GEOLOGICAL SURVEY CIRCULAR 182

EVALUATION OF STREAMFLOW RECORDS IN FLATHEAD RIVER BASIN MONTANA

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ABSTRACT

This report presents data which are, in general, supplementary to those of the surface-water investigations made in the past by the Geological Survey. Those investigations have consisted essentially of the operation of the many gaging stations on the Flathead River and tributaries.

The data presented were obtained from a detailed field investigation of the various man-made devices that are factors influencing the quantity or regimen of the flow at the gaging stations. These factors include diversions from the stream, bypass channels carrying water around the gaging stations, return flow from irrigation or other projects, storage and release of flood waters, and other similar factors. Where feasible, the location, size, effect upon the streamflow, periods of use, method of operation, and similar information are given. The information is segregated into sections corresponding to areas determined by the location of gaging stations. An index of streamflow records is included.

A section dealing with the adequacy of available water-resources data, including location and period of record, also is included. This information is given in general terms only, and is portrayed mainly by maps and graphs.

INTRODUCTION

Purpose and Scope

Studies of the water supply for a project utilizing surface water are based primarily on streamflow data obtained by operating gaging stations. Project design requires an estimate of the probable future water supply that reasonably may be expected during the life of the project. This can be achieved only through a study of records of past streamflow or other hydrologic events. Records covering a period of many years are necessary to evaluate adequately the effect of vagaries of the weather and to determine the safe yield during drought periods. If during the period of operation of a gaging station, man-made devices have altered the normal regimen of the stream or utilized consumptively a portion of the water supply, the effects of these changes must be considered in analyzing the data to determine the possible future supply.

River discharge determined by gaging stations represents, in each instance, the actual discharge at that particular point. In a basin where natural runoff prevails, these records depict the surface-water yield of the basin at that point. Such records are of great value to the hydrologist or designing engineer, as they are a direct measure of the yield of the drainage basin. When upstream water use diverts and depletes the water supply, the discharge records no longer serve as a measure of the yield of the basin unless appropriate adjustments are made. If the point of proposed diversion or future use is remote from the gaging station, it is even more important to have complete knowledge of these factors.

The primary purpose of this report is to evaluate each streamflow record in terms of the factors that influence or alter the flow of the Flathead River and tributaries at the gaging-station locations. Such factors include diversions, bypass channels carrying water around the gaging stations, consumptive use, regulation by storage, and other factors that alter the natural regimen of the stream or the discharge record obtained at the gaging station.

The scope of this report is confined to indexing facts and material needed for the quantitative evaluation of the surface-water resources. Emphasis is on the factors influencing the runoff regimen and the gaging-station records without attempting a quantitative determination of their effect. For example, diversions are identified by name, location, approximate size, time of occurrence, purpose, and sources of information concerning their use. These data are basic to quantitative surface-water-supply studies and to the evaluation of the surface-water resources of the basin. One of the more important items of this information is the reference to the sources of data.

In addition to presenting information for the evaluation of factors influencing basin yield, some attention is given to evaluating the adequacy of the streamflow records, themselves, in time and distribution. This includes: a bar graph picturing the length and distribution of discharge records; maps showing areal distribution of stations and the relative length of records; a table showing stream-depletion data; and a table of reservoir storage potentials.

Acknowledgments

Data presented in this report were collected from many sources, including publications and files of the U. S. Geological Survey, the

U. S. Bureau of Indian Affairs, and the U. S. Bureau of Reclamation, agencies of the State of Montana, irrigation districts, and many individuals. The assistance of Frank H. Tyro, engineer for the Flathead Project of the U. S. Bureau of Indian Affairs, and U. S. Forest Service officials at the Kalispell Headquarters is greatly appreciated. Much valuable information was furnished by watermasters of Jocko and Mission divisions of the Flathead Project.

This report was prepared under the immediate supervision of E. G. Bailey, Hydraulic Engineer, U. S. Geological Survey, Tacoma, Washington. Frank Stermitz, District Engineer, Surface Water Branch, Helena, Mont., and C. C. McDonald, Staff Engineer, Technical Coordination Branch, Tacoma, Wash., provided valuable technical assistance.

PHYSICAL FEATURES OF THE BASIN

The Flathead River originates in British Columbia and follows a general southerly course to a point about 25 miles from its confluence with the Clark Fork, where it turns abruptly westward. The stream pattern is governed by the mountain ranges, trending northward. South Fork, the largest tributary, flows northwest in close alignment with the main river above their confluence, but flows in the opposite direction.

