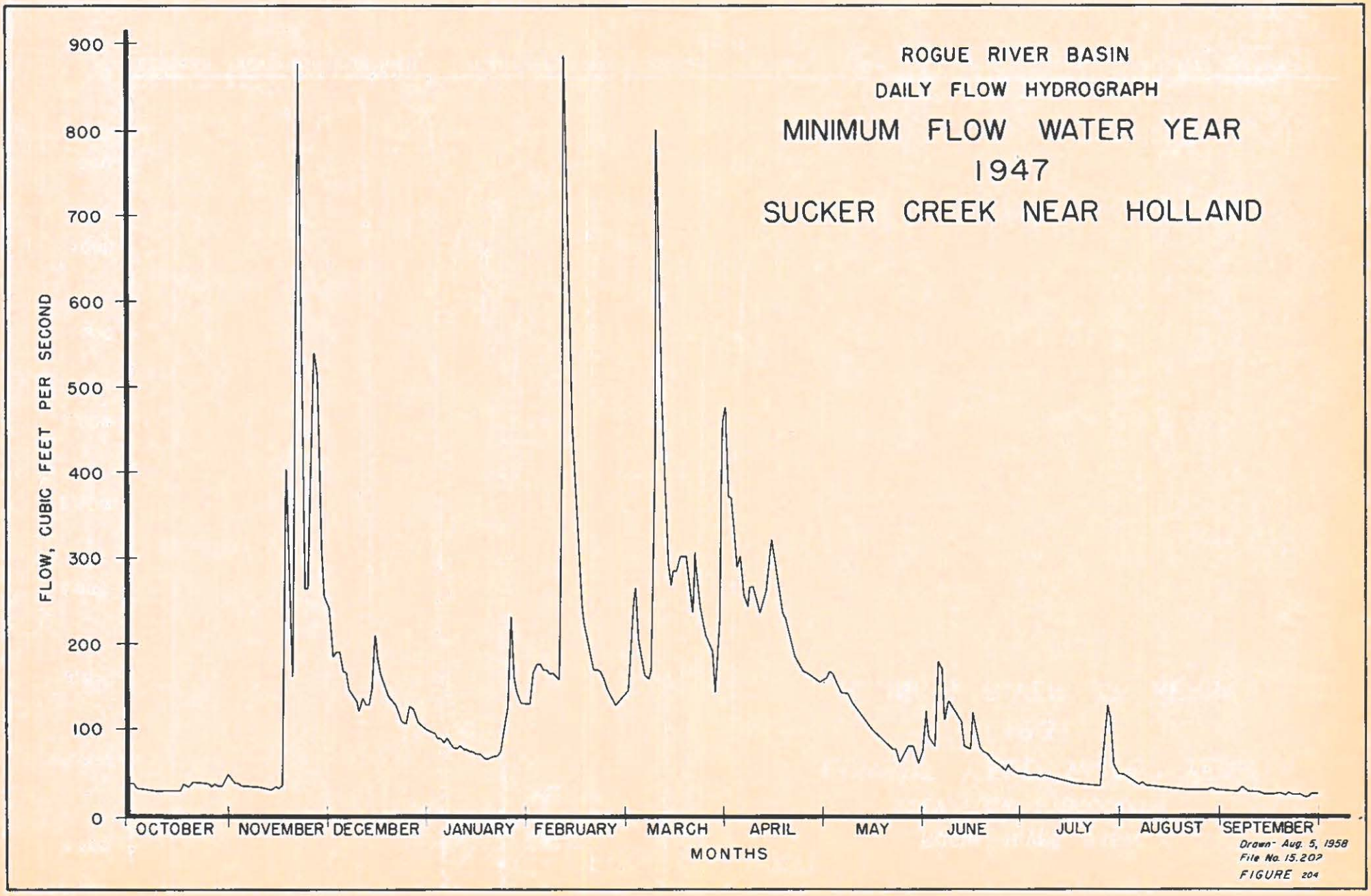
Drawn Nov. 18, 1958
File No. 15.202

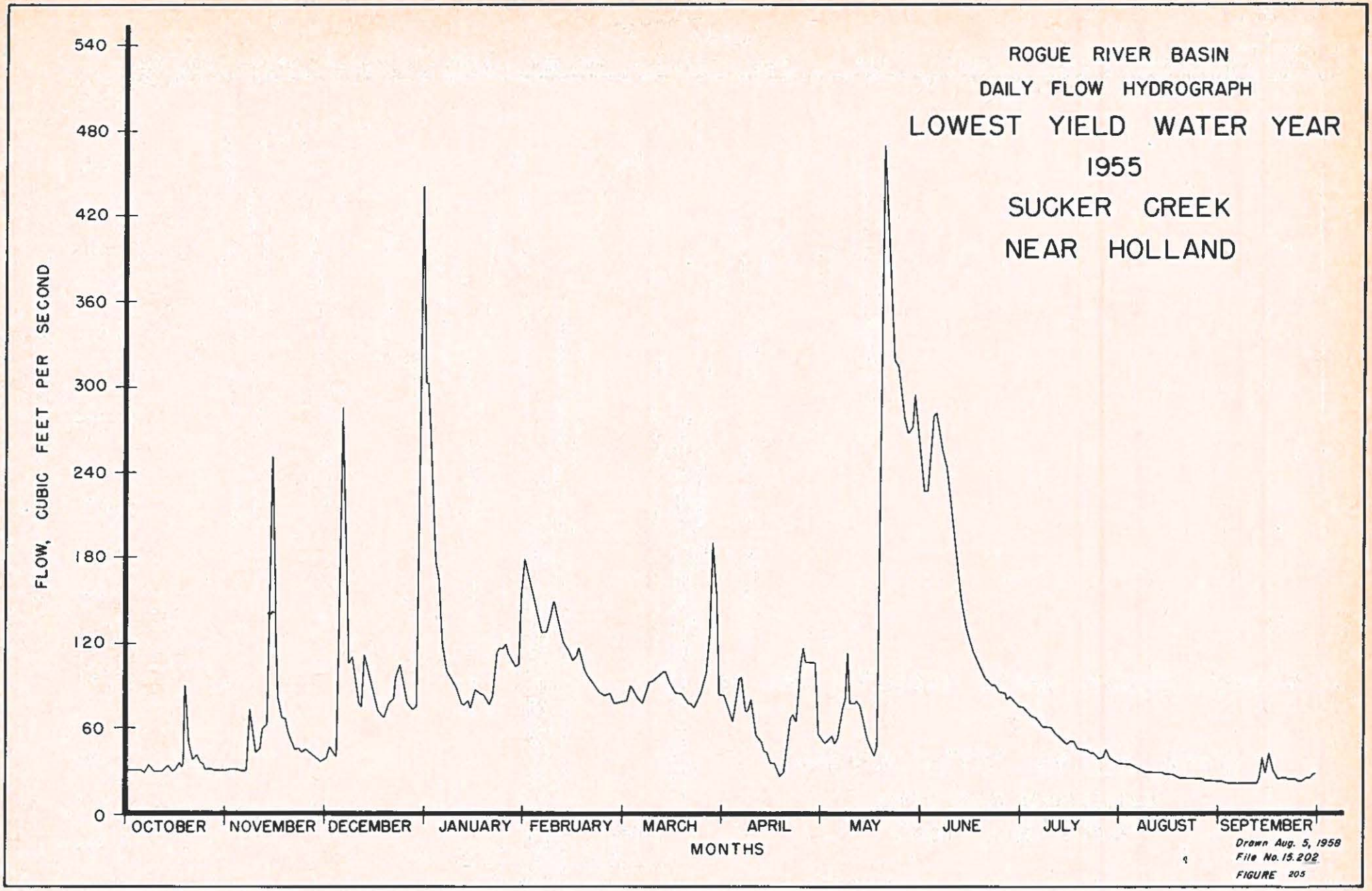
FIGURE 200

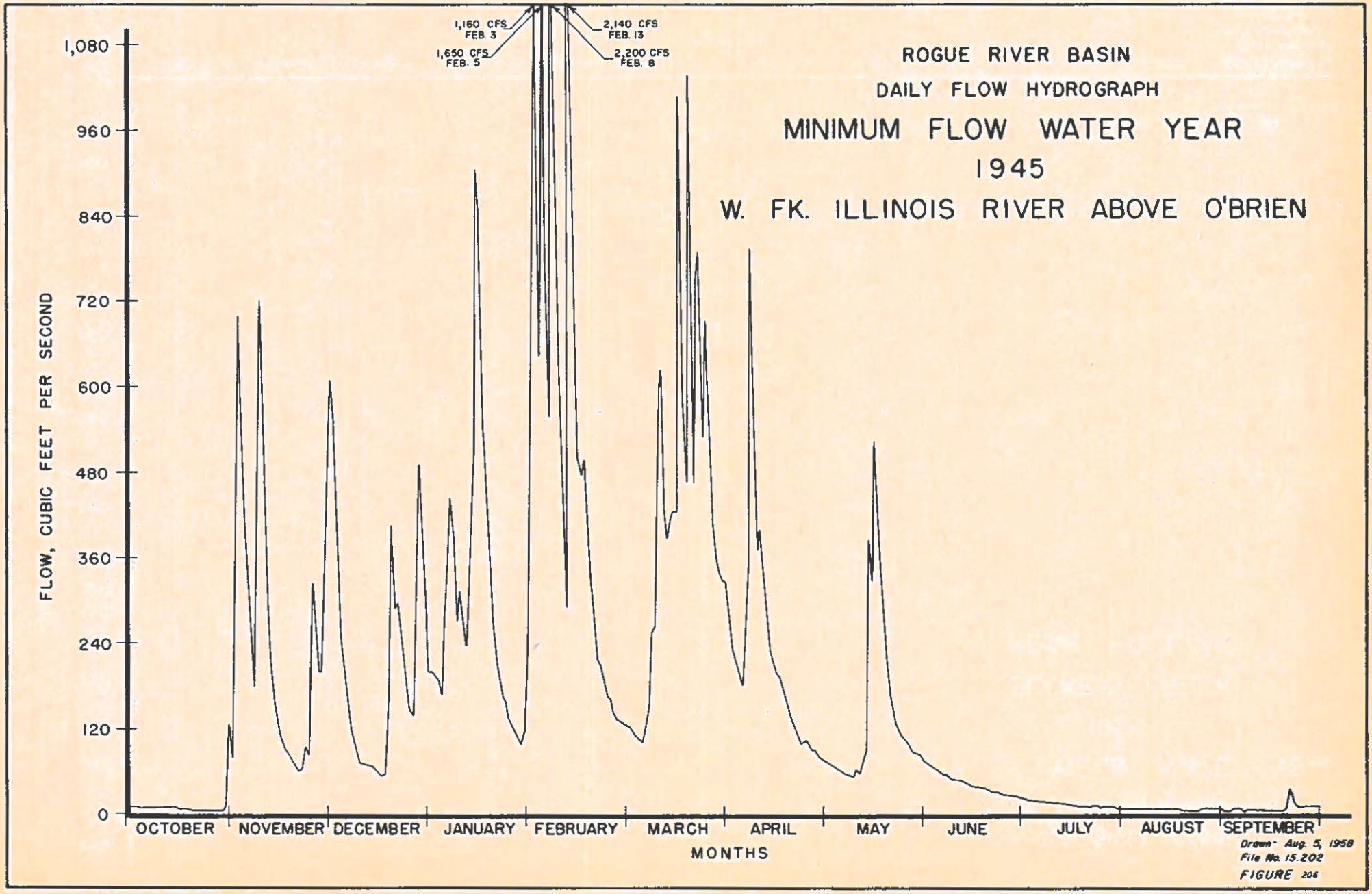

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW & LOWEST YIELD
WATER YEAR
1944
EAST FORK ILLINOIS RIVER
NEAR TAKILMA
1,710 CFS
NOV. 4
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 29, 1958
File No. 15.202
FIGURE 201

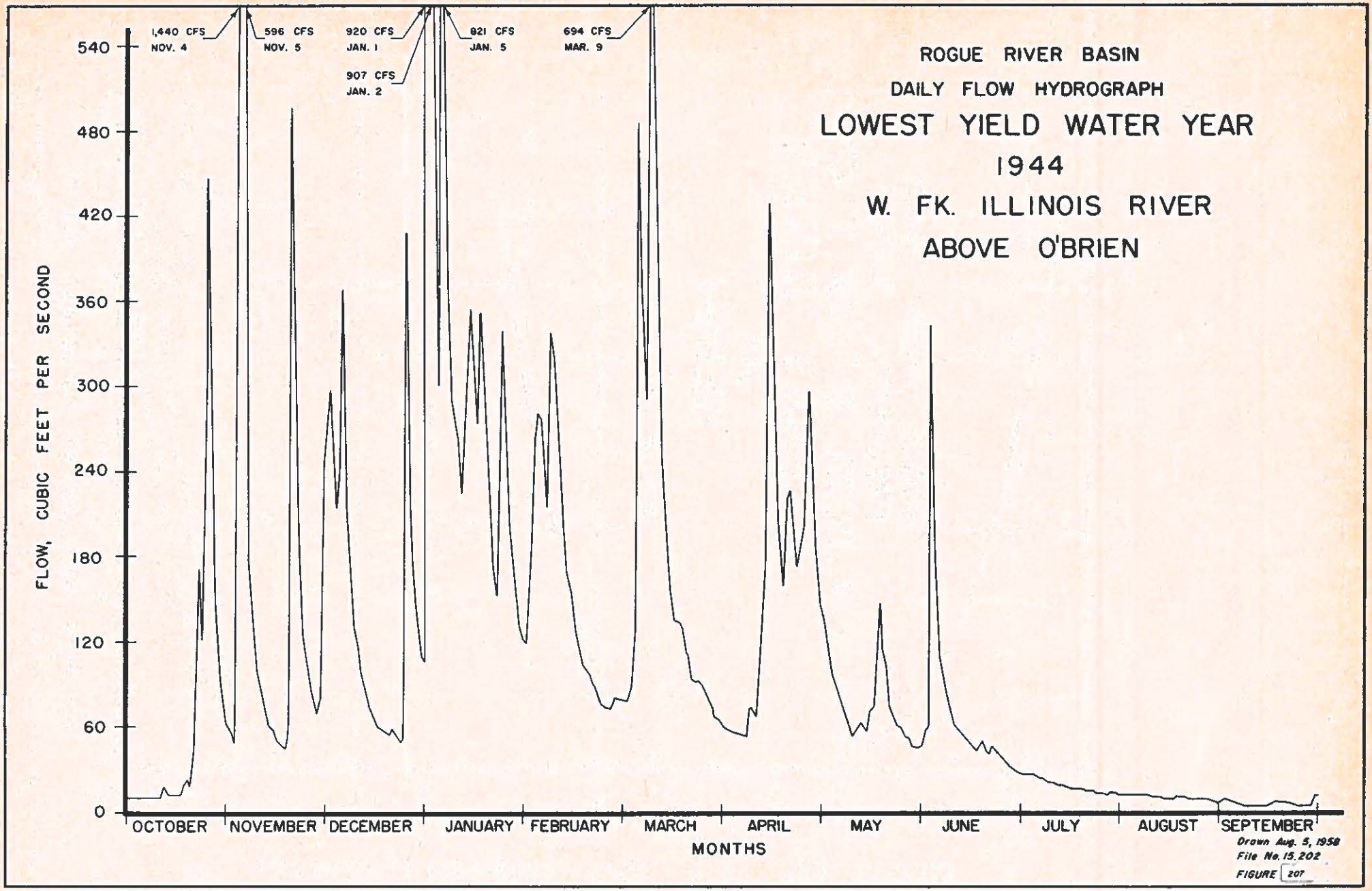

ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1934
ILLINOIS RIVER AT KERBY
6,150 CFS DEC. 12
5,200 CFS DEC. 13
5,430 CFS DEC. 17
3,940 CFS DEC. 18
6,400 CFS DEC. 19
4,760 CFS DEC. 20
5,280 CFS JAN. 23
4,890 CFS JAN. 15
7,160 CFS JAN. 14
4,140 CFS JAN. 3
6,400 CFS JAN. 2
FLOW, CUBIC FEET PER SECOND
3,600
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn- July 30, 1958
File No. 15.202
FIGURE 202


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1931
ILLINOIS RIVER AT KERBY
6,910 CFS MAR. 12
7,500 CFS JAN. 23
7,700 CFS MAR. 18
5,200 CFS APR. 1
9,000 CFS JAN. 5
FLOW, CUBIC FEET PER SECOND
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn July 30, 1958
File No. 15 207
FIGURE 803


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1947
SUCKER CREEK NEAR HOLLAND
FLOW, CUBIC FEET PER SECOND
900
800
700
600
500
400
300
200
100
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn- Aug. 5, 1958
File No. 15.202
FIGURE 204


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1955
SUCKER CREEK
NEAR HOLLAND
FLOW, CUBIC FEET PER SECOND
540
480
420
360
300
240
180
120
60
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 5, 1958
File No. 15.202
FIGURE 205


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
MINIMUM FLOW WATER YEAR
1945
W. FK. ILLINOIS RIVER ABOVE O'BRIEN
1,160 CFS FEB. 3
1,650 CFS FEB. 5
2,140 CFS FEB. 13
2,200 CFS FEB. 8
FLOW, CUBIC FEET PER SECOND
1,080
960
840
720
600
480
360
240
120
0
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn- Aug. 5, 1958
File No. 15.202
FIGURE 206


ROGUE RIVER BASIN
DAILY FLOW HYDROGRAPH
LOWEST YIELD WATER YEAR
1944
W. FK. ILLINOIS RIVER
ABOVE O'BRIEN
1,440 CFS NOV. 4
596 CFS NOV. 5
920 CFS JAN. 1
907 CFS JAN. 2
821 CFS JAN. 5
694 CFS MAR. 9
FLOW, CUBIC FEET PER SECOND
0
60
120
180
240
300
360
420
480
540
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
MONTHS
Drawn Aug. 5, 1958
File No. 15.202
FIGURE 207

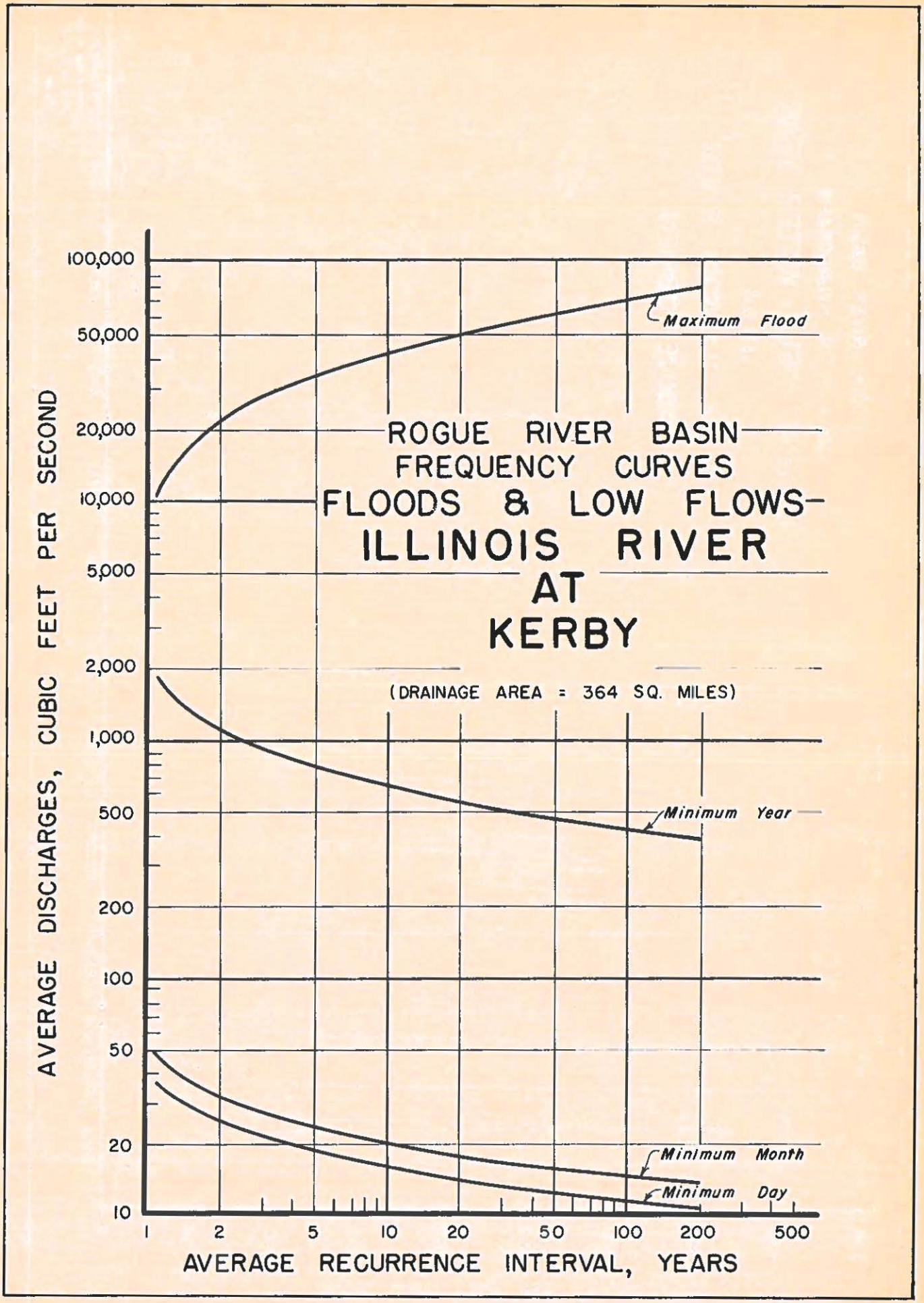

ROGUE RIVER BASIN
FREQUENCY CURVES
FLOODS & LOW FLOWS-
ILLINOIS RIVER
AT
KERBY
(DRAINAGE AREA = 364 SQ. MILES)
Maximum Flood
Minimum Year
Minimum Month
Minimum Day
AVERAGE DISCHARGES, CUBIC FEET PER SECOND
100,000
50,000
20,000
10,000
5,000
2,000
1,000
500
200
100
50
20
10
1
2
5
10
20
50
100
200
500
AVERAGE RECURRENCE INTERVAL, YEARS

FIGURE 208

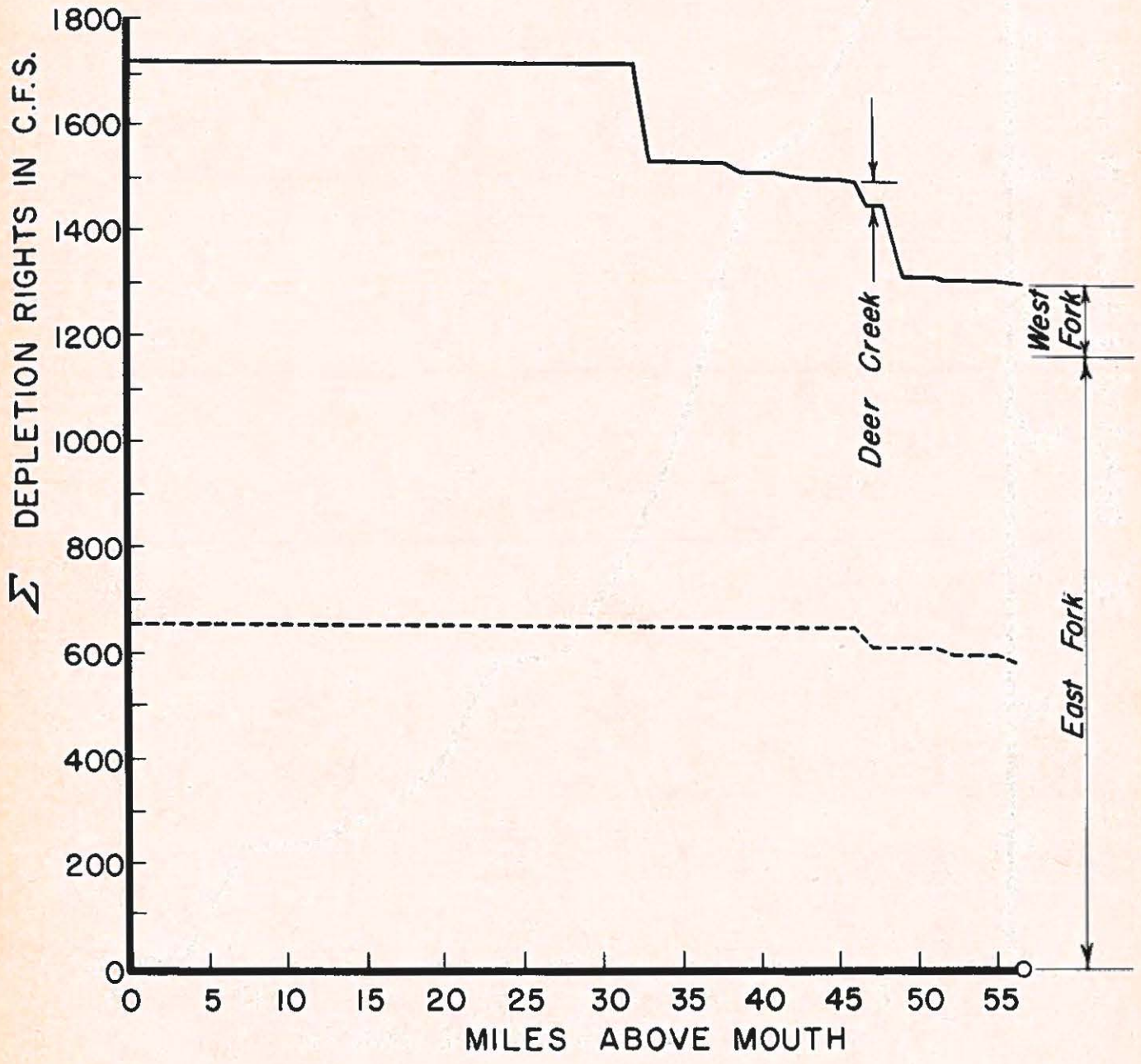
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

ILLINOIS RIVER

as of Jan. 1, 1958



Drawn - Oct. 29, 1958
File No. 15.302

FIGURE 209

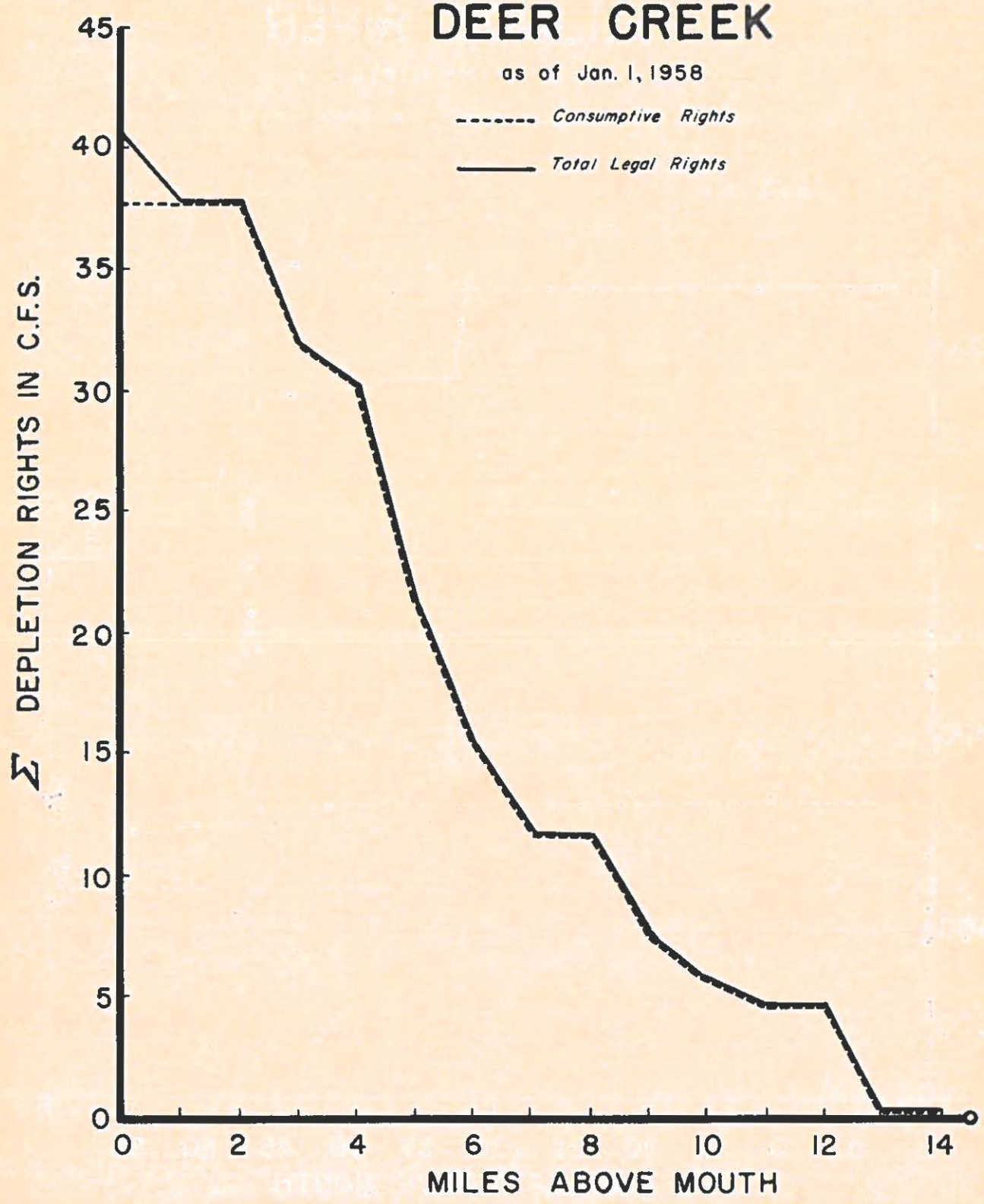
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

DEER CREEK

as of Jan. 1, 1958



Drawn - May 27, 1958
File No. 15.302

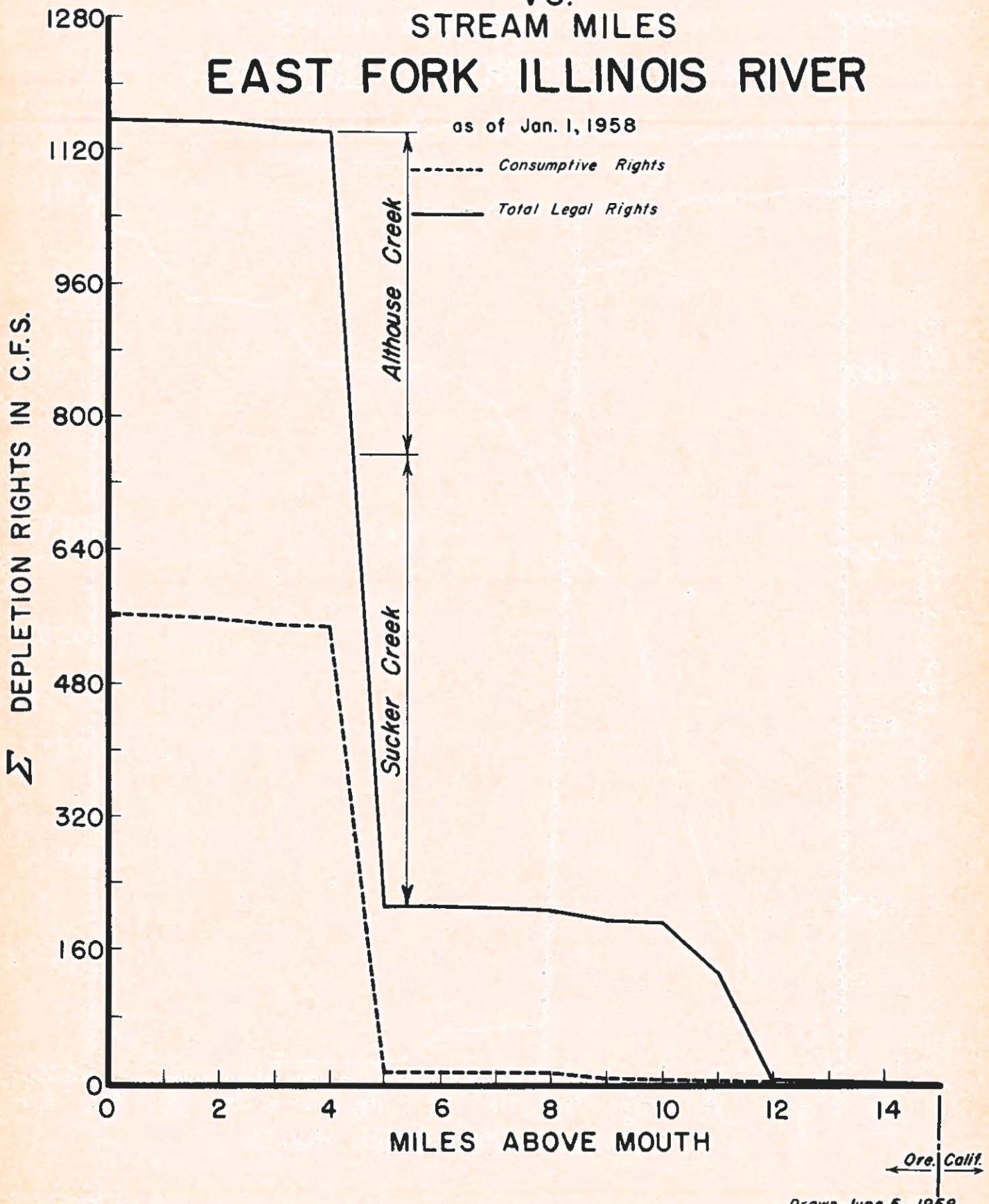
FIGURE 210

ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

EAST FORK ILLINOIS RIVER



Drawn-June 5, 1958
File No. 15.302

FIGURE 211

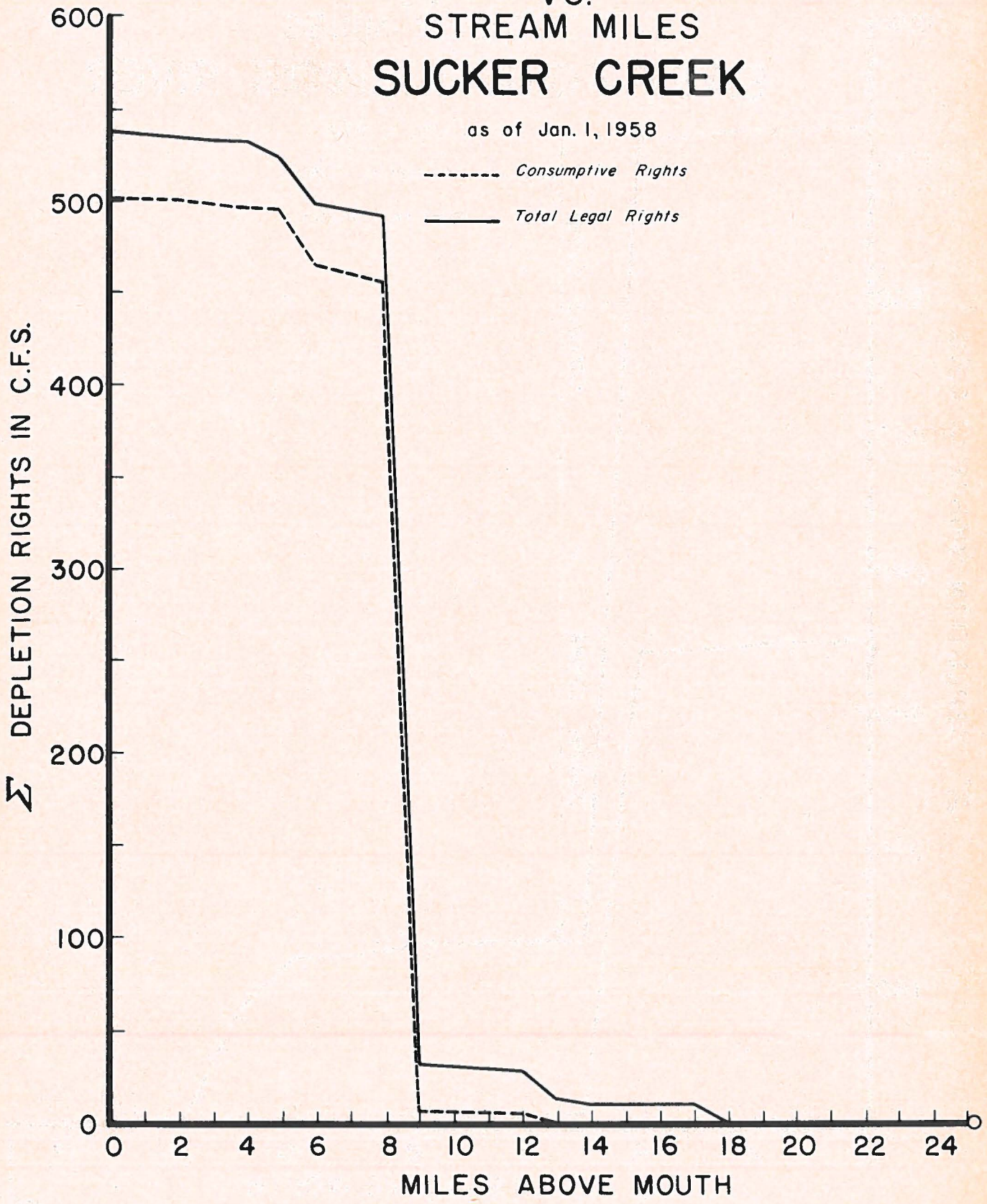
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

SUCKER CREEK

as of Jan. 1, 1958



Drawn May 28, 1958
File No. 15.302

FIGURE 212

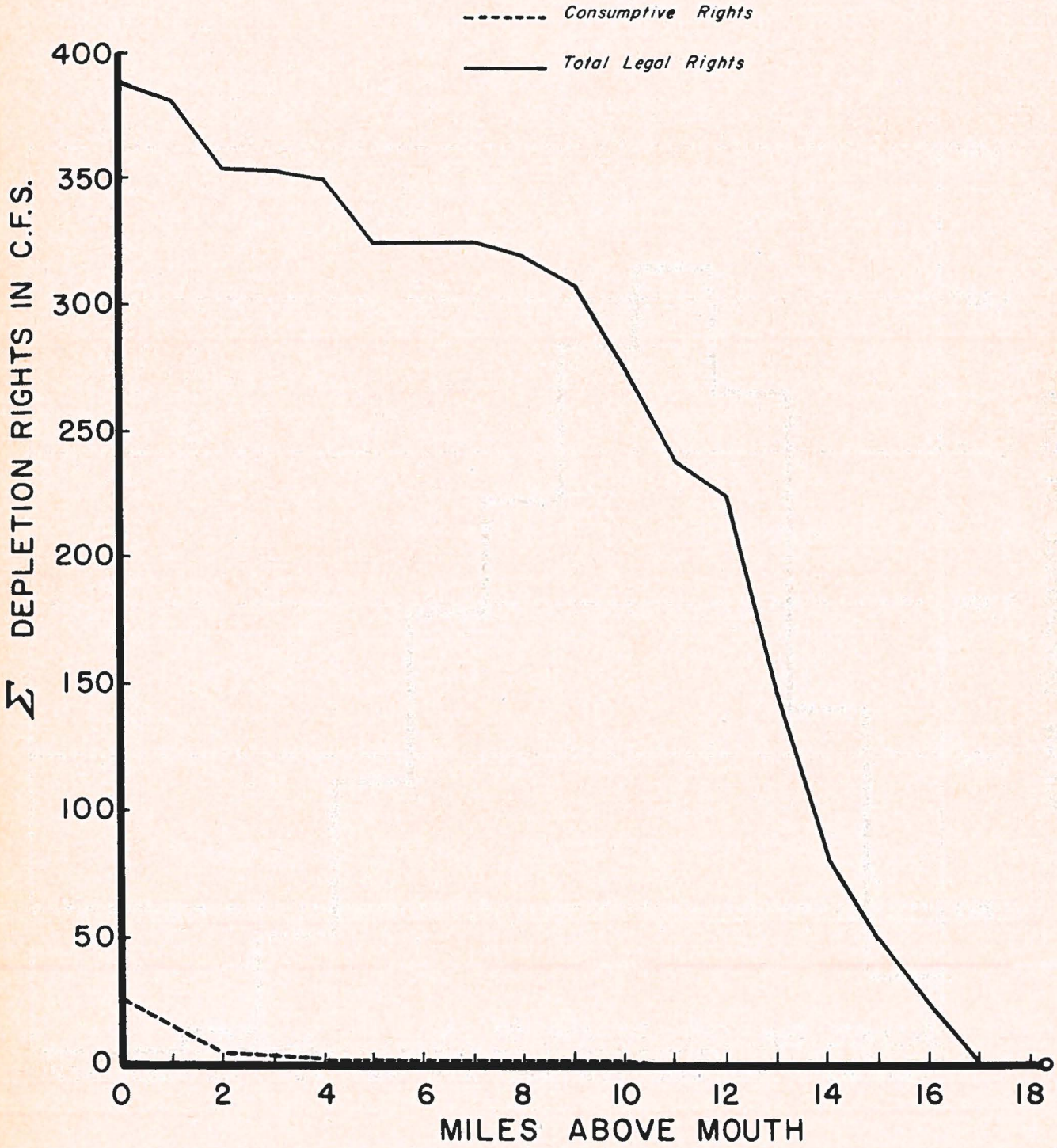
ROGUE RIVER BASIN

DEPLETION DIAGRAM

LEGAL RIGHTS VS. STREAM MILES

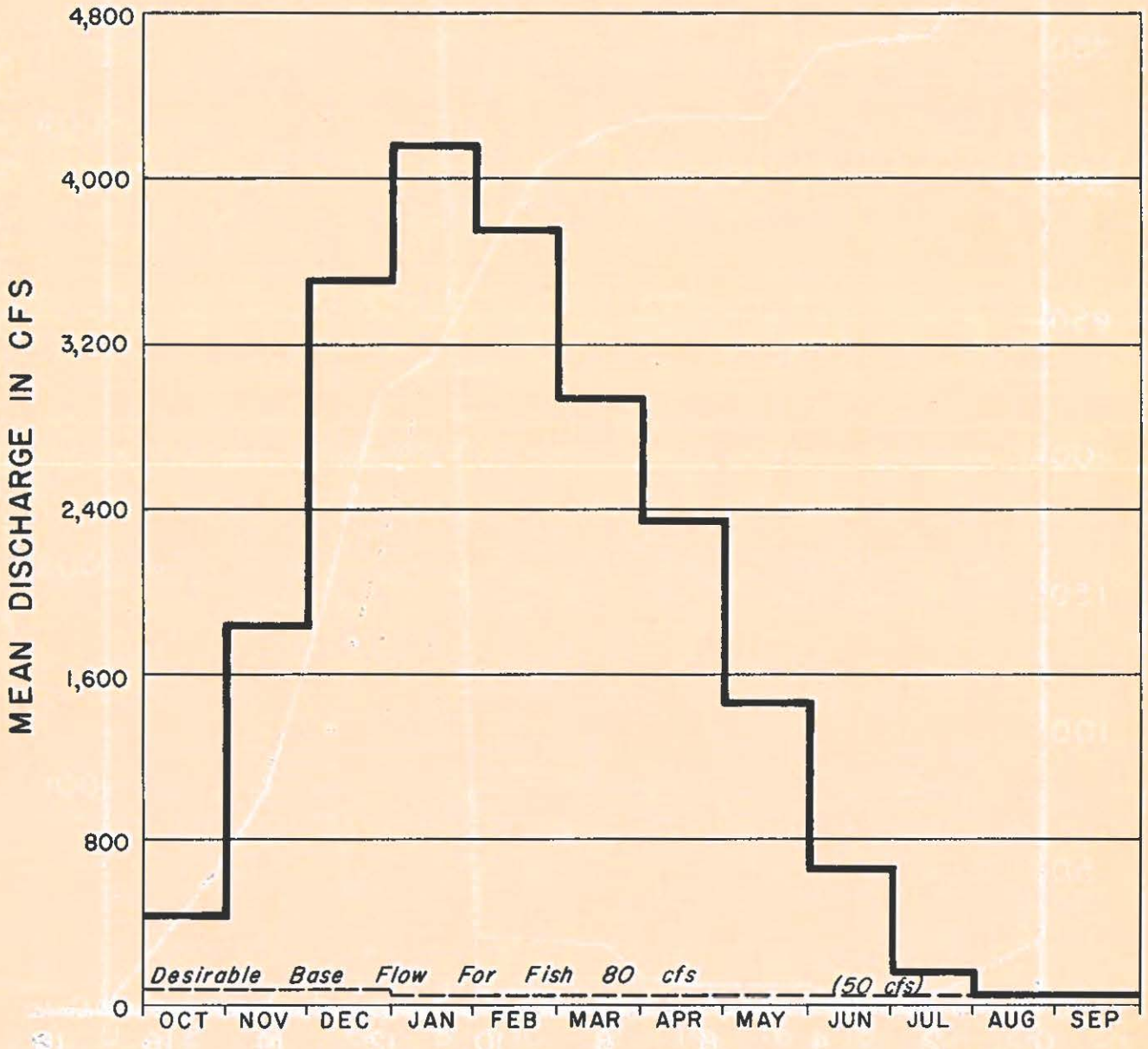
ALTHOUSE CREEK

as of Jan. 1, 1958



Drown - June 4, 1958
File No. 15.302
FIGURE 213

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
ILLINOIS RIVER - MILE 30.8
1927-1955