The drainage basin of the Flathead River encompasses nearly 9,000 sq mi, 649 sq mi of which are in Canada. The basin, which lies west of the Continental Divide, is high and mountainous, and largely primitive and uninhabited. The central portion of the area lies in the Rocky Mountain Trench, a structural depression that includes Flathead Lake and the gently rolling hills and prairies to the north and south of the lake. Flathead Lake, a prominent feature in the topography of the basin, contains about 190 sq mi of water area. Several small lakes are on the western slopes near Glacier National Park. A few small glaciers and permanent snow fields are present in the headwater areas of Flathead River.

The largest tributaries of the Flathead River are South and Middle Forks, which join the river not far above the point where it cuts through the Swan Range and enters Kalispell Valley. Whitefish Creek and Stillwater River enter from the west below this point, and Swan River enters Flathead Lake from the east. Several smaller tributaries from the east are utilized almost entirely for irrigation in the Flathead Project of the U. S. Bureau of Indian Affairs.

Precipitation in the valley area is light, averaging 14.7 in. at Kalispell, about half of which falls during the growing season. Precipitation in the mountainous areas is much greater; a substantial portion is snow. This snow pack is the major source of the normal spring runoff and forms the water supply for irrigation and power production.

Temperatures in the mountainous areas are low, and the growing season is short, but there is little arable land in these areas. In the lower basin near Kalispell and below Flathead Lake, summer temperatures are high, and the growing season is sufficiently long to mature most fruit and grain crops.

Low flows of the Flathead River basin naturally occur during the late winter, and floods normally occur in the late spring during periods of rapid snow melt. Rain also may be an important factor during these flood periods. Winter floods in this area rarely reach substantial proportions. Damaging floods are infrequent and confined to a few localized areas. The river is confined within high banks over much of its course and has no thickly populated flood plains.

UTILIZATION OF WATER IN THE BASIN

The principal uses of water in the basin are for irrigation and power generation. Municipal and industrial use of water is relatively minor up to the present and almost negligible in comparison with the total amount of water used. Total regulation and diversion is not sufficient to have a measurable effect on runoff in the basin. The regulation for power generation is confined to Flathead Lake, and all but a small fraction of the use for irrigation is practiced below the lake.

Storage has been provided for about 17 percent of the average annual runoff of 8 million acre-ft, as measured at Flathead River near Polson. Flathead Lake encompasses 15 percent of this storage capacity, and reservoirs built for irrigation store the remaining 2 percent.

Power production is of major importance at present and is now at the beginning of a period of great expansion. Considerable regulation of the Flathead River results from the operation of 1,219,000 acre-ft of storage in Flathead Lake for power generation at Kerr Dam and other plants on the Clark Fork and Columbia River. Two smaller plants on Swan River and Big Creek operate without storage facilities except for a small reservoir on Big Creek. The total installed capacity in the basin at present is 60,000 kw, but studies of power potentialities indicate that an additonal 350,000 kw can be installed at several sites. Hungry Horse Dam, now under construction on the South Fork, will develop about 3.5 million acre-ft of storage for power and flood control.

A depletion study based on acreage irrigated in 1946 shows a consumptive use in the whole basin of less than 1.4 percent of the runoff measured at Polson. It is apparent that the total yield of the basin is affected little by consumptive use, particularly when it is noted that a substantial part of the irrigation water supply is imported from adjacent river basins.

Water in the main stem of the Flathead River is not available for use in the areas where most of the irrigable land is located without the expense of pumping. The water supply usually is diverted from tributaries nearby, so that local shortages occur in spite of the ample supply for the basin as a whole.

There are two principal areas of water use as well as population. The first is the relatively flat valley area north of Flathead Lake and surrounding Kalispell. The second is the broader and more extensive area that extends generally southward from Flathead Lake and contains the Flathead Irrigation Project of the Bureau of Indian Affairs.

Precipitation in the area surrounding Kalispell generally is adequate for the growing of

selected crops, and irrigation usually is practiced on small and scattered tracts. Pumping and sprinkler irrigation is increasing, particularly along the lower reaches of the Stillwater River and east of Kalispell. Irrigation in the separate valleys along the forks and tributaries of the Flathead River generally is confined to hay land, which is served by one or two applications of flood water during the high-water season. The Ashley Irrigation District is the only organized development north of Flathead Lake, and it is served by a gravity canal that diverts from Ashley Creek. The remaining developments have been made by individuals, and information on their extent is meager. In many instances, such as for the irrigation of certified seed potatoes, land and water sourcesare varied in successive years. Agriculture statistics show that nonirrigated crops comprise only a small portion of the crop value.