Drawn Sept. 5, 1958
File No. 15.202
FIGURE 214

ROGUE RIVER BASIN

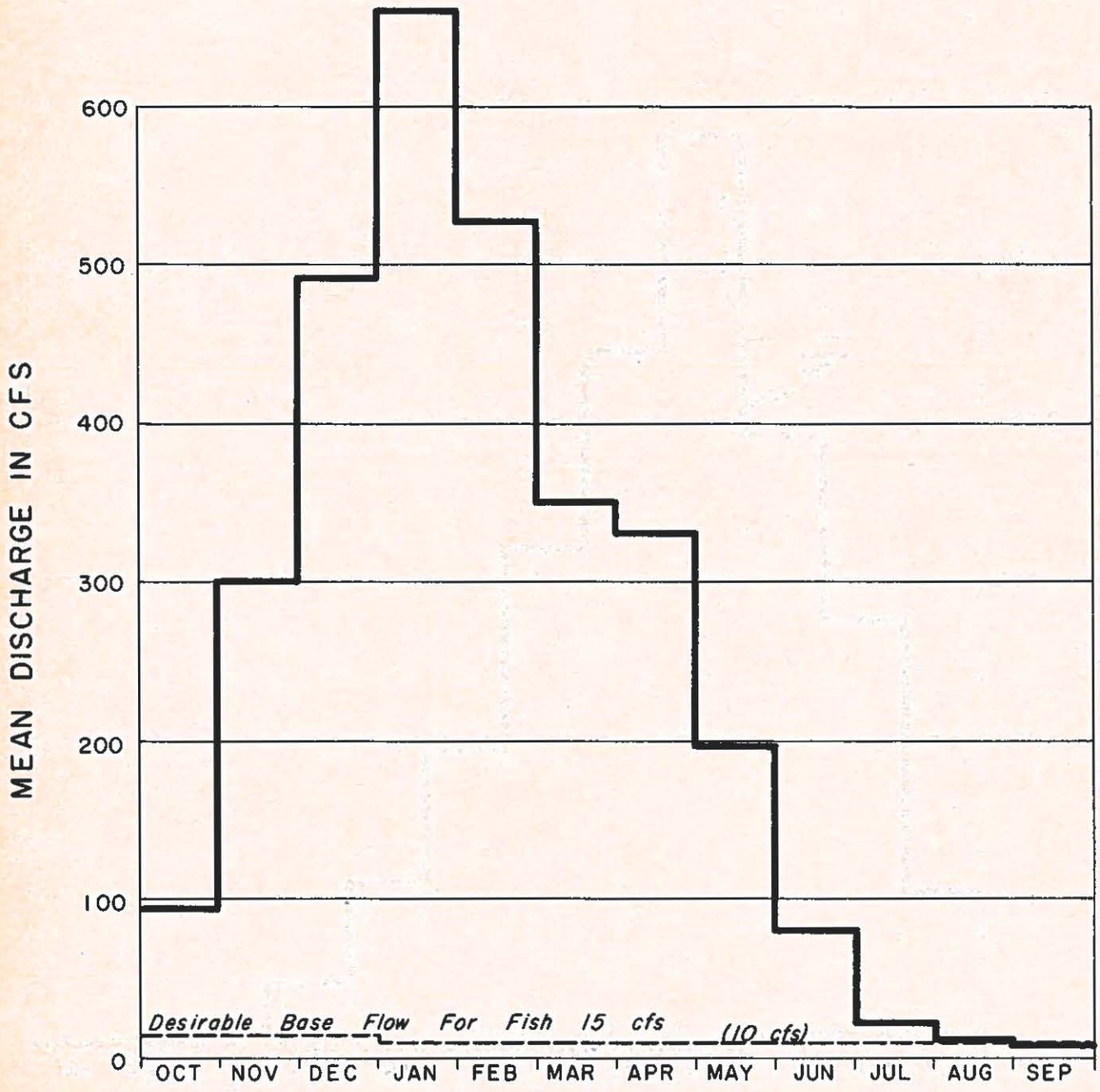
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

DEER CREEK - MILE 5.0

1943-1955



Drawn Sept. 5, 1958
File No. 15.202

FIGURE 215

ROGUE RIVER BASIN

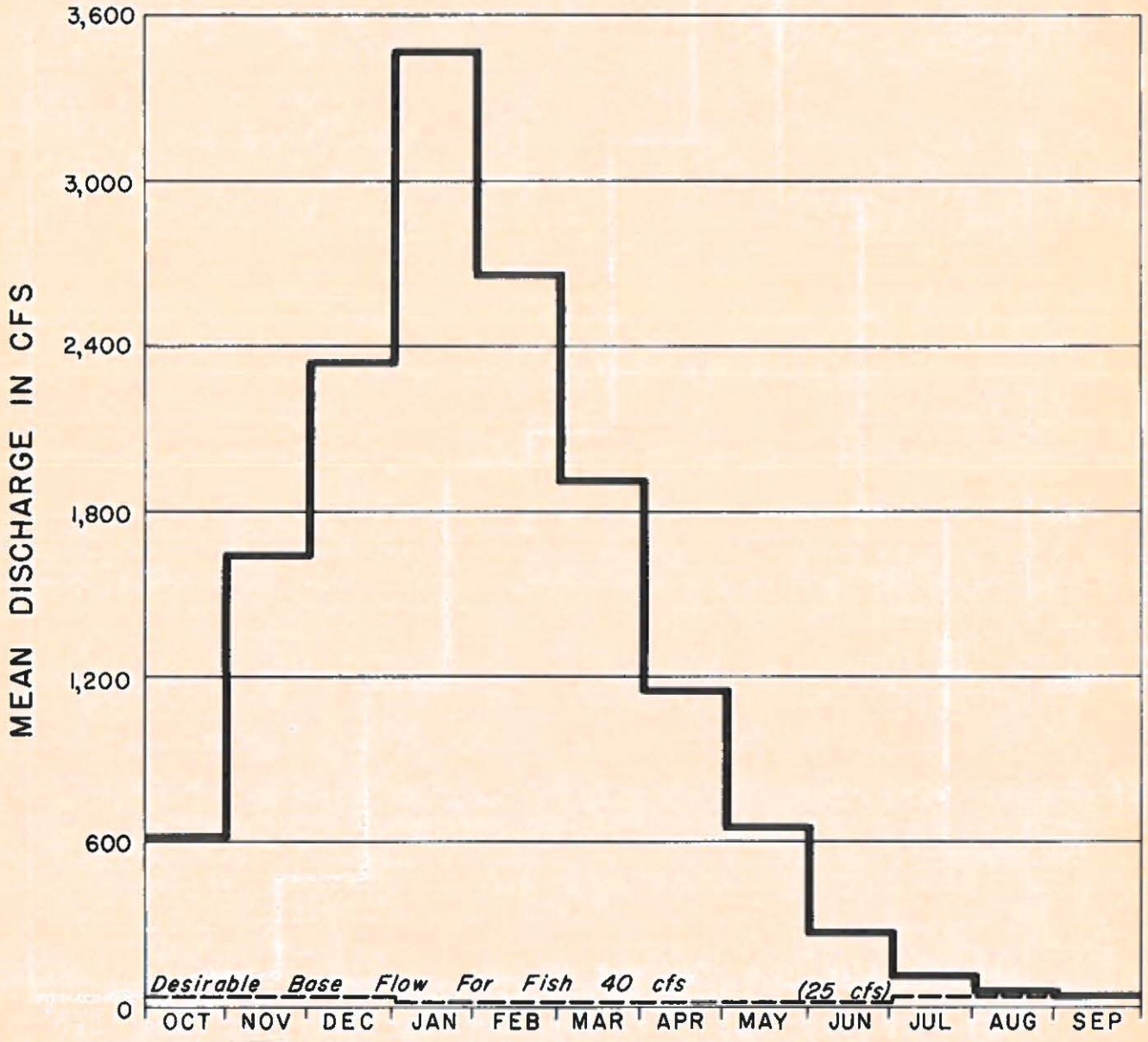
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

EAST FORK ILLINOIS RIVER AT MOUTH

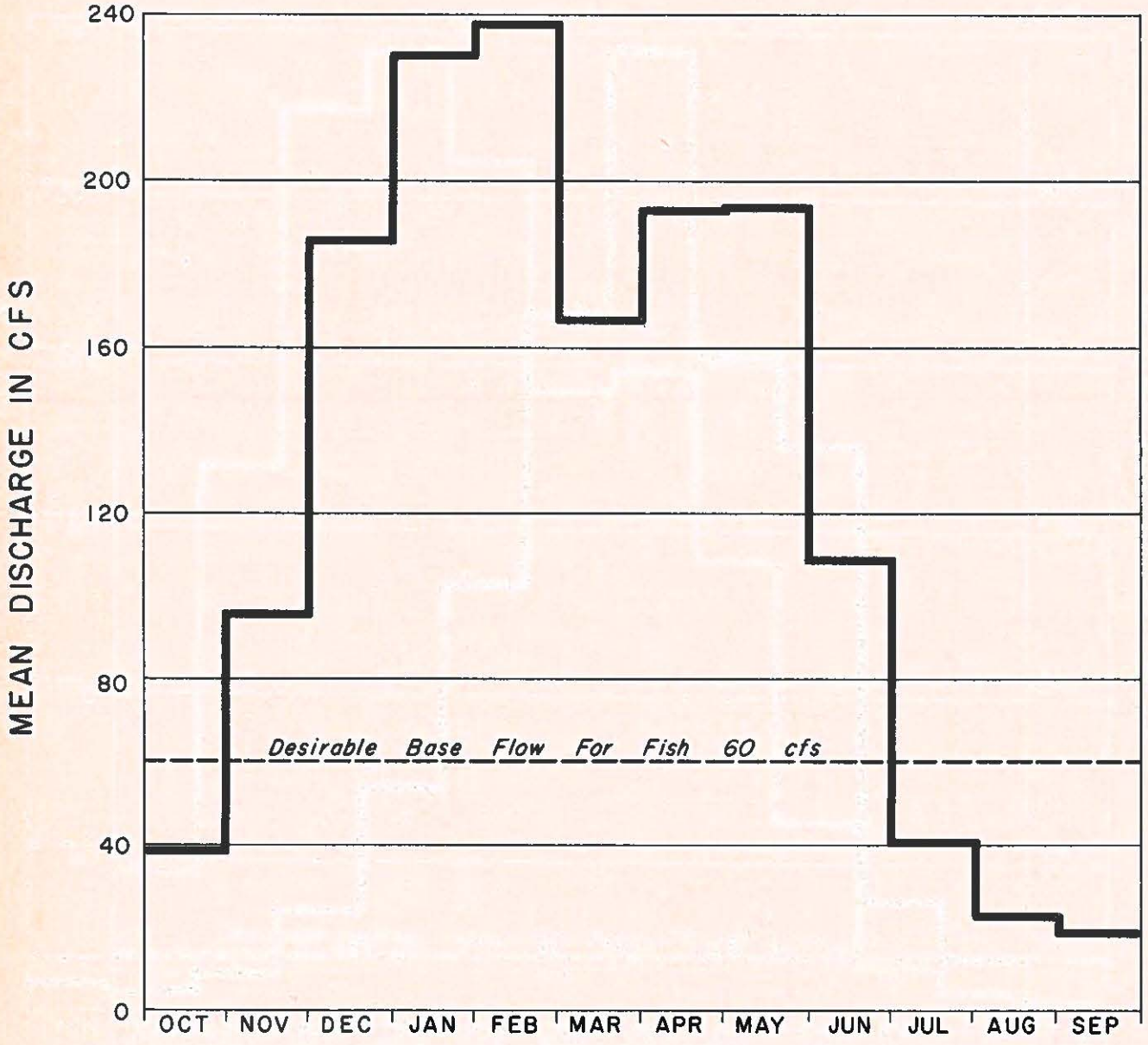
1928 - 1931 & 1942 - 1955



Drawn Sept. 8, 1958
File No. 15.202

FIGURE 216

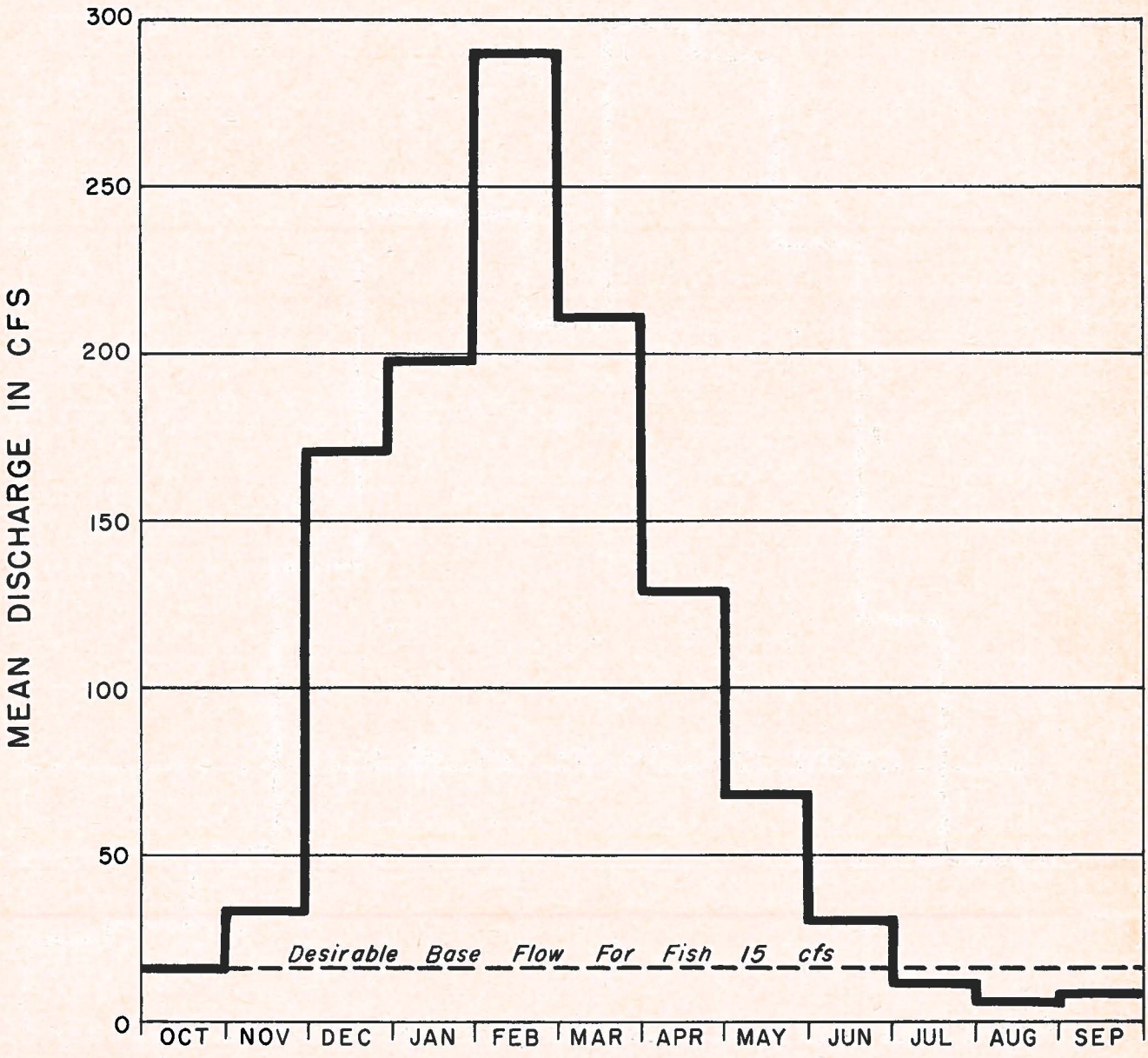
ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
SUCKER CREEK - MILE 11.6
1942-1955



Drawn Sept. 8, 1958
File No. 15.202

FIGURE 217

ROGUE RIVER BASIN
MEAN MONTHLY HYDROGRAPH
and
FISH WATER REQUIREMENTS
ALTHOUSE CREEK - MILE 0.3
1939 - 1941



Drawn Sept. 9, 1958
File No. 15.202
FIGURE 218

ROGUE RIVER BASIN

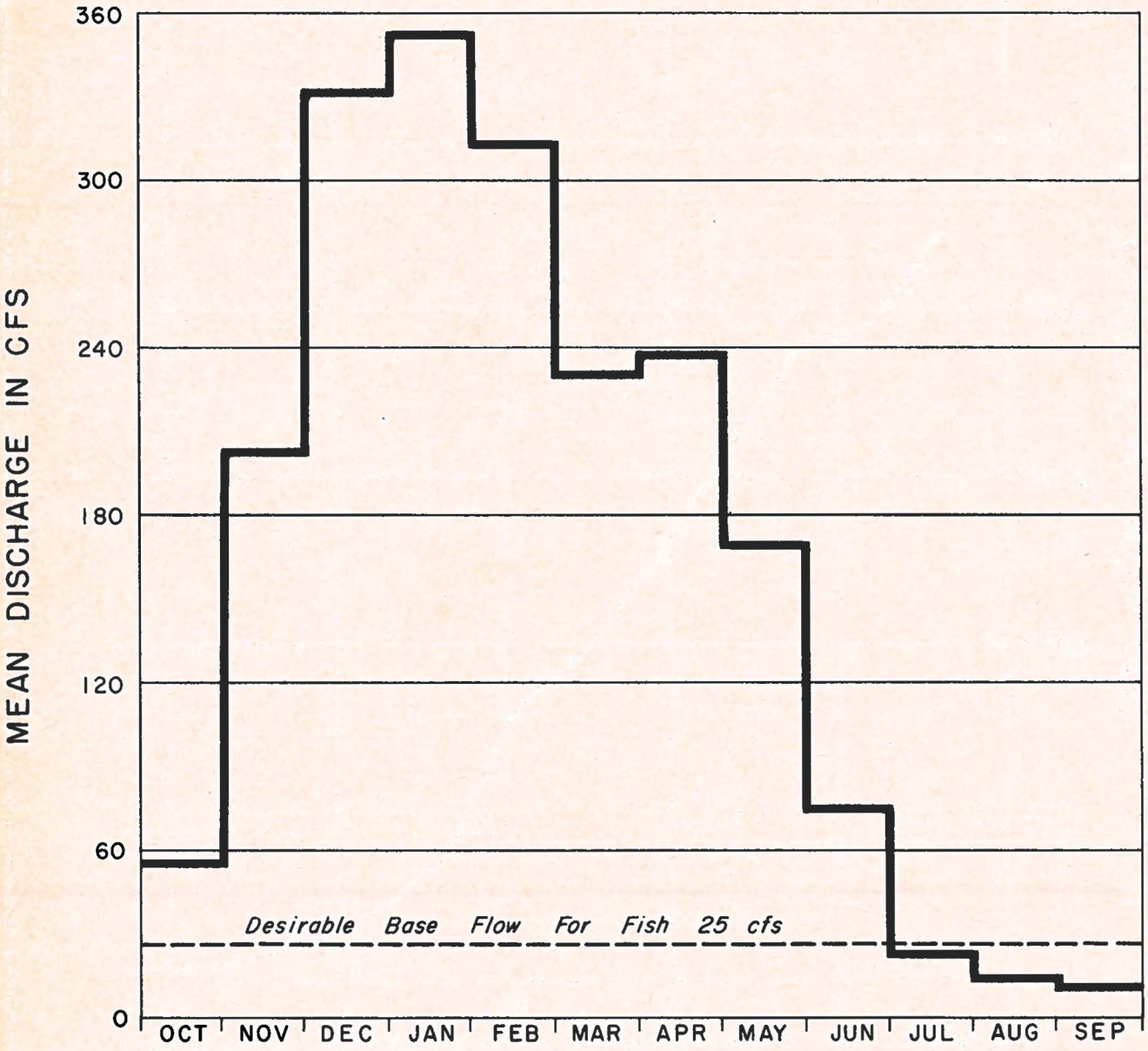
MEAN MONTHLY HYDROGRAPH

and

FISH WATER REQUIREMENTS

EAST FORK ILLINOIS RIVER - MILE 11.0

1928-1931 & 1942-1955



Drawn Sept. 8, 1958
File No. 15.202

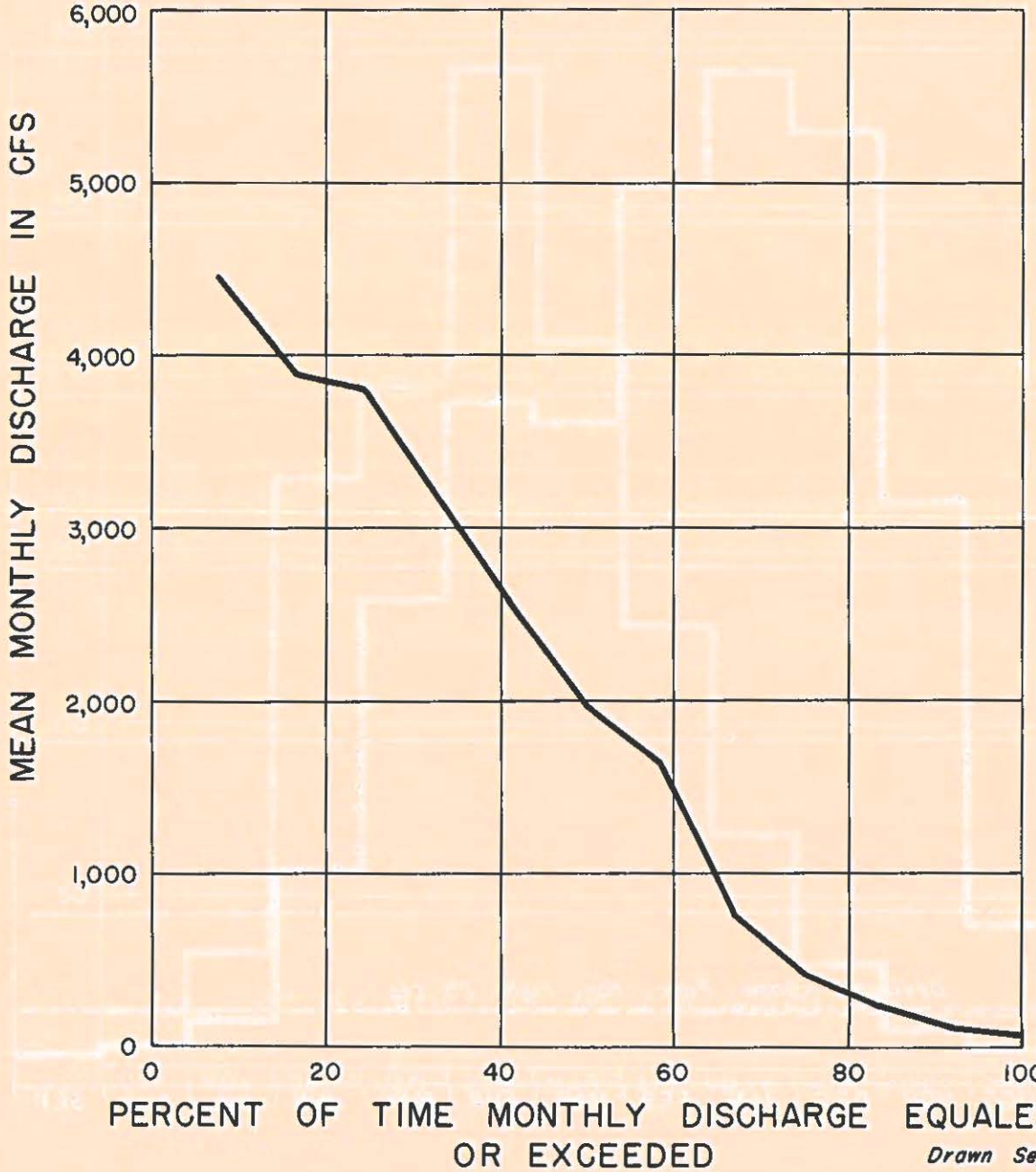
FIGURE 219

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

BALD MOUNTAIN SITE



Drawn Sept. 19, 1958
File No.

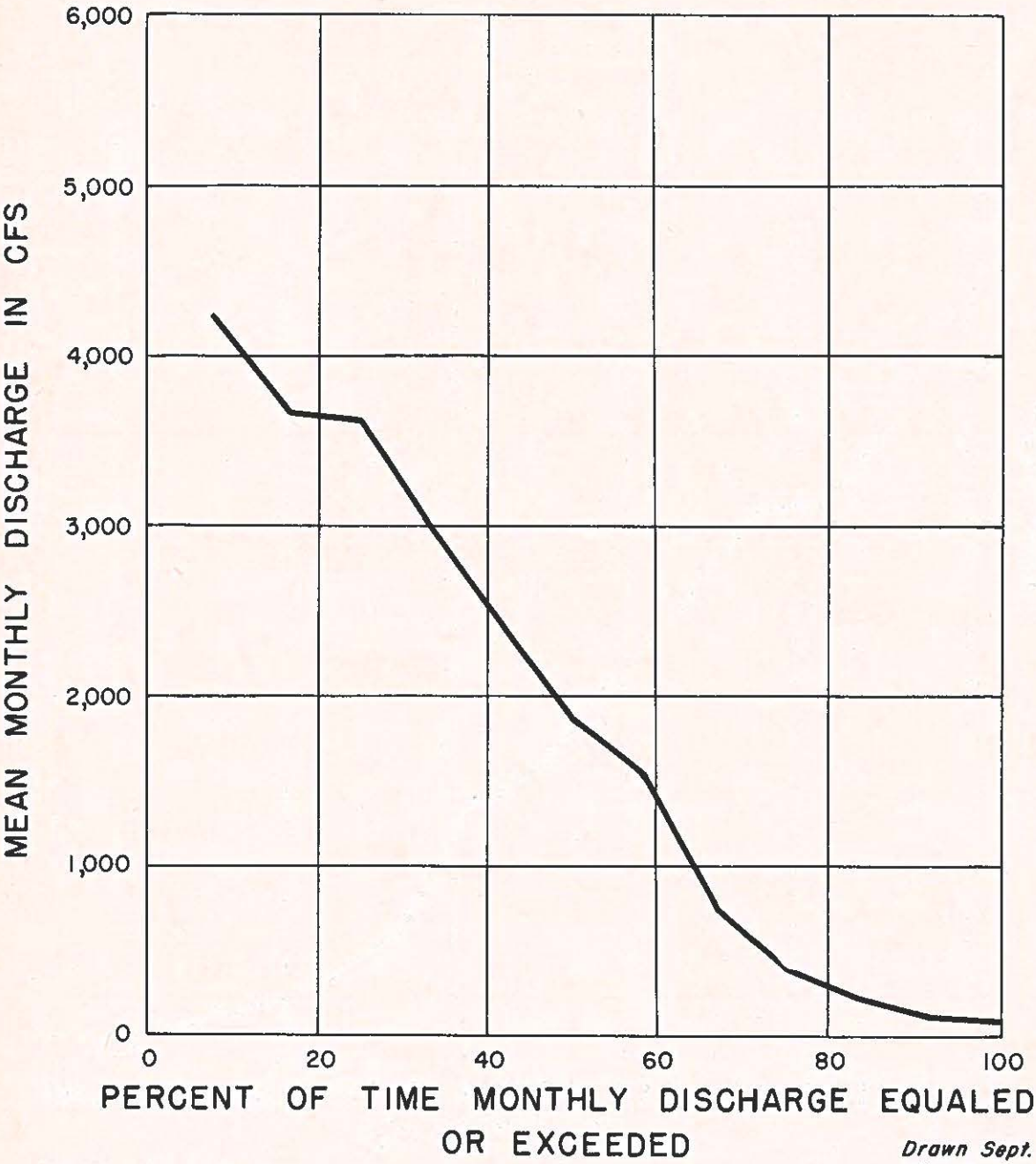
FIGURE 220

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

CLEAR CREEK SITE

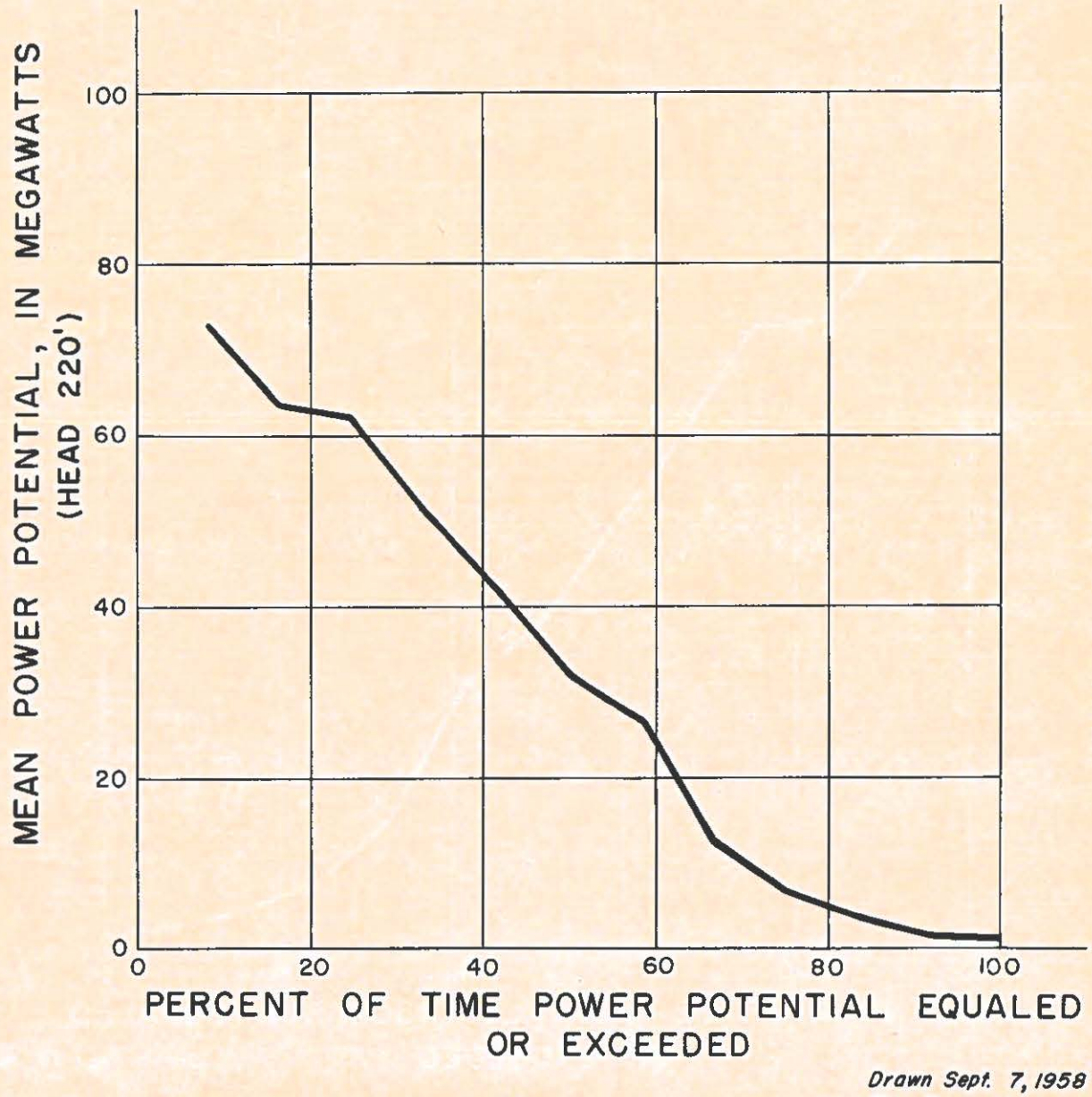


Drawn Sept. 19, 1958
File No.

FIGURE 221

ROGUE RIVER BASIN

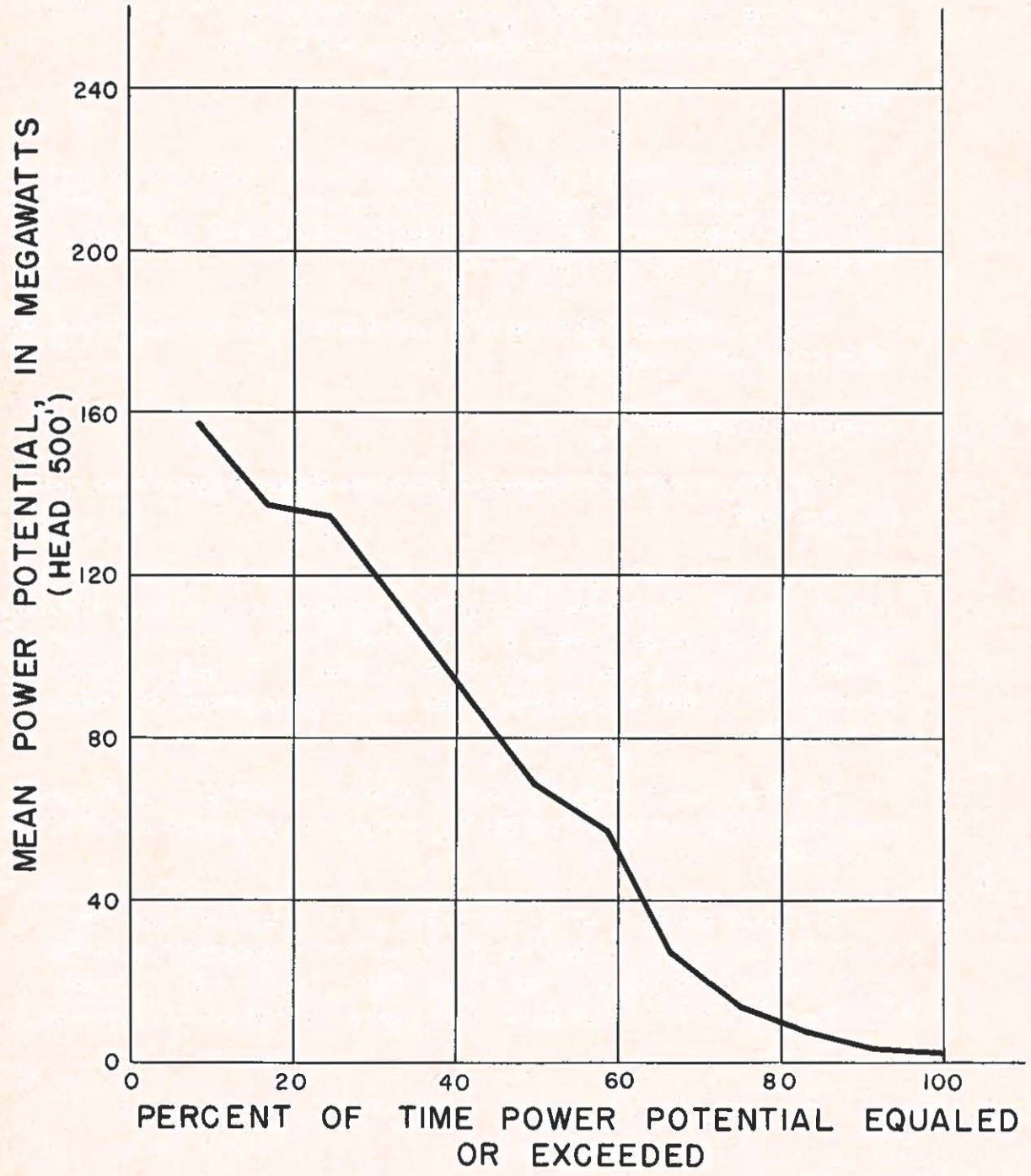
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for BALD MOUNTAIN SITE



Drawn Sept. 7, 1958
File No.
FIGURE 222

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for CLEAR CREEK SITE



Drawn Sept. 5, 1958
File No.
FIGURE 223

SECTION 7 LOWER ROGUE

GENERAL DATA

Location

This sub-basin includes all of the Rogue River drainage system downstream from mile 68 with the exception of the Illinois Valley which is treated as a separate sub-basin. There are no major tributaries in this section. Figure 224 shows the complete stream system for the section.

Size

This sub-basin ranks fifth in size among the seven sub-basins and contains 503 square miles, which is a little less than one-tenth of the Rogue Basin area, of which 397 square miles are in Curry County, 98 in Josephine County, 5 in Douglas County, and 3 in Coos County.

There is a total of 550 miles of stream in this sub-basin including the 68 miles of the Rogue main stem.

Topography and Geology

This area is nearly all mountainous with no blocks of agricultural lands of significance.

River bottom elevations run from mean sea level at the mouth to 620 feet at mile 68. The highest point in the sub-basin is Brandy Peak, elevation 5,316, which is located in the northeast part of the sub-basin at the head of Shasta Costa Creek. There is only one other peak in the sub-basin above elevation 4,000 and an additional seven peaks having elevations greater than 3,000.

The Rogue has its flattest gradient in this section dropping a little more than nine feet per mile. The Rogue Basin stream system profile was shown in Figure 2.

The only geological information available for the Lower Rogue Basin covers the northeastern portion which has rock formations consisting of predominantly medium-grained indurated sandstone, in part massive, thickly-bedded and in part thinly-bedded, with intervening layers of dark gray or

black mudstone, shale, or siltstone which locally has slatey cleavage. Along the eastern border of the sub-basin, a strip of sedimentary, metamorphic, and igneous rocks cross in a northeasterly direction.

From mile 57 to mile 68 the stream bed of the Rogue is composed mainly of massive, light to dark, gray-green, altered lava flows, and tuffs, conglomerates, and flow breccias.

Direction of flow for the main stem in this region is generally towards the southwest.

Climate

Average annual precipitation is high in this section ranging from 90 inches near the mouth of the Rogue to a maximum rainfall, in the northwest corner of the sub-basin, of nearly 120 inches per year. The average annual rainfall along the Rogue from its mouth to mile 40 increases from 90 to 100 inches annually and from mile 40 to 68 decreases to about 50 inches annually. Approximately 20 percent of the annual rainfall occurs during the irrigation season, May 15 - October 15. Average annual snowfall recorded at Illahe is approximately 15 inches.

Temperature averages are mild and vary from 47 to 64 during the summer and 41 to 55 during the winter along the coast and from 48 to 80 during the summer and 38 to 54 during the winter in the mountainous regions.

According to the Bureau of Reclamation's climatological map, annual growing seasons are high, averaging from 260 days at the higher elevations to 280 days along the coast.

Population

Population in this region is about 2,100 persons with 1,950 residing in the town of Gold Beach, according to the 1958 certified populations by the State Board of Census, located at the mouth of the Rogue. There are a few other small towns located on the Rogue main stem from the mouth to mile 48. The location of towns was shown on the sub-basin stream system map, Figure 224.

Land Ownership

Seventy-nine percent of the Lower Rogue is government timber land managed by either the Forest Service or the Bureau of Land Management; one percent is public domain lands; two-tenths of a percent is under the control of the State Land Board; and the remainder is privately owned. Much of the land bordering the Rogue itself is in private ownership and there is presently an attempt being made to promote a trade of this land with government-owned land located back away from the river in order to be able to maintain a protective strip which would prevent spoiling of the scenic value of this stretch of the river. Major land ownership division by sub-basins for the Rogue Valley were summarized in Table 2.

Transportation Facilities

Rogue River Basin transportation facilities were shown in Figure 19.

The Coast Highway, U. S. 101, passes through the town of Gold Beach in cutting across the western corner of this sub-basin.

There are no other paved routes and gravel roads give access to Agness and Illahe and connect Marial with Glendale in the Umpqua Basin. There are a few other gravel roads and about 100 miles of unimproved dirt roads.

There are small privately-owned landing strips at Gold Beach, at Big Bend - mile 34, and at Paradise Bar - mile 44, and a very short landing strip at Black Bar - mile 60.

A motor-powered mailboat travels the Rogue from its mouth to Agness daily from May 1 to November 1. During this period, boats for hire piloted by experienced guides are available to travel the same route.

Regular Western Greyhound bus schedules and regular freight truck schedules operate on U. S. 101. Irregular freight service is available in the Gold Beach area.

There is no direct rail service in the sub-basin.

Present Economy

Timber and tourists are the economy of this section of the Rogue Basin,

and due to the nature of the area nearly all of the economy is centered around the towns of Gold Beach and Wedderburn located at the mouth of the Rogue.

AMOUNT AND DISTRIBUTION OF THE RESOURCE

Precipitation Data

Precipitation and air temperature data are collected at the climatological station at Illahe, located at mile 33, and at Gold Beach at the mouth of the Rogue, Figure 30. Average annual precipitation for the Rogue Basin was shown in Figure 3, and precipitation in this sub-basin was discussed under Climate.

Stream Gaging

Gaging stations are non-existent in this section and the furthest downstream gaging station on the main stem of the Rogue River is located at Grants Pass. A few miscellaneous measurements at various points along the Rogue have been made in the past but these are of little help in determining yields or any other specific items and help only in giving an indication of what occurred at a given instance of time in the past. The location of active and inactive stations in the Rogue Basin were shown in Figure 29.

Yields

Annual yields for the Rogue River at its mouth were shown in Figure 13. This diagram was prepared by correlation with measured yields in other parts of the Rogue Basin and shows that the approximate average annual yield at this location is 5,661,000 acre-feet.

Mean monthly discharges for the same point were shown in Figure 25. This plot shows the distribution of the average annual yield with respect to time. Peak runoff in this sub-basin occurs in the months of January and February as the result of winter rains. Flows are also relatively high in December and March of the average year. The effect of snow melt in the Cascades which occurs later in the year is not nearly as pronounced at the lower end of the Rogue Basin as is the effect of winter rains. Due to the lack of gaging stations in this section, no minimum flow or minimum yield hydrographs have been prepared. Likewise there are no frequency curves to show the critical drought or flood conditions.

AMOUNT AND DISTRIBUTION OF THE RESOURCE UNDER APPROPRIATION

Water Rights

Distribution of the location of water rights in the Rogue Basin was shown in Figure 20 and Table 20 is a summary of water rights by classification existing at present in the Lower Rogue section of the Basin. There are only 174 cubic feet per second of rights in the Lower Rogue section and 87 percent of these are for mining.

TABLE 20

WATER RIGHTS SUMMARY

LOWER ROGUE RIVER BASIN

USE	STREAM		TOTAL RIGHTS CFS
Domestic	All		2.7
Municipal	All		2.5
Irrigation	All		4.0
Power	All		0.5
Industrial	All		13.0
Mining	Rogue River	22.3	
	Others	129.0	
	Total - Mining		151.3
Wildlife	None		
Recreation	All		0.1
Fish Life	None		
Pollution Abatement	None		
	TOTAL LOWER ROGUE BASIN		174.1

Depletions

A depletion diagram showing the legal rights versus stream miles for the Lower Rogue River section is in Figure 225. Ordinate values on the plot do not include supplemental rights and these are not part of the totals in Table 20. Supplemental rights permit alternate sources of supply but do not add to existing rights.

As pointed out in Table 20, depletions in the Lower Rogue system are almost entirely nonconsumptive in nature.

EXISTING NEEDS

Domestic

Domestic uses of water are small and are easily met by existing flows in the streams.

Municipal

The only municipal right is held by the City of Gold Beach which gets its water supply from Indian Creek and the supply seems to be adequate and of good quality.

Irrigation

Irrigation needs are slight and not much land is involved in the Lower Rogue sub-basin. Irrigation lands in the Rogue Basin were shown in Figure 15 and Irrigation Developments in Figure 16.

Power

There is practically no power use of water in the Lower Rogue Basin. Power generation in the Rogue Basin is listed in Table 5 and physical features, diversions, canals, powerhouses, etc., were shown in Figure 21.

Industrial

Industrial rights of 13 cfs are for sawmills, boilers, and mill ponds and 12 cfs of this total are for a cannery and cheese factory having a priority date of 1914.

Mining

Mining rights are the largest portion of the total rights in the Lower Rogue Basin but most of these were for development of deposits which have since been depleted. The location of mineral deposits and active mining operations in the Rogue River was shown in Figure 17.

Recreation

Recreation in this area consists primarily of fishing, particularly the lower stretch of the river below Agness, and boat rides from the mouth to Agness. Other boat trips are taken from Grants Pass downstream to Agness; these require an experienced guide and can be exhilerating, breathtaking, and even hair-raising for the uninitiated because many stretches of the river are rapid and rugged.

There are campsites available at many locations along this stretch of the Rogue but they can be reached only by hiking. It is also possible to fly, by light plane, to such places as Black Bar Ranch.

There are no lakes or reservoirs to offer water-type recreation and the country is too rugged and inaccessible for winter sports. Recreation areas in the Rogue Basin were shown in Figure 18.

Wildlife

Wildlife needs for water are small and easily satisfied due to the low level of development by man in this area.

Fish Life

All of the anadromous fish must travel through this section to reach their final destination and must have an adequate quantity of water of propet quality to sustain such runs. Fall chinook are the only anadromous fish which spawn in the lower river with about 10 percent of the total run using the gravel in this section. According to the State Game Commission, there are about 100 miles of streams with 91,000 square yards of spawning gravel available to migratory fish in the Lower Rogue section. Fish spawning areas in the Rogue Basin were shown in Figures 22-24.

A mean monthly discharge hydrograph with the desirable base flow for fish as recommended by the State Game Commission for the Rogue River at its mouth is shown in Figure 226. This plot shows that, for average flow conditions, there is insufficient water to satisfy requirements for proper management of the fishery resources during the months of July, August, and September. Fish water requirements for the Rogue Basin stream system were shown in Figure 42.

Water temperature data for this sub-basin is plotted in Figures 227-236 which show that temperatures of the Rogue during July, August, and September often reach the 70's and are very detrimental to fish life.

Pollution Abatement

Pollution abatement problems are not serious in this section. A primary treatment sewage plant is located at Gold Beach.

Flood Control

Peak flows and floods occur usually in the months of January and February resulting from heavy winter rains as shown in Figure 13 and discussed under Yields. Flood damages in the Lower Rogue section during the 1955 flood totaled $289,000 which was about seven percent of the total for the Rogue Basin and these damages were primarily residential, industrial, and commercial occurring at the mouth and along the Rogue River. Areas subject to flooding in the Rogue Basin were shown in Figure 31 and Table 12 listed damages which occurred during the 1955 flood.

FUTURE NEEDS

Domestic

Population growth will occur slowly in this region and future domestic needs will probably be met from surface water supplies.

Municipal

Future requirements for the City of Gold Beach, the major municipal user of water in the Lower Rogue section can probably be met from the available supply. Other municipal usage will not increase much above the present level and should not pose a problem in the future.

Irrigation

Little irrigation potential exists in the Lower Rogue Basin.

Power

Figure 41 was a profile showing the location of sites, along with heads,

used in power potential computations. Copper Canyon and Ramey Falls were the only sites in this sub-basin included in the study.

Average discharges for each month were determined for the sites and discharge duration curves, Figures 237-239, were prepared from this information.

With the use of the head and discharges, monthly power potentials were determined and duration curves were prepared. With the use of these plots, Figures 240 and 241, the power potential at each site can be determined.

Potentially there is sufficient water flowing in the Lower Rogue stream system in the month of September to develop an average of 83,000 kilowatts of power (59,760,000 KWH of energy per month) if the head shown in Figure 41 were utilized. This potential increases to a maximum during the winter rains for the month of January to 754,000 kilowatts (542,880,000 KWH of energy per month), giving an average mean discharge for all years of record of approximately 374,000 kilowatts (3,276,240,000 KWH of energy annually).

Industrial

Expanded needs for water to satisfy industrial growth within this sub-basin will be quite restricted. The only known possibility is the establishment of pulp and paper operations in the Gold Beach area. Gold Beach does not have rail facilities and highway facilities are limited. It does have the potential for handling the export share of a pulp and paper industry on the basis of an ocean shipping operation. The effectiveness of such operations would depend largely upon the development of port facilities at Gold Beach. It is unlikely that any mill established in this area would base its capacity upon the timber resources specifically within the Rogue River Basin. Actually this area could service the lower portion of the Rogue River, plus portions of Coos and Curry Counties lying outside the Rogue River Basin proper. The natural resource area tapped by a plant at this location would probably justify an installation of 200-300 ton-per-day capacity. Such an installation would require approximately 20-30 cfs for a process water supply, which is a relatively small item magnitude-wise, due to the availability of Rogue main stem water in the Gold Beach area, but is still in conflict with the desired base flows for fish.

One of the great advantages for the establishment of pulp and paper operations in this area would be the potential for ocean disposal of the pollution products of such an operation.

No data is available in regard to the specific potentials of the sub-basin for development of the mineral industries.

Industrial development based on agricultural commodities is practically non-existent for this particular section. Any development of this type would be so small that its effect on the water resource of the Rogue River Basin would be insignificant. Pollution abatement in connection with such operations, while a specific problem, is not considered of sufficient importance to warrant detailed attention at this time.