In the second general area, nearly all irrigated land is contained in the Flathead Project in the valleys of Crow Creek, Mission Creek, and Jocko River on the east and southeast side of the Flathead River, and of the Little Bitterroot River to the west. Here again, the privately irrigated land is in widely scattered small tracts served by diversions from various tributaries of the Flathead River.

The Flathead Project is supplied with water by streams that originate in the mountains bordering this part of the valley. Lower Jocko Lake, McDonald, Mission, and Tabor reservoirs are on streams feeding the Jocko and Mission divisions, and Little Bitterroot Lake, Hubbart, Upper Dry Fork, and Dry Fork reservoirs are on streams feeding the Camas Division. In addition to these reservoirs, Twin, Pablo, Kicking Horse, and Ninepipe reservoirs, fed entirely by canals, are in the Mission Division. Lower Crow Reservoir on Crow Creek is supplied largely by ground-water return flow from the large areas of irrigated land upstream, as the natural yield of the Crow Creek basin is largely diverted before reaching the reservoir. Interbasin diversions have been built in the upper basin of the Jocko River and in the basin of the Little Bitterroot River to supplement the natural supply available in the basin.

The on-stream reservoirs can, of course, store water at all times of the year, but they catch most of their water supply during the spring and early-summer period of high runoff. During this same time feeder canals come into operation to fill the off-stream reservoirs. The Pablo Feeder Canal is the controlling feature of this system. It intercepts all streams from the Middle Fork of Jocko River north along the Mission Range to the headwaters of Crow Creek, and can convey water to almost any point where it is needed, although its principal purpose is to fill Pablo Reservoir. In years when the total supply is deficient, water can be turned out of this canal to where needed, and water needed to fill Pablo Reservoir can be pumped from the main stem of the Flathead River. This provides enough flexibility of operation so that the available water supply can be used with great efficiency. Water supply is ordinarily ample in the Jocko River basin, but further development is limited there by the lack of suitable storage sites for flood waters. The situation is somewhat different in the Camas Division where the dependable supply has turned out to be somewhat smaller than originally expected, and development has probably reached its limit, even with some importation of water from the Thompson River basin.

Settlement of the Flathead River basin progressed at first more rapidly in the region north of Flathead Lake, many old filings for water rights dating back to the period of about 1870. The former Flathead Indian Reservation, which included most of what is now Lake County, was closed to white settlement by treaty in 1855. Beginning in 1909, funds were appropriated to begin construction of the Flathead Project, and in 1910, farm lands not individually allotted to Indians were opened to white settlement. Construction proceeded rapidly, and although some development is still in progress, it has reached the point of almost complete utilization of available water. Private development of irrigated land, however, probably had reached a total approaching the present amount by the time the Flathead Project had begun, and development has been fairly stable since, except for the recent development of sprinkler irrigation near Kalispell.

Hay accounts for about one-third of the total crop production and has been the largest (in value) single crop produced on the project. Cereal grains--of which wheat is the most important, followed by oats and barley--are produced in nearly equal value. A variety of crops, among which potatoes and sugar beets are the most important, make up the remainder of those that are cultivated. Livestock and dairy products are an important source of income; the animals are fed on locally grown crops.

Economic development in the basin is principally confined to agriculture. The density of population is low, and towns and communities are few and small; therefore, consumptive use of water by these municipalities is relatively insignificant (see table 1).

WATER-RESOURCES DATA FOR FLATHEAD RIVER BASIN

Streamflow Records

The Geological Survey has collected surface-water data at points in the Flathead River basin since the early 1900's in cooperation with the U. S. Bureau of Indian Affairs, the U. S. Bureau of Reclamation, the Federal Power Commission, and the State of Montana.

The contribution of other Federal agencies to the stream-gaging program has been confined to cooperation with the Geological Survey, except for a recently instituted program, by the Bureau of Indian Affairs, for measurements of streams draining the Mission Range. Records obtained will be available at the Flathead Project office in St. Ignatius.

Development of the gaging-station program in the basin may be separated into two very well defined stages. The first includes the establishment of a number of gaging stations, which began in 1906 in connection with the planning of irrigation development in the basin below Flathead Lake. Operation of these stations served its purpose within a comparatively short period of years and was discontinued by 1918, insofar as stations on tributaries below Flathead Lake are concerned. In the second stage, stream-gaging above Flathead Lake began

Table 1.--Municipal and industrial uses of water in Flathead River basin, Montana

City	Source of supply	Approximate normal rate of use (cfs)	Sewage system	Remarks
Essex	Middle Fork Flathead River, Bear Creek, Essex Creek.	0.01	----	Several watering stations