Mining

According to the State Department of Geology and Mineral Industries, mineral deposits of significance in the Lower Rogue sub-basin consist of gold, vanadium, asbestos, coal, and semi-precious gems but it is unlikely that these will be developed to any great extent in the future.

Recreation

Due to its rugged topography and scenic characteristics, portions of the Lower Rogue sub-basin probably would best serve the entire Rogue Basin economy if it were to remain as a semi-wilderness area and the scenic values were utilized in the future as they are at present. As the timber resource is developed, additional roads permitting easier access into the area will be constructed which should add to the number of people desiring to visit the area for recreational purposes.

Wildlife

Wildlife needs will probably remain static unless their habitat is appreciably changed by future developments that are unlikely except for an increase in area suitable for blacktail deer resulting from logging operations.

Fish Life

If the existing characteristics of the stream system remain unaltered,

the changes in the fishery resource could result primarily from increased fishing pressure. Construction of reservoirs in this region would undoubtedly do much more harm to the fishery resource than any possible good which might be accomplished since all of the fish must pass this region to get to tributaries upstream for spawning purposes.

Pollution Abatement

Requirements for pollution abatement will not increase much over the present level.

Flood Control

For the purpose of determining the optimum flood control potential of the Rogue Basin, storage was not considered in this sub-basin because such storage would provide no protection for upstream locations which is where more than 90 percent of flood damages occur.

Sites included in the study, regulated outflows for the floods considered, and the storage necessary to achieve this level of control were discussed in Chapter IV, The Basin Potential, Flood Control, and were listed in Table 13. The location of the sites was shown in Figure 43.

LOWER ROGUE

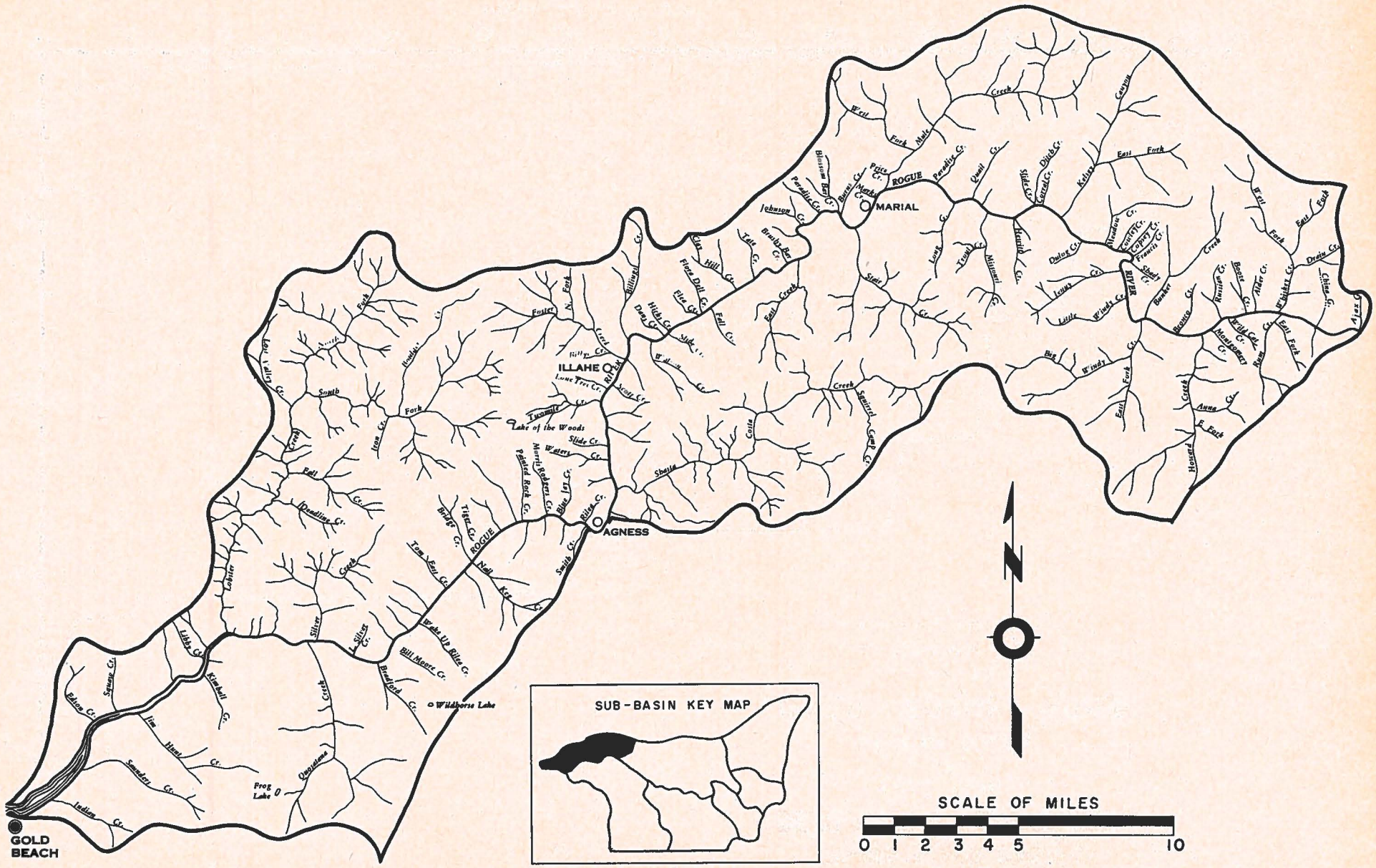


FIGURE 224

ROGUE RIVER BASIN

DEPLETION DIAGRAM

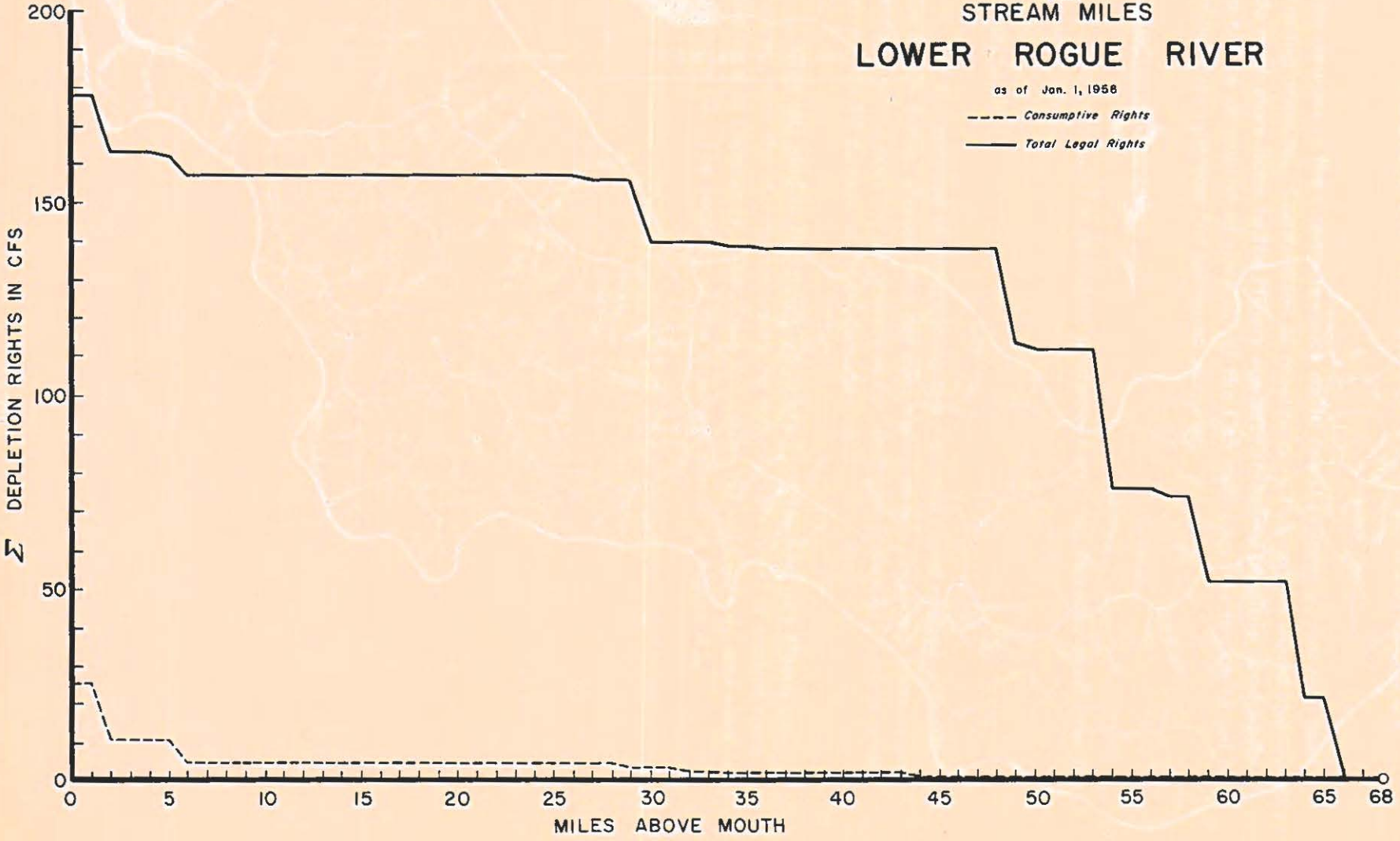
LEGAL RIGHTS
VS.
STREAM MILES

LOWER ROGUE RIVER

as of Jan. 1, 1958

---- Consumptive Rights

——— Total Legal Rights



Drawn: September, 1958
File No. 15.302

FIGURE 225

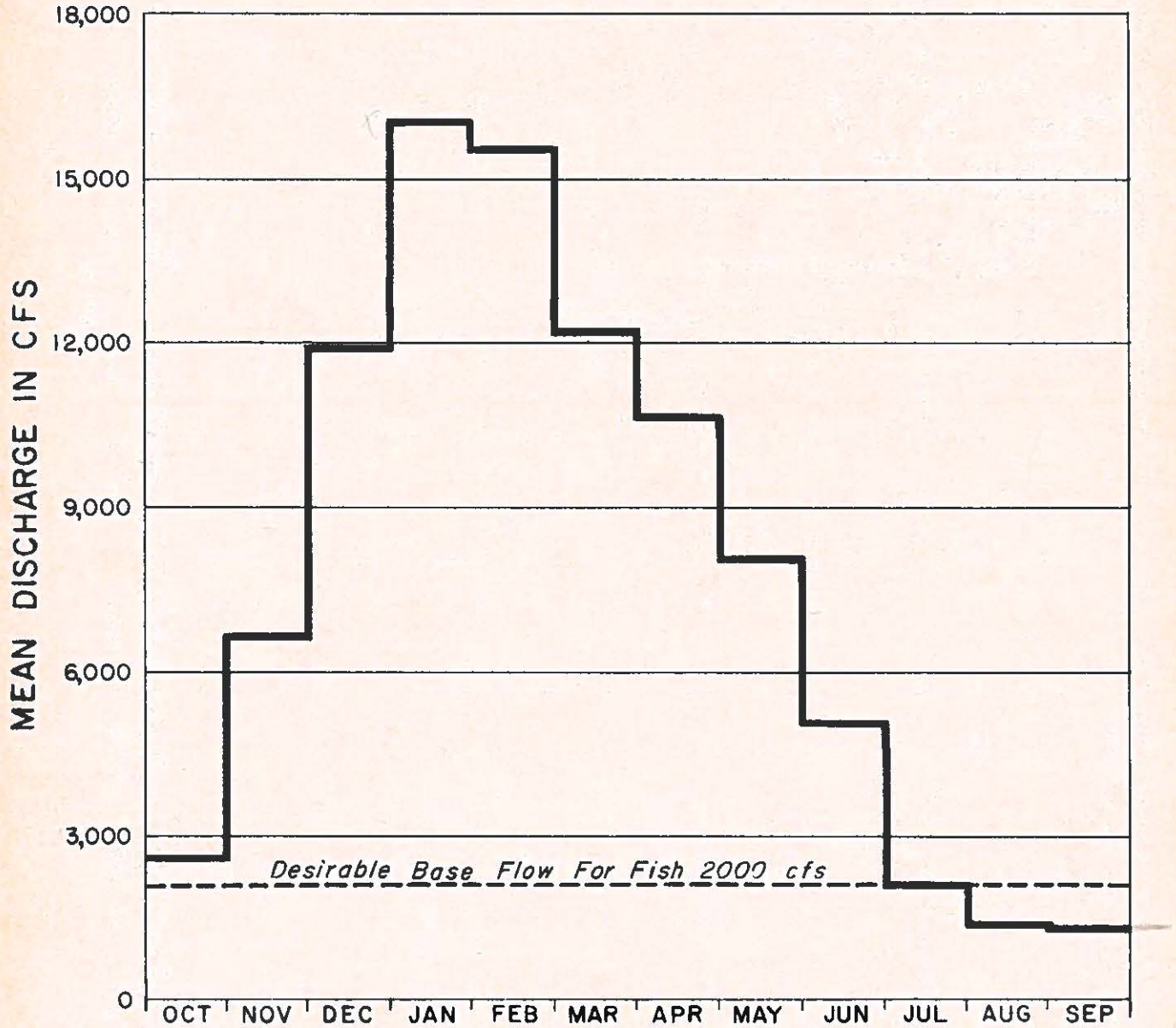
ROGUE RIVER BASIN

MEAN MONTHLY HYDROGRAPH

ROGUE RIVER AT MOUTH

1933 - 1955

WITH FISH WATER REQUIREMENTS



Drawn Nov. 15, 1958
File No. 15.202

FIGURE 226

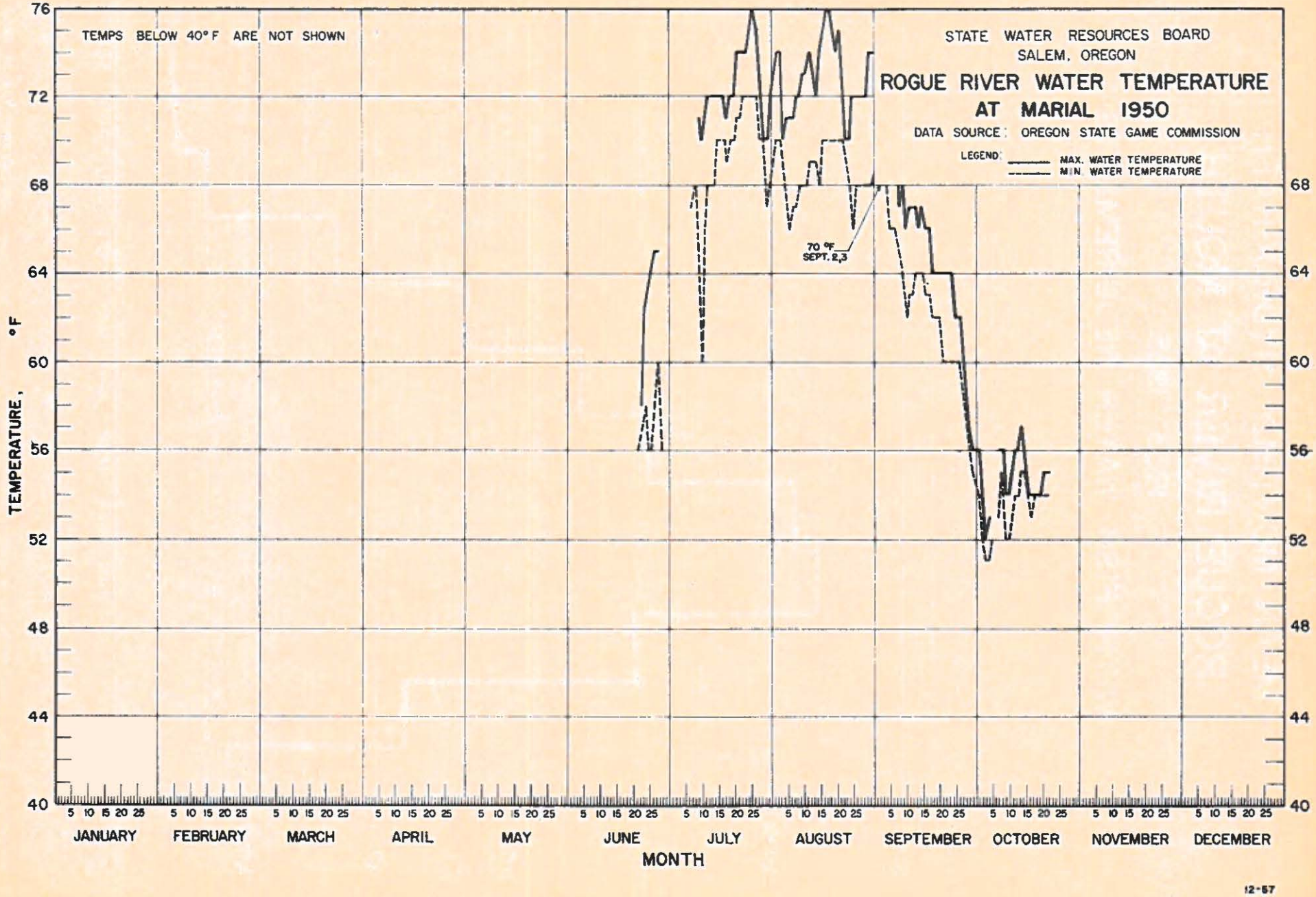

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AT MARIAL 1950
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
70 °F SEPT. 2,3
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 227

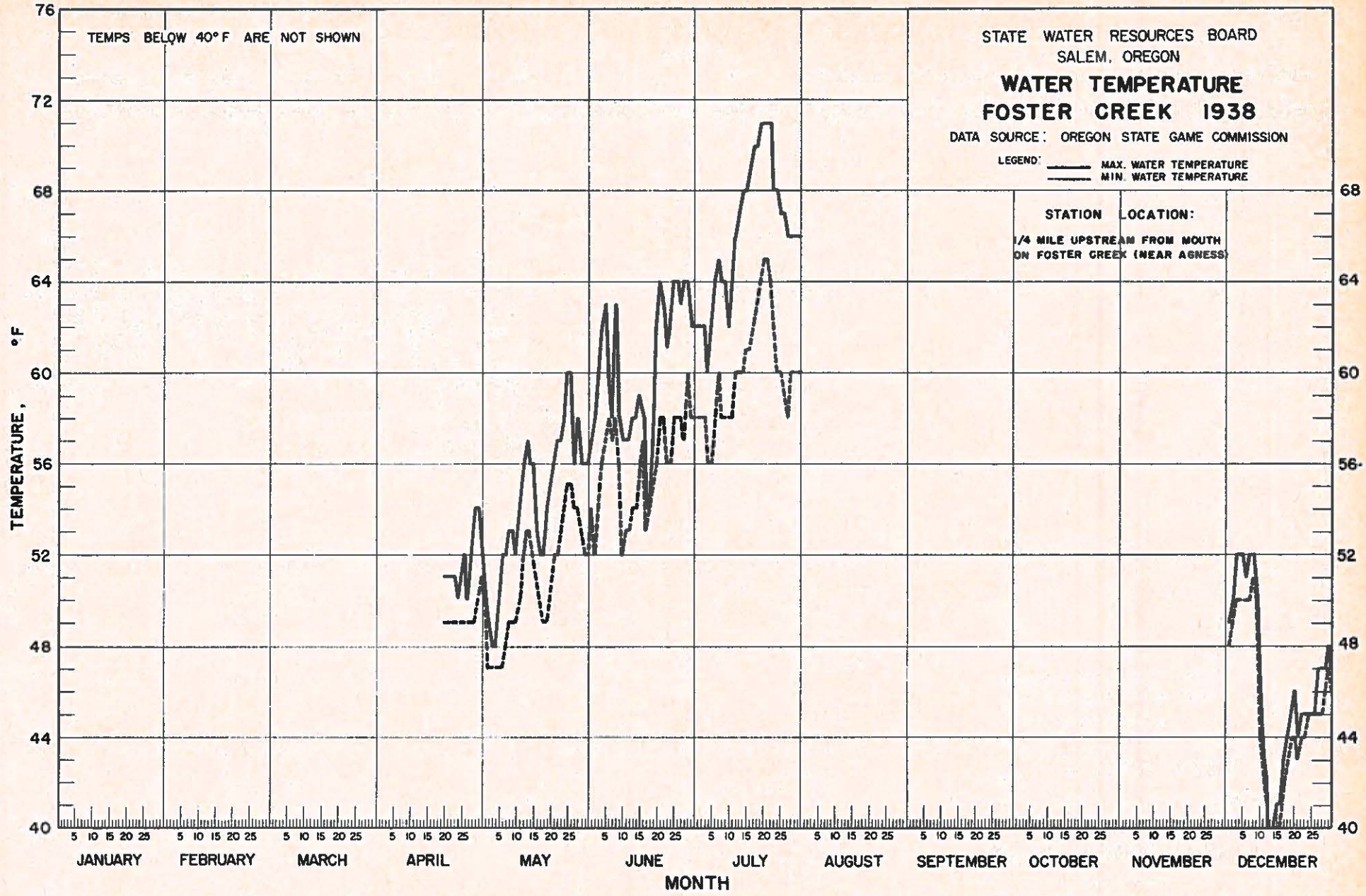
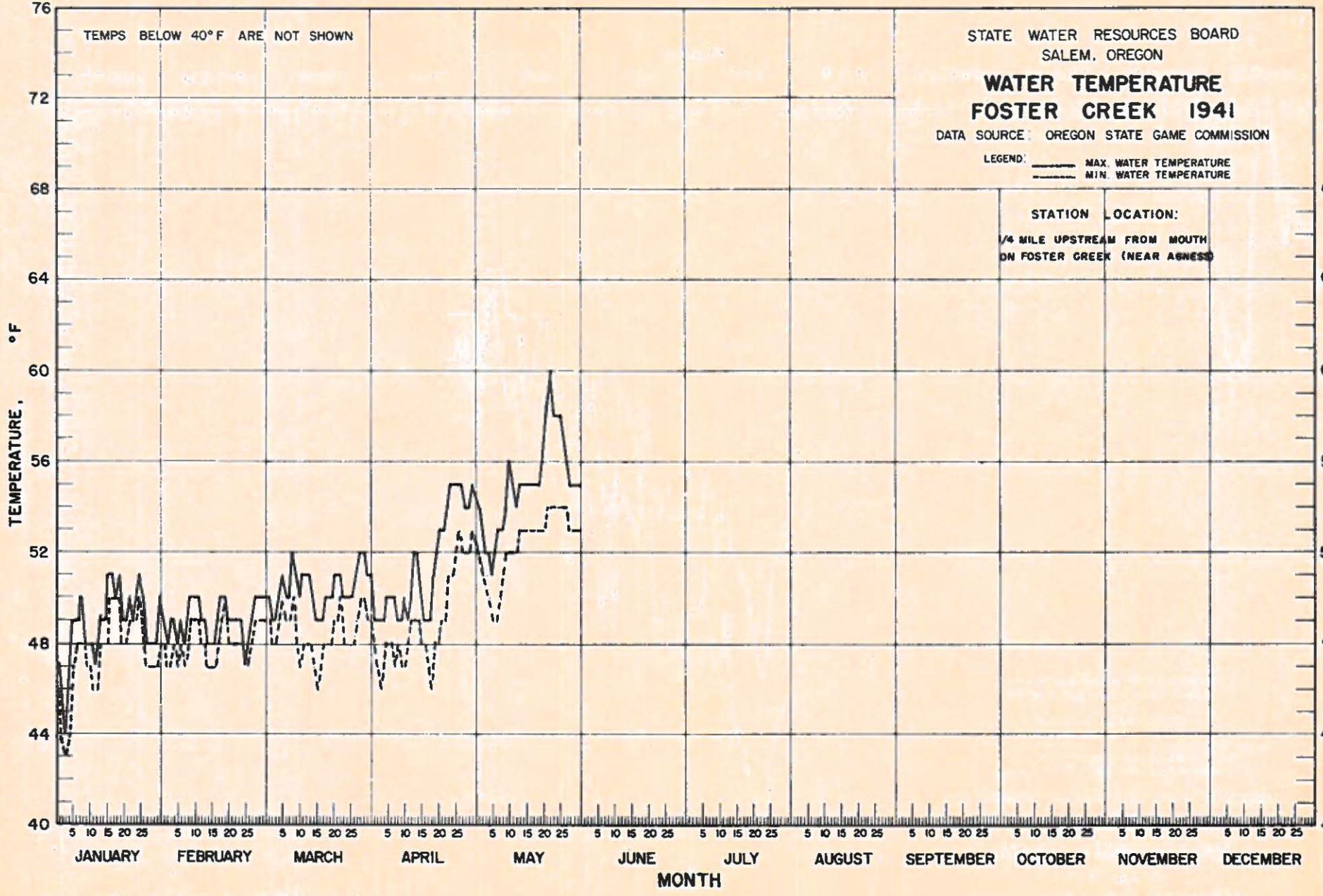

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
WATER TEMPERATURE
FOSTER CREEK 1938
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
STATION LOCATION:
1/4 MILE UPSTREAM FROM MOUTH
ON FOSTER CREEK (NEAR AGNESS)
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
1-58

FIGURE 228



406

FIGURE 229

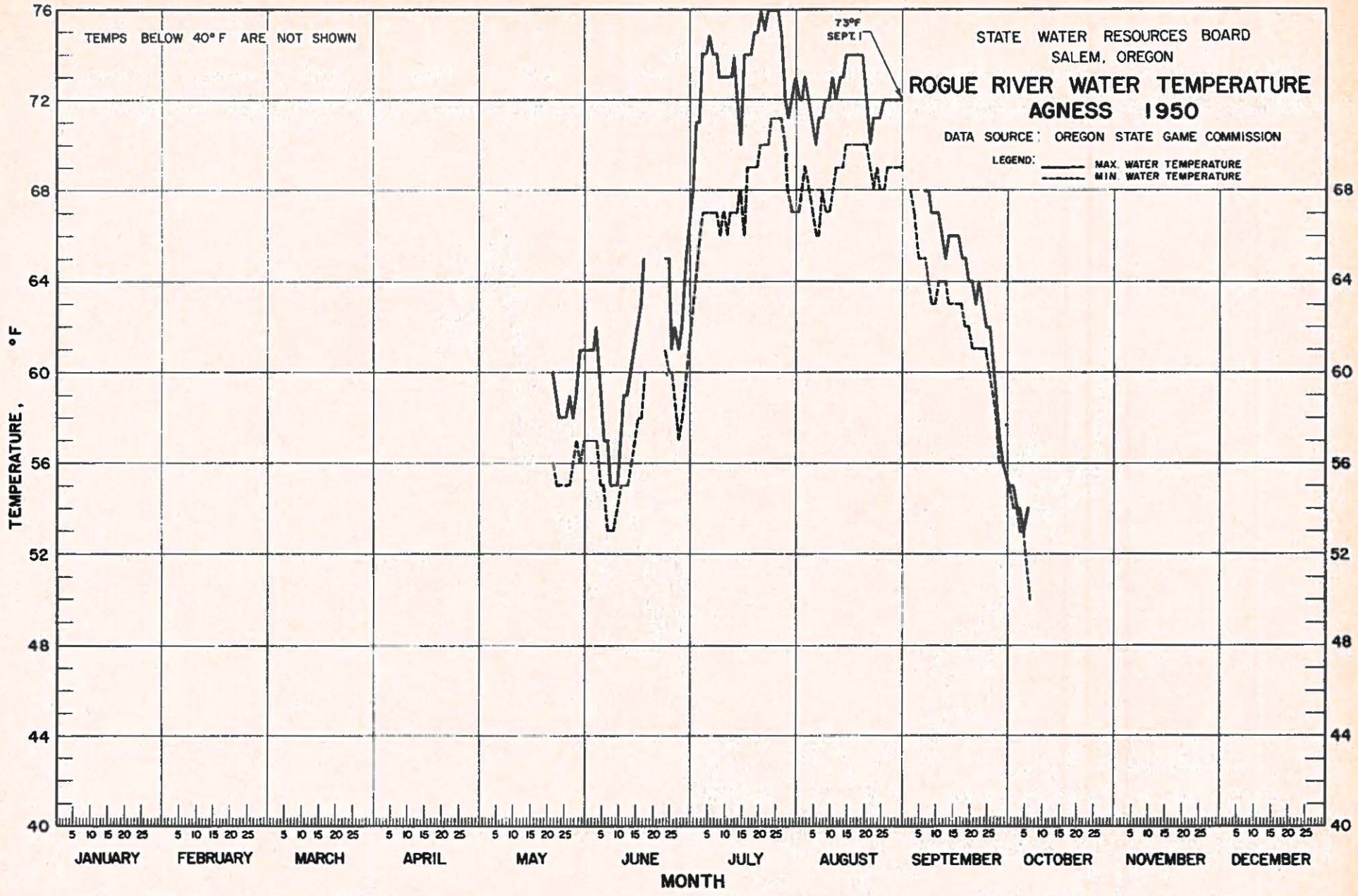

TEMPS BELOW 40° F ARE NOT SHOWN
73°F SEPT. 1
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AGNESS 1950
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 230

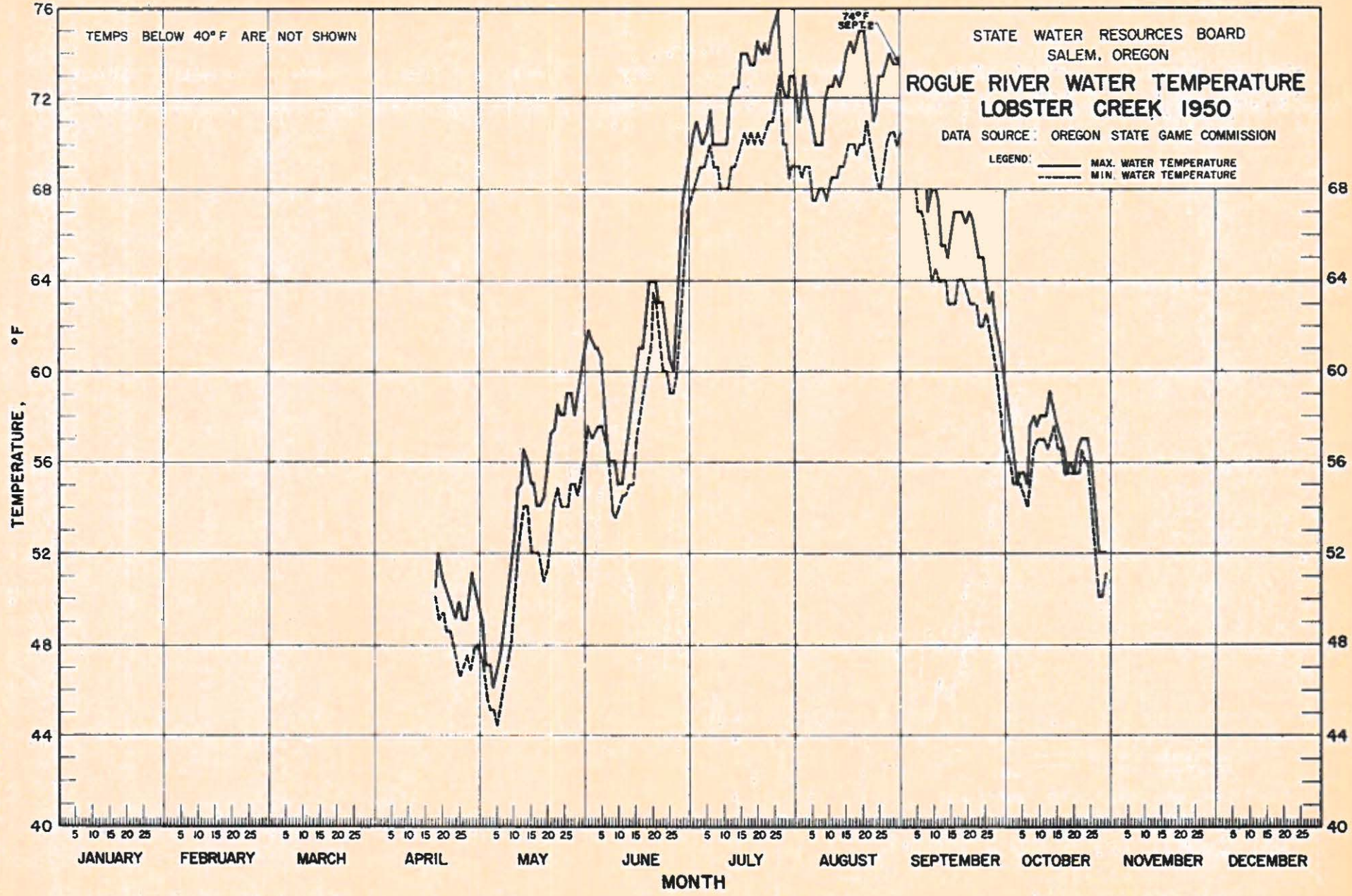

TEMPS BELOW 40° F ARE NOT SHOWN
74° F SEPT. 2
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
LOBSTER CREEK 1950
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 231

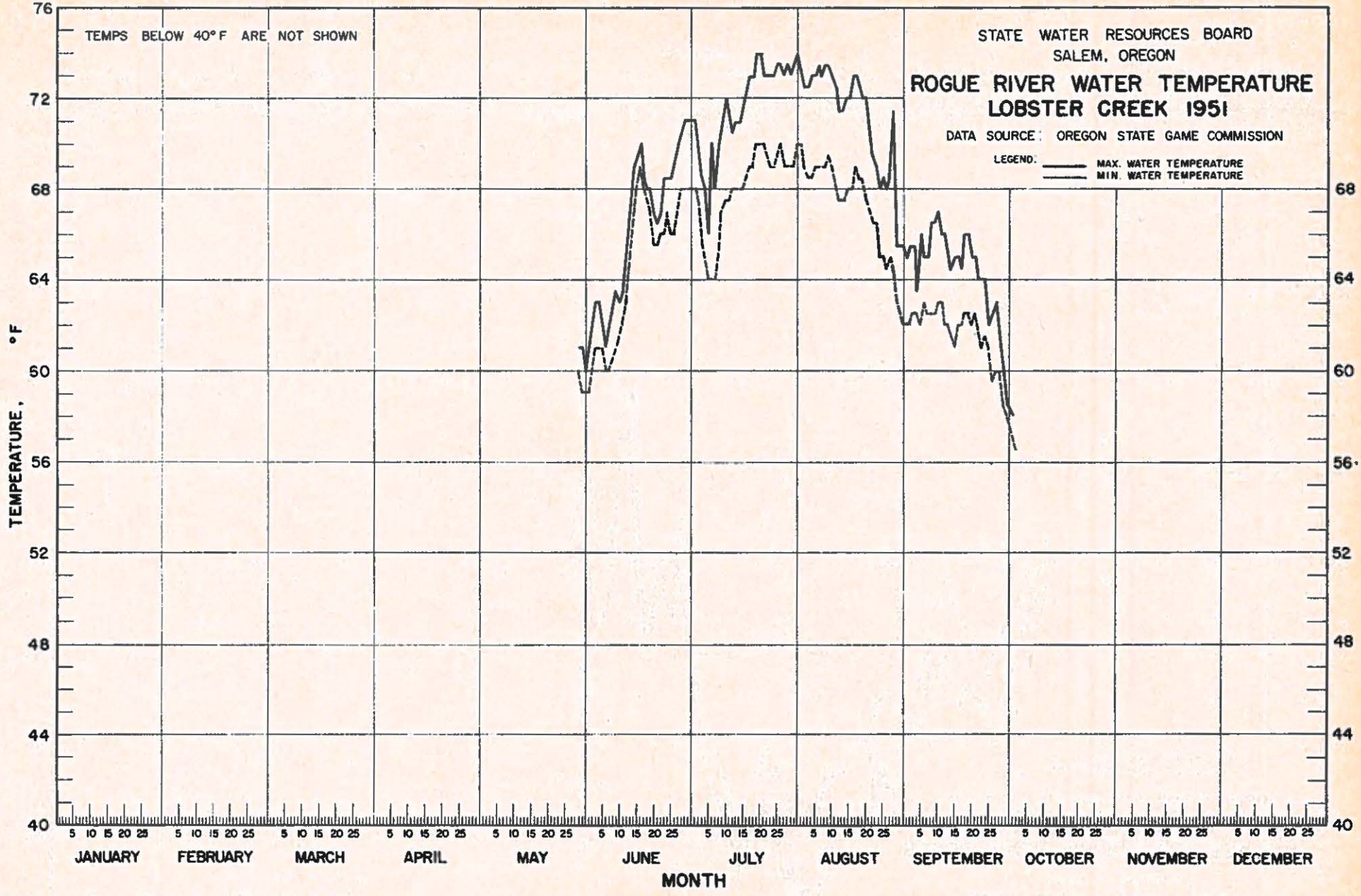

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
LOBSTER CREEK 1951
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

FIGURE 232

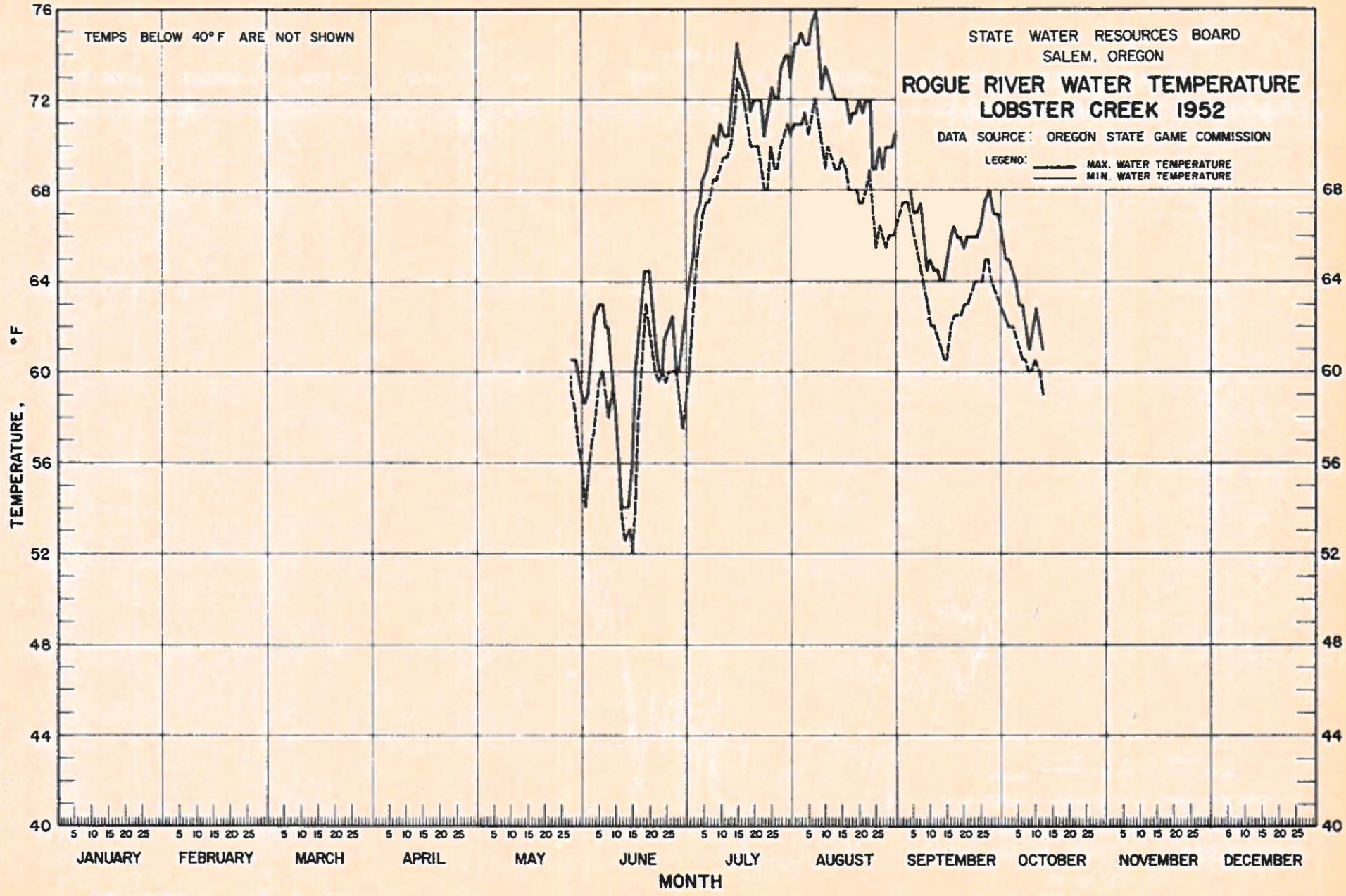

TEMPS BELOW 40° F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
LOBSTER CREEK 1952
DATA SOURCE: OREGON STATE GAME COMMISSION
LEGEND: MAX. WATER TEMPERATURE
MIN. WATER TEMPERATURE
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
1-68

FIGURE 233

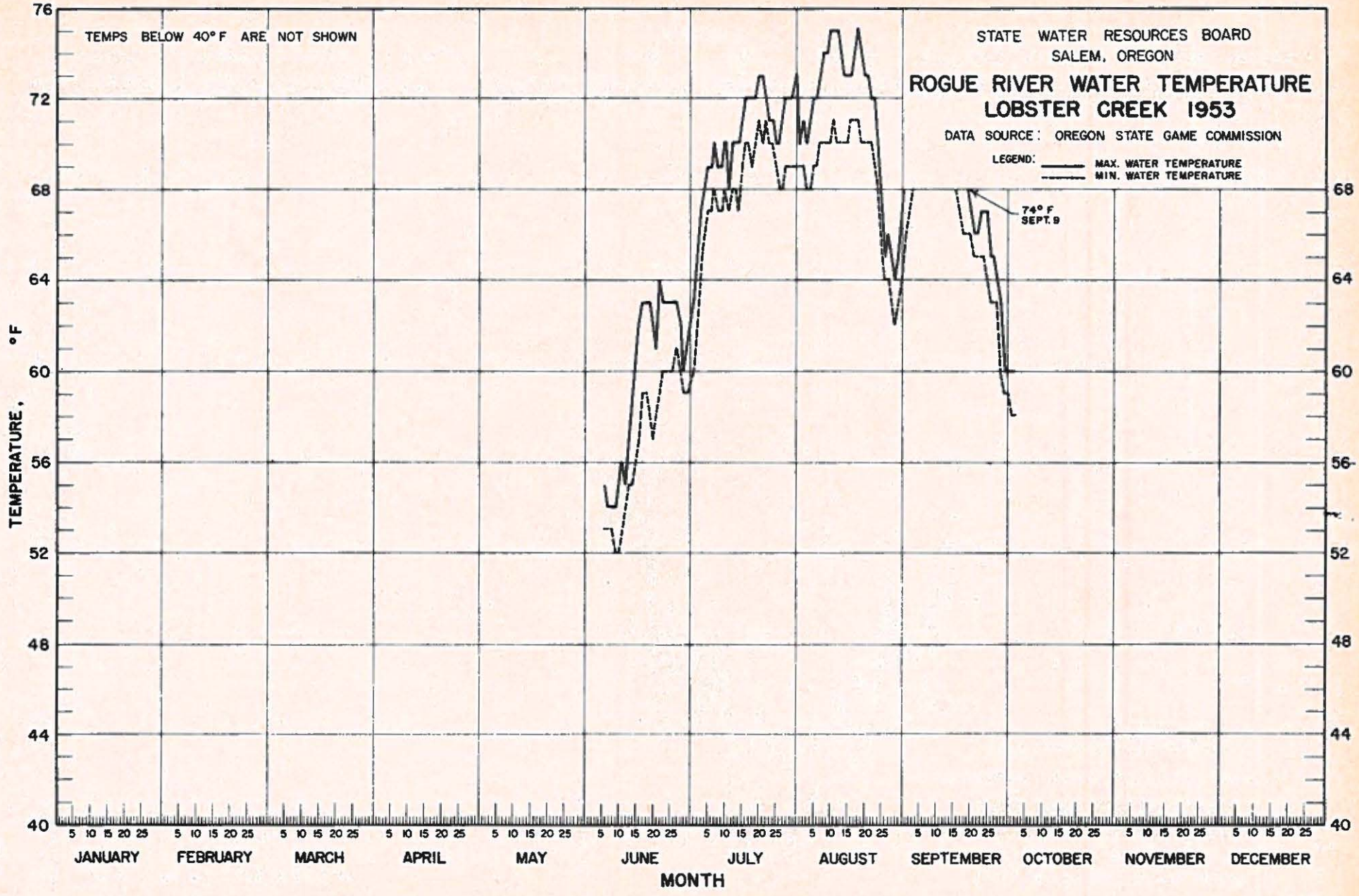
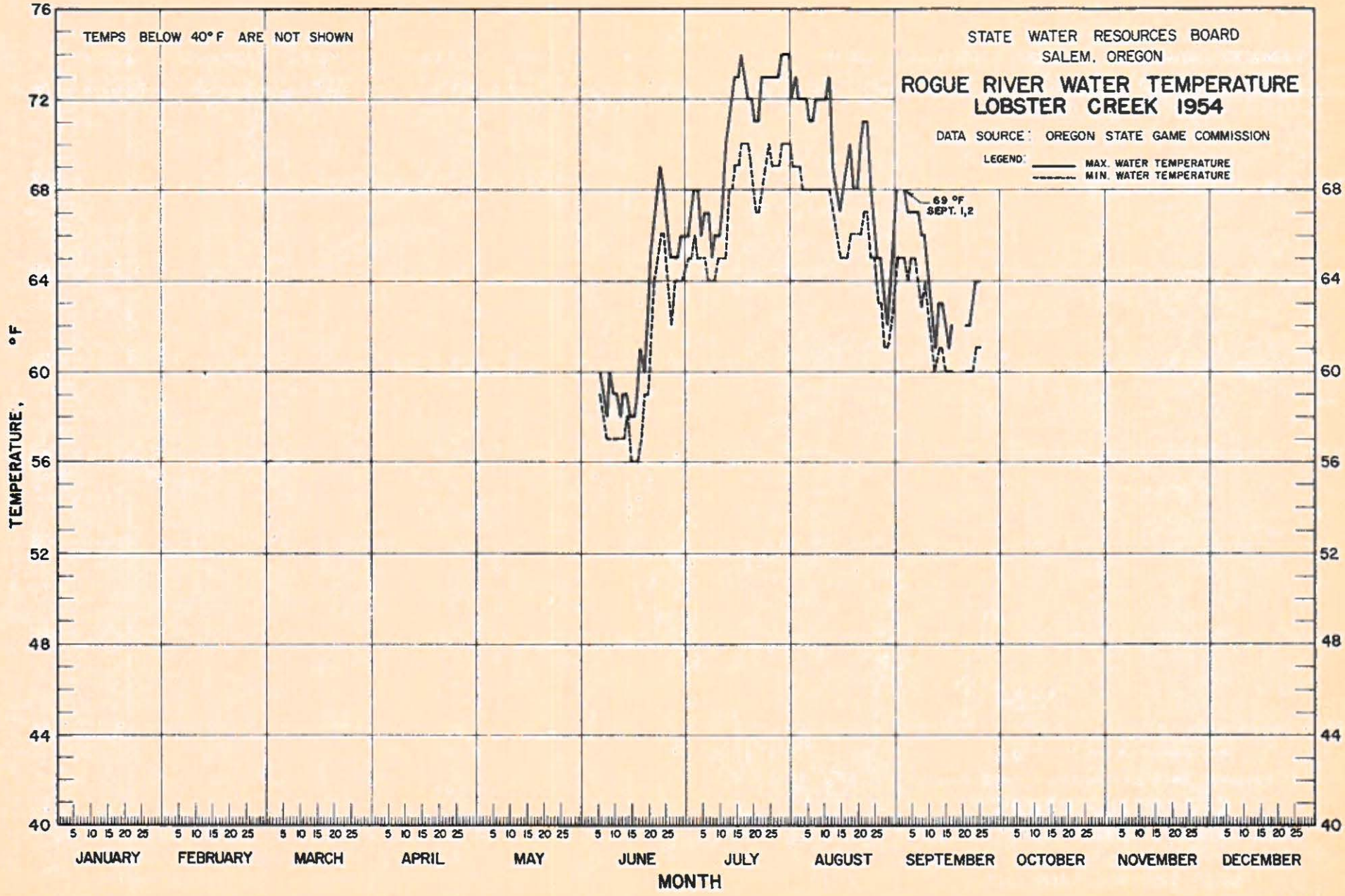


FIGURE 234

411



412

FIGURE 235

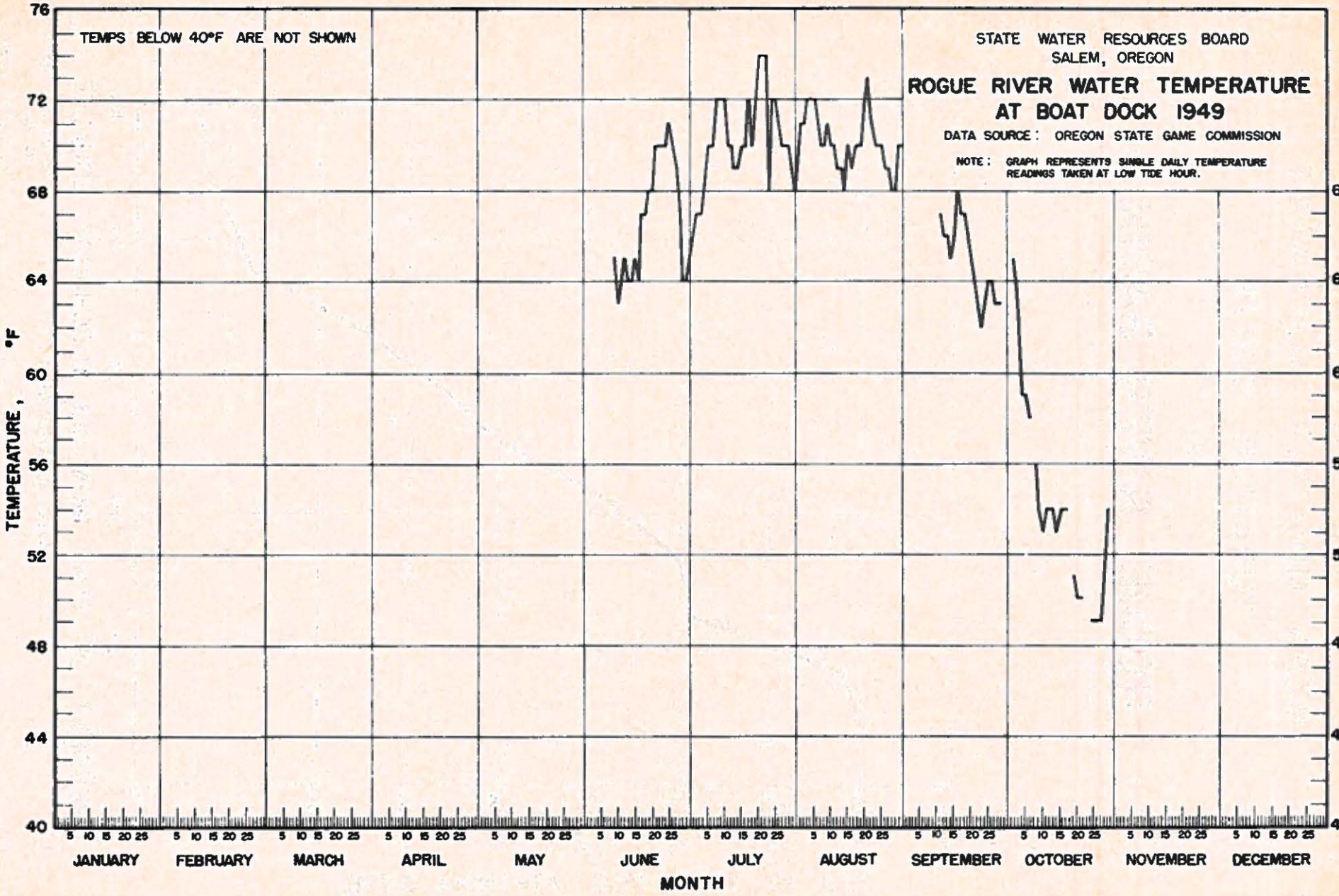

TEMPS BELOW 40°F ARE NOT SHOWN
STATE WATER RESOURCES BOARD
SALEM, OREGON
ROGUE RIVER WATER TEMPERATURE
AT BOAT DOCK 1949
DATA SOURCE: OREGON STATE GAME COMMISSION
NOTE: GRAPH REPRESENTS SINGLE DAILY TEMPERATURE READINGS TAKEN AT LOW TIDE HOUR.
TEMPERATURE, °F
76
72
68
64
60
56
52
48
44
40
5 10 15 20 25
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
MONTH
12-57

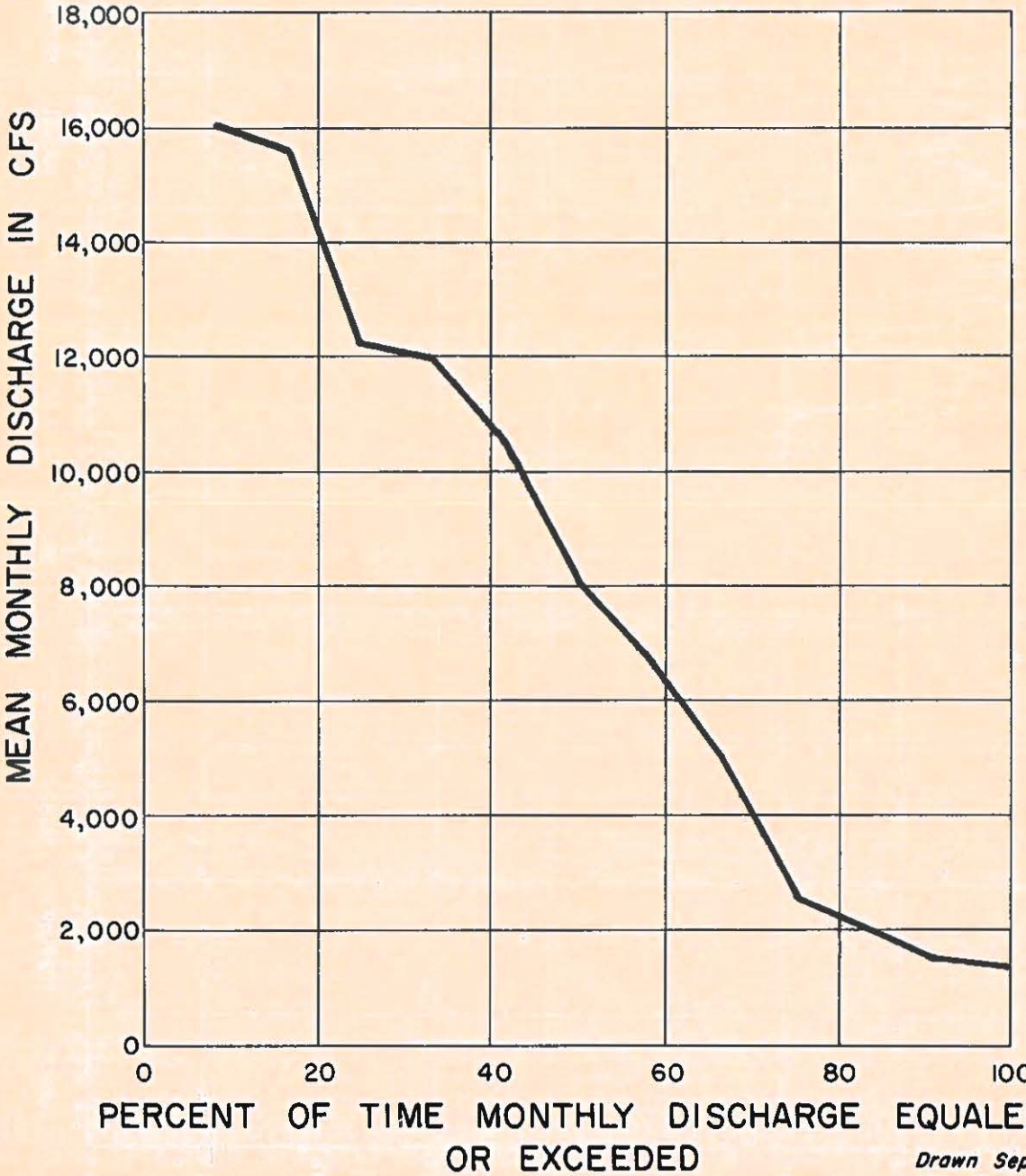
FIGURE 236

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

ROGUE RIVER BASIN



Drawn Sept. 26, 1958
File No.

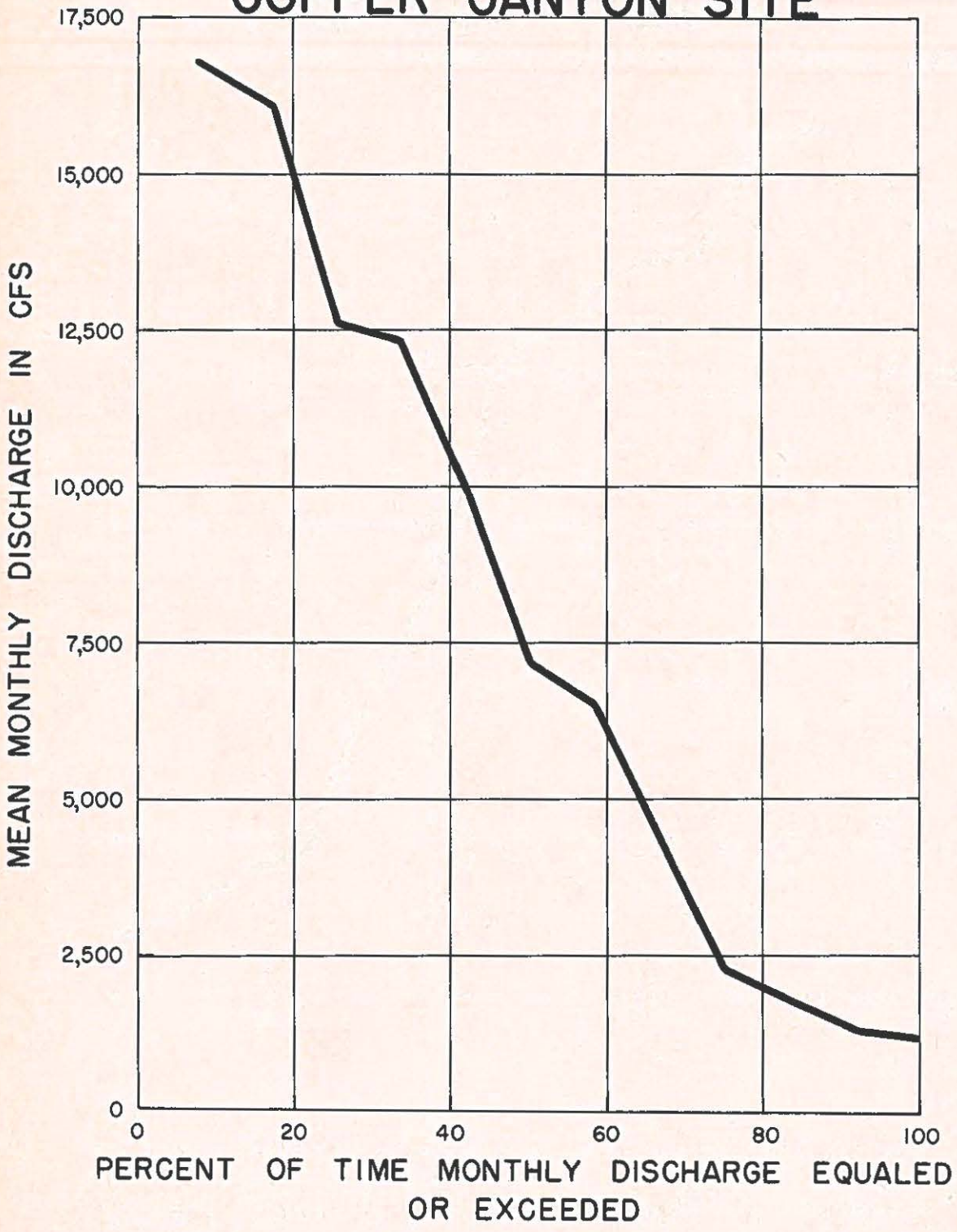
FIGURE 237

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

COPPER CANYON SITE



Drawn Sept. 17, 1958
File No.

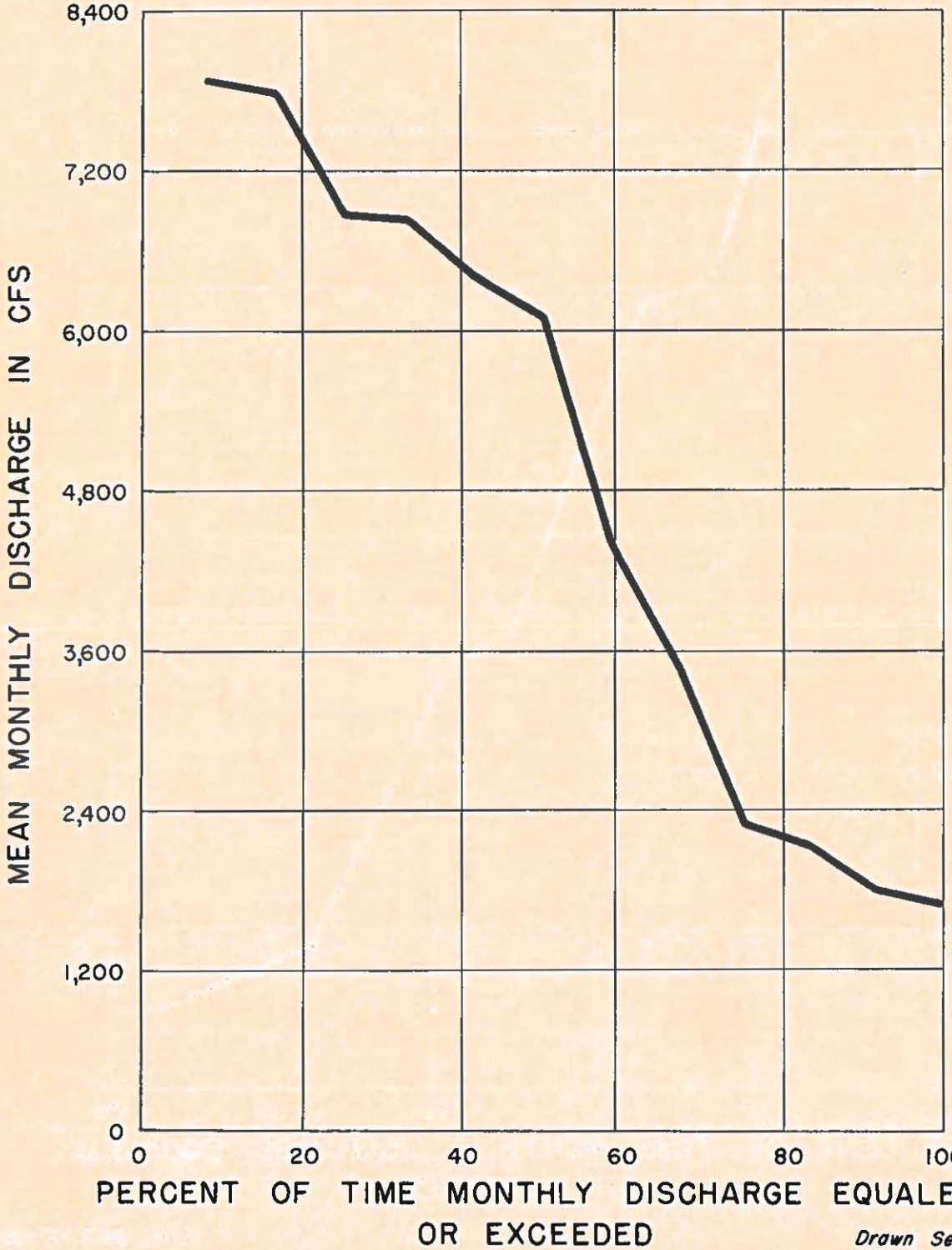
FIGURE 238

ROGUE RIVER BASIN

MEAN MONTHLY DISCHARGE DURATION CURVE

for

RAMEY FALLS SITE

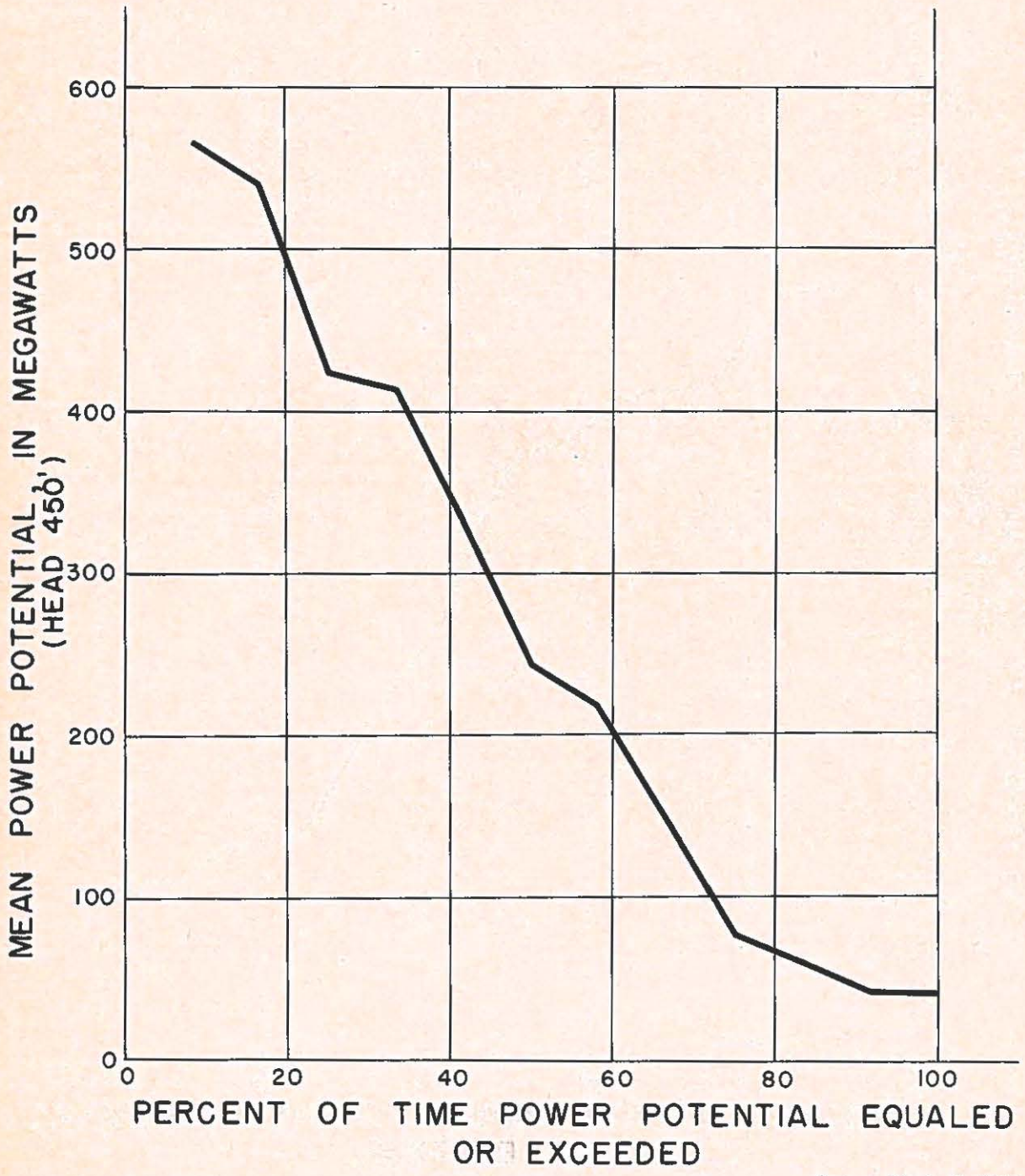


Drawn Sept. 22, 1958
File No.

FIGURE 239

ROGUE RIVER BASIN

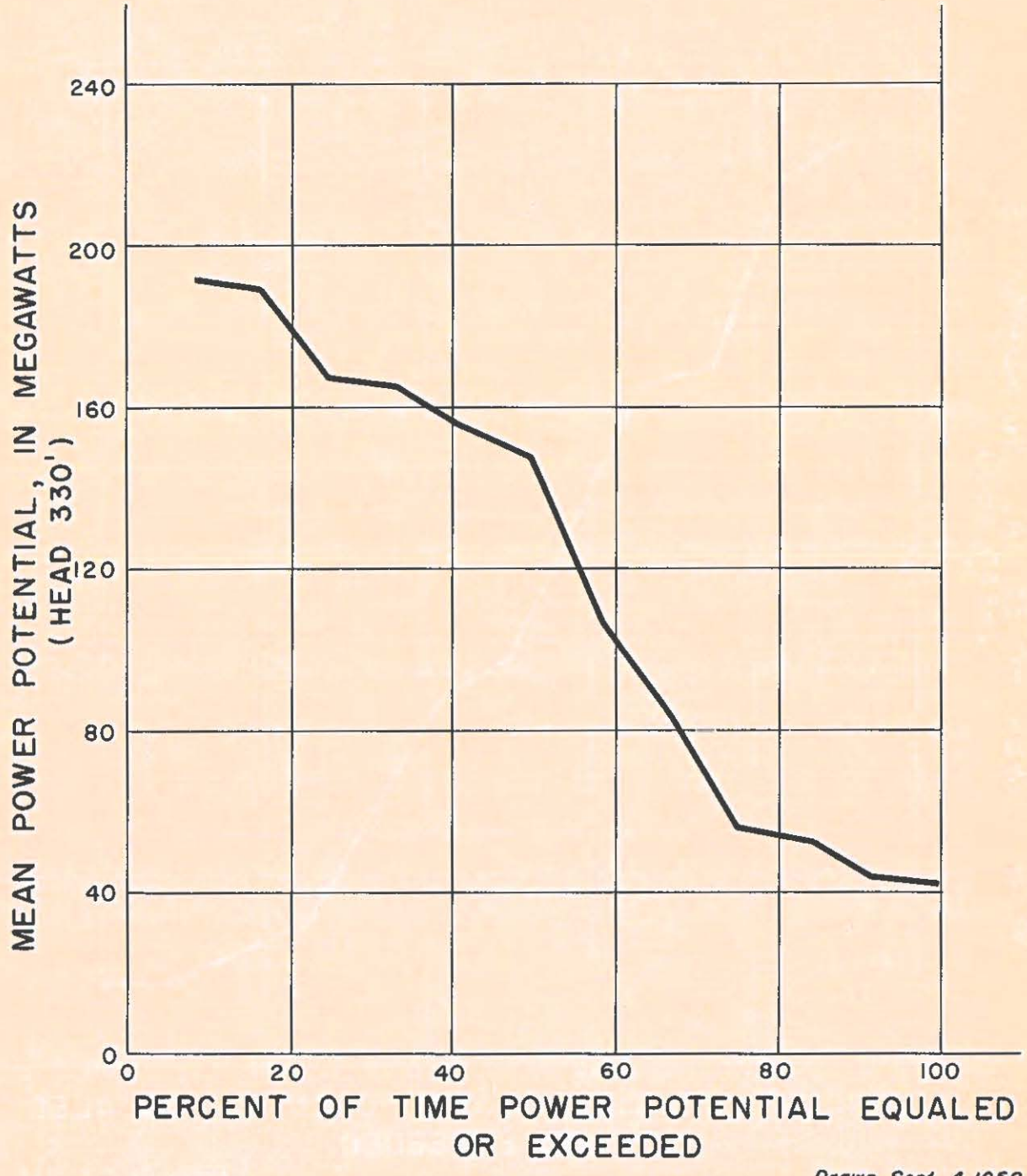
MEAN MONTHLY POTENTIAL POWER DURATION CURVE for COPPER CANYON SITE



Drawn Sept. 5, 1958
File No.
FIGURE 240

ROGUE RIVER BASIN

MEAN MONTHLY POTENTIAL POWER DURATION CURVE for RAMEY FALLS SITE



Drawn Sept. 4, 1958
File No.
FIGURE 241

APPENDIX

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ABBREVIATIONS AND SYMBOLS	421
APPROXIMATE HYDRAULIC EQUIVALENTS	422
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ABBREVIATIONS AND SYMBOLS

ac	acre
BOD	biochemical oxygen demand
Br.	Branch
Br.	Bridge
Can.	Canyon
cfs	cubic feet per second
CFS	cubic feet per second
Col.	column
Cr.	Creek
DA	drainage area
E.	East
FC	flood control
Fig.	Figure
Fk.	Fork
ft	feet or foot
G.	Gulch
gpd	gallons per day
gpm	gallons per minute
H	head, ft
Irrig.	irrigation
Jct.	Junction
KW	kilowatts
KWH	kilowatt hours
L.	Little
L.	Lake
Lat.	lateral
mgd	million gallons per day
mi	miles
Mt.	Mount
Mtn.	Mountain
msl	mean sea level
N.	North
nr.	near
ORS	Oregon Revised Statutes
ppm	parts per million
Q	rate of flow, cfs
quad	quadrangle
R.	River
R	range
Res.	Reservoir
S.	South
Sec.	section
Σ	(sigma) a summation
Spr.	Spring
T	township
USGS	United States Geological Survey
W.	West
WSP	water supply papers

APPROXIMATE HYDRAULIC EQUIVALENTS

1 acre foot

= *a volume 1 acre in area and 1 foot in depth*
= *326,000 gallons*
= *43,560 cubic feet*
= *0.5 cubic feet per second for 1 day*

1 cubic foot per second

*falling 8.8 feet will produce 1 horsepower**
*falling 11.8 feet will produce 1 kilowatt**
= *7.5 gallons per second*
= *450 gallons per minute*
= *2.0 acre feet per day*
= *650,000 gallons per day*

1 inch per day

= *0.04 cubic feet per second per acre*
= *27 cubic feet per second per square mile*
= *19 gallons per minute per acre*

1 inch per hour

= *1.0 cubic feet per second per acre*
= *640 cubic feet per second per square mile*
= *450 gallons per minute per acre*

1 million gallons per day

= *690 gallons per minute*
= *1.5 cubic feet per second*
= *3.0 acre feet per day*

* *theoretical for water at standard conditions*

STATUTORY REFERENCES

HOUSE JOINT RESOLUTION NO. 40 (Forty-Ninth Legislative Assembly) "Whereas the current readjustments now taking place in the forest industries urgently require prompt action in the development of a state water resources policy for the Rogue River basin and watershed in order to permit full consideration of various projects that would make it possible for Southern Oregon to move forward and make full use of its unlimited potential for growth and economic stability; and

"Whereas the State Water Resources Board is charged with the responsibility of formulating a state water resources policy in order to encourage, promote and secure the maximum beneficial use and control of the state's water resources; and

"Whereas the economic and general welfare of the people of Southern Oregon have been seriously impaired and are in danger of further impairment because the investigations, surveys and studies necessary to the formulation of a state water resources policy for the Rogue River basin and watershed have not been made; and

"Whereas the making of such investigations, surveys and studies necessary to the formulation of a state water resources policy for the Rogue River basin and watershed is a matter of greatest concern and highest priority; now, therefore,

"BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES OF THE STATE OF OREGON, THE SENATE JOINTLY CONCURRING:

"That the State Water Resources Board hereby is directed to begin immediately the investigations, surveys and studies necessary to formulate a state water resources policy for the Rogue River basin and watershed in accordance with the provisions of ORS Chapter 536."

ORS 536.300 "Formulation of state water resources policy. (1) The board shall proceed as rapidly as possible to study: existing water resources of this state; means and methods of conserving and augmenting such water resources; existing and contemplated needs and uses of water for domestic, municipal, irrigation, power development, industrial, mining, recreation, wildlife, and fish life uses and for pollution abatement, all of which are declared to be beneficial uses, and all other related subjects, including drainage and reclamation.

"(2) Based upon said studies and after an opportunity to be heard has been given to all other state agencies which may be concerned, the board shall progressively formulate an integrated, coordinated program for the use and control of all the water resources of this state and issue statements thereof. [1955 c. 707 §10 (1), (2)] "

ORS 536.310 "Purposes and policies to be considered in formulating state water resources policy. In formulating the water resources program under subsection (2) of ORS 536.300, the board shall take into consideration the purposes and declarations enumerated in ORS 536.220 and also the following additional declarations of policy:

"(1) Existing rights, established duties of water, and relative priorities concerning the use of the waters of this state and the laws governing the same are to be protected and preserved subject to the principle that all of the waters within this state belong to the public for use by the people for beneficial purposes without waste;

"(2) It is in the public interest that integration and coordination of uses of water and augmentation of existing supplies for all beneficial purposes be achieved for the maximum economic development thereof for the benefit of the state as a whole;

"(3) That adequate and safe supplies be preserved and protected for human consumption, while conserving maximum supplies for other beneficial uses;

"(4) Multiple-purpose impoundment structures are to be preferred over single-purpose structures; upstream impoundments are to be preferred over downstream impoundments. The fishery resource of this state is an important economic and recreational asset. In the planning and construction of impoundment structures and milldams and other artificial obstructions, due regard shall be given to means and methods for its protection;

"(5) Competitive exploitation of water resources of this state for single-purpose uses is to be discouraged when other feasible uses are in the general public interest;

"(6) In considering the benefits to be derived from drainage, consideration shall also be given to possible harmful effects upon ground water supplies and protection of wildlife;

"(7) The maintenance of minimum perennial stream flows sufficient to support aquatic life and to minimize pollution shall be fostered and encouraged if existing rights and priorities under existing laws will permit;

"(8) Watershed development policies shall be favored, whenever possible, for the preservation of balanced multiple uses, and project construction and planning with those ends in view shall be encouraged;

"(9) Due regard shall be given in the planning and development of water recreation facilities to safeguard against pollution;

"(10) It is of paramount importance in all cooperative programs that the principle of the sovereignty of this state over all the waters within the state be protected and preserved, and such cooperation by the board shall be designed so as to reinforce and strengthen state control;

"(11) Local development of watershed conservation, when consistent with sound engineering and economic principles, is to be promoted and encouraged; and

"(12) When proposed uses of water are in mutually exclusive conflict or when available supplies of water are insufficient for all who desire to use them, preference shall be given to human consumption purposes over all other uses and for livestock consumption, over any other use, and thereafter other beneficial purposes in such order as may be in the public interest consistent with the principles of this Act under the existing circumstances. [1955 c. 707 §10 (3)]"

ORS 538.220 *"Waters of Mill and Barr Creeks, Jackson County, withdrawn; fish protection excepted. The waters described as follows are withdrawn from appropriation or condemnation, and shall not be diverted or interrupted for any purpose whatsoever, except for protecting fish life therein by the State Game Commission:*

"(1) The waters of Mill Creek, in Jackson County, beginning in section 22, township 31 south, range 4 east, Willamette Meridian, running thence southwesterly through township 31 south, range 3 east, Willamette Meridian, and township 32 south, range 3 east, Willamette Meridian, to a junction with the Rogue River in section 32, township 32 south,

range 3 east, Willamette Meridian, together with the tributaries of said Mill Creek; and

"(2) Barr Creek, in Jackson County, beginning in section 1, township 32 south, range 3 east, Willamette Meridian, and in section 6 and section 7, township 32 south, range 4 east, Willamette Meridian, running thence in a general southwesterly direction through township 32 south, range 3 east, Willamette Meridian, to a junction with the Rogue River in section 32, township 3 east, Willamette Meridian, together with the tributaries of said Barr Creek."

ORS 538.230 *"Vested water rights not affected; condemnation for park not prevented. ORS 538.220 shall not affect vested water rights or prevent condemnation for public park purposes of lands through which Mill and Barr Creeks or their tributaries flow."*

ORS 538.270 *"Rogue River; withdrawal from appropriation; excepted water uses; tributaries. Subject to water rights existing on July 17, 1949, the waters flowing in the main channel of the Rogue River from its intersection with the south line of section 10, township 34 south, range 1 west of the Willamette Meridian in Jackson County, to its confluence with the Pacific Ocean, are withdrawn from appropriation; except that this section shall not prevent the appropriation and use of such waters for domestic, stock, irrigation and municipal purposes, nor prevent the appropriation, diversion and use of the waters of any stream tributary to the river."*

ORS 538.430 *"Medford and Eagle Point Irrigation District; right to waters of Big Butte Creek; generation, sale and distribution of electric energy by irrigation district. (1) Subject to water rights existing on May 29, 1925, the city of Medford, in Jackson County, is granted the exclusive right to use for municipal purposes all the waters of Big Butte Creek, a tributary of Rogue River situated in Jackson County, and of the springs at the head which form the creek, and of its tributaries. The city of Medford, any of its officers, and others on its behalf may appropriate all the waters for these purposes and an application therefor may be made for the benefit of the city, either by it in its own name, or by any of its officers or by any other person on its behalf. No person shall appropriate or be granted a permit to use any of the waters except as provided in this section, and for the use and benefit of the city. But the city of Medford may, under this grant, divert such waters from their watershed and convey them to*

the city and elsewhere for use by it for municipal purposes, either within or without the city limits. All of such waters are withdrawn from future appropriation, except for such use and benefit of the city of Medford.

"(2) Subject to rights existing on July 21, 1953, to the use of the waters of Big Butte Creek, and of the springs at the head which form the creek, and of its tributaries, including the rights granted in subsection (1) of this section to the City of Medford to the use of such waters and the right of future appropriation of such waters, the Eagle Point Irrigation District is granted the right to appropriate and use up to and including 100 cubic feet per second of the waters of Big Butte Creek, using the diversion site of the Eagle Point Irrigation District existing on April 1, 1953, for the purpose of generating electric energy; provided, however, that not less than 10 cubic feet per second of said waters shall be permitted to pass said diversion point and remain in the channel of said stream at all times other than times when said waters are diverted for irrigation purposes. The Eagle Point Irrigation District may:

"(a) Enter into such contracts and perform such other acts as it deems necessary or desirable for the generation of electric energy and the construction and maintenance of facilities for the generation of electric energy.

"(b) Enter into such arrangements as it deems proper for the use, sale or distribution of the electric energy which is generated.

"(3) In performing any of the acts under subsection (2) of this section, the Eagle Point Irrigation District shall not be deemed a public utility as defined in ORS 757.005. [Amended by 1953 c. 572 §2]"

ORS 542.040 *"Withholding water from appropriation pending investigation; restrictions on permit to appropriate; repayment of cost of project. (1) The State Engineer, on behalf of the state, shall withdraw and withhold from appropriation any unappropriated water which may be required for any project under investigation or to be investigated under the provisions of ORS 542.010 to 542.050. If the project is found to be feasible, he shall withhold the same from appropriation until the money expended in the investigation of the project is repaid to the cooperating parties in proportion to the amount contributed by each unless funds for construction are provided by one or both of the cooperating parties, in which case the*

State Engineer shall issue a permit without requiring such repayment. No permit to appropriate water which may be in conflict with any such project under investigation shall be approved by the State Engineer, nor shall any assignment of plans and information or any part thereof be made except upon consideration and order by him after full hearing of all interested parties.

"(2) Any moneys returned to the State Engineer under the provisions of this section shall promptly be turned over to the State Treasurer and credited to the General Fund in the State Treasury."

ORS 542.210 *"Construction of federal dams and structures in Rogue River; limitations. In order to further necessary investigations and studies for the maximum development of the Rogue River basin and watershed and to conserve established and potential uses thereof, and to facilitate full consideration of various projects to accomplish a coordinated and comprehensive development of the basin and watershed, the United States and its authorized agencies may construct in the Rogue River and on its bed dams and such other structures as the government deems necessary, upon compliance with the laws of Oregon. However, no dam or structure hereby authorized shall be placed in the Rogue River between the intersection of the river with the south line of section 10, township 34 south, range 1 west of the Willamette Meridian in Jackson County, and the confluence of that river with the Pacific Ocean, which would interfere with the free passage of fish up or down stream. No dam or other structure shall be constructed by any person in or on the bed of the Rogue River below its intersection with the south line of section 27, township 33 south, range 1 east of the Willamette Meridian, in Jackson County, except as authorized by this section."*

APPLICABLE WITHDRAWALS BY STATE ENGINEER

ROGUE RIVER AND ITS TRIBUTARIES ABOVE GOLD RAY

"I, John H. Lewis, State Engineer of the State of Oregon, in accordance with the authority vested in me by virtue of Chapter 87, Laws of Oregon for 1913, do hereby withdraw and withhold from appropriation on behalf of the State of Oregon, any and all unappropriated waters of Rogue River and its tributaries above Gold Ray, for irrigation, power, domestic and storage purposes, which may be required for the project under investigation or to be investigated under the provisions of said Act, and that certain contract between the United States of America, by Franklin K. Lane, Secretary of the Interior, and the State of Oregon by John H. Lewis, State Engineer, approved by Oswald West, Governor, on the 5th day of May, 1913, executed thereunder.

"Dated this 6th day of September, 1915.

/s/ JOHN H. LEWIS

John H. Lewis,

State Engineer of the State of Oregon."

"It is the purpose of this instrument to withdraw and withhold from general appropriation, any unappropriated waters of the above named streams, for the use and benefit of the irrigation project which is to be jointly investigated under the provisions of said Chapter 87, Laws of 1913, and the contract between the State and the United States."

APPLICATION NO. 4496, dated Sept. 6, 1915, is in the name of John H. Lewis, State Engineer, for a permit to appropriate the waters listed in the above withdrawal.

APPLICATION NO. 4497, dated Sept. 6, 1915, is in the name of John H. Lewis, State Engineer, for a permit to construct a reservoir and to store the waters listed in the above withdrawal.

APPLICABLE WITHDRAWALS BY STATE ENGINEER

BUCK LAKE AND TRIBUTARIES, BEAVER CREEK, KEENE CREEK

"I, John H. Lewis, State Engineer of the State of Oregon, in accordance with the authority vested in me by virtue of Chapter 87, laws of Oregon for 1913, do hereby withdraw and withhold from appropriation on behalf of the State of Oregon, any and all unappropriated waters of Buck Lake and tributaries thereof, in T. 38 S. R. 5 E. W. M., and Beaver Creek and Kane, Keen or Keene Creek in Jackson County, for irrigation, power, domestic supply and storage purposes, which may be required for the project under investigation or to be investigated under the provisions of said Act, and that certain contract between the United States of America, by Franklin K. Lane, Secretary of the Interior, and the State of Oregon by John H. Lewis, State Engineer, approved by Oswald West, governor, on the 5th day of May, 1913, executed thereunder.

"Dated this 6th day of September, 1915.

/s/ JOHN H. LEWIS

John H. Lewis,

State Engineer of the State of Oregon."

"It is the purpose of this instrument to withdraw and withhold from general appropriation any unappropriated waters of the above named Streams for the use and benefit of the irrigation project which is to be jointly investigated under the provisions of said Chapter 87, Laws of 1913, and the contract between the State and the United States."

APPLICATION NO. 4498, dated Sept. 6, 1915, is in the name of John H. Lewis, State Engineer, for a permit to appropriate the waters listed in the above withdrawal.

BIG BUTTE CREEK

"I, John H. Lewis, State Engineer of the State of Oregon, in accordance with the authority vested in me by virtue of Chapter 87, Laws of Oregon for 1913, do hereby withdraw and withhold from appropriation

on behalf of the State of Oregon, any unappropriated waters of Big Butte Creek to the extent of 600 second feet for irrigation, power and domestic supply, which may be required for the project under investigation or to be investigated under the provisions of said Act and that certain contract between the United States of America, by Franklin K. Lane, Secretary of the Interior, and the State of Oregon, by John H. Lewis, State Engineer, approved by Oswald West, Governor, on the 5th day of May, 1913, executed thereunder.

"Dated this 21st day of August, 1915.

/s/ JOHN H. LEWIS

State Engineer for the State of Oregon."

"It is the purpose of this instrument to withdraw and withhold from general appropriation, any unappropriated waters of the above named stream for the use and benefit of the irrigation project which is to be jointly investigated under the provisions of said Chapter 87, Laws of 1913, and the contract between the State and the United States, executed thereunder."

APPLICATION NO. 4476, dated August 21, 1915, is in the name of John H. Lewis, State Engineer, for a permit to appropriate the waters listed in the above withdrawal.

APPLICABLE ORDERS BY STATE ENGINEER

BIG BUTTE CREEK

"IN THE MATTER OF THE APPLICATION OF)
EAGLE POINT IRRIGATION DISTRICT FOR AN)
ALLOTMENT OF THE WATERS OF BIG BUTTE)
CREEK, HERETOFORE WITHDRAWN FROM) ORDER
APPROPRIATION UNDER THE PROVISIONS OF)
CHAPTER 87, LAWS OF OREGON FOR 1913.)

"Now at this time this matter coming on for consideration by the State Engineer, after full hearing of all interested parties on October 10, 1923, pursuant to notice, and the State Engineer having carefully considered all evidence and data presented, and it appearing:

"That on the 21st day of August, 1915, the unappropriated waters of Big Butte Creek were withdrawn from appropriation by the State Engineer under the provisions of Chapter 87, Laws of Oregon for 1913, for the benefit of irrigation in Rogue River Valley and in connection with cooperative investigations by the State of Oregon and the U. S. Reclamation Service. That the Eagle Point Irrigation District has made application for an allotment of a part of the water so withdrawn, and has paid to the State and Reclamation Service its proportionate part of the cost of said investigations.

"That objections to an allotment to said District have been filed by the California Oregon Power Company and by Isabella Rowley, but it appears that the rights of said parties could not be in any way adversely affected by an allotment to the applicant herein. That no other parties have appeared herein, and there are apparently no conflicting claims for water rights from said stream that would be injured by the granting of an allotment to said Eagle Point Irrigation District.

"And it further appearing that said Eagle Point Irrigation District is entitled to the assignment of that portion of the plans and information secured in connection with said cooperative investigations which pertain to the reclamation of the lands within said District, and to permit to appropriate the amount of water required for the irrigation of its lands.

"NOW, THEREFORE it is ORDERED that there is hereby allotted to the Eagle Point Irrigation District from the waters of Big Butte Creek withdrawn August 21, 1915, the amount of water which may be beneficially applied to the irrigable lands in said District in accordance with the terms of the permit issued pursuant to this order, not to exceed 100 cubic feet per second measured at the diversion point of the main canal of said District from said stream. And it is further ORDERED that the priority of said right shall be the date of the withdrawal, namely, August 21, 1915, and that no superiority of right shall be acquired by said District as against any subsequent allottee by reason of prior allotment.

"Dated this 20th day of February, 1924, at Salem, Oregon.

/s/ RHEA LUPER

RHEA LUPER
STATE ENGINEER"

"IN THE MATTER OF THE APPLICATION OF)
THE CITY OF MEDFORD FOR THE ALLOTMENT)
OF THE WATERS OF BIG BUTTE CREEK) ORDER
HERETOFORE WITHDRAWN FROM APPROPRIATION)
UNDER THE PROVISIONS OF CHAPTER 87,)
LAWS OF OREGON FOR 1913.)

"Now at this time this matter coming on for consideration by the State Engineer and after hearing of all interested parties at the City Hall in the City of Medford on October 10, 1923, pursuant to notice at which appearance through counsel was made by the Eagle Point Irrigation District, the City of Medford, California-Oregon Power Company and Isabella Rowley, and the State Engineer having carefully considered all the facts;

"And it appearing that on the 21st day of August, 1915, the unappropriated waters of Big Butte Creek were withdrawn from appropriation by the State Engineer, under the provisions of Chapter 87 Laws of Oregon for 1913 for the benefit of the irrigation of Rogue River Valley, and in connection with the cooperative investigation by the

State of Oregon and the United States Reclamation Service, and it appearing further that an allotment of 100 second feet, or so much thereof as can be beneficially used, of said withdrawn waters, to the Eagle Point Irrigation District, has been made under the order of the State Engineer dated February 20, 1924, and that the quantity of water remaining unappropriated under said withdrawal during the extreme low water period in years of minimum flow may not exceed 30 cubic feet per second, and it further appearing that the use of water for municipal purposes is a preference right over the use of water for irrigation purposes, and that the allotment of not less than 30 second feet can be made to the City of Medford without affecting other vested rights on the stream, including those of the Eagle Point Irrigation District, and the State Engineer being fully advised in the premises, NOW, THEREFORE it is ORDERED that there is hereby allotted to the City of Medford, from the waters of Big Butte Creek withdrawn August 21, 1915, the quantity of water which may be beneficially used in said City in accordance with the terms of the permit issued pursuant to this order not to exceed 30 cubic feet per second measured at the diversion point of the City's canal or pipe line from said stream, and it is further ordered that the priority of said right shall be the data of withdrawal, namely, August 21, 1915.

"Dated this 25th day of April, 1925 at Salem, Oregon.

/s/ RHEA LUPER

RHEA LUPER,
STATE ENGINEER."

SUCKER AND ALTHOUSE CREEKS

"IN THE MATTER OF THE WITHDRAWAL)
FROM FURTHER APPROPRIATION OF THE)
WATERS OF SUCKER AND ALTHOUSE CREEKS) ORDER
AND THEIR TRIBUTARIES)

"It now appearing from information before the State Engineer that the waters of Sucker and Althouse Creeks, both tributary to the East Fork of the Illinois River, and all their tributaries are at this time over appropriated, and

APPLICABLE ORDERS BY STATE ENGINEER

"That there is no water in these streams or their tributaries available for appropriation over and above that quantity required for existing rights, and

"That any rights granted to appropriate additional water from these streams or their tributaries will conflict with existing rights, and

"That any new appropriations attempted will result only in the creation of an administrative problem which should be avoided,

"IT IS THEREFORE ORDERED that no further permits to appropriate water from these streams or their tributaries, for any purpose other than domestic use, or for power or mining developments where such may be made without actual consumption of water or injury to existing rights, be granted.

"Dated at Salem, Oregon, this 27th day of July, 1934.

/s/ CHAS. E. STRICKLIN

CHAS. E. STRICKLIN,
State Engineer"

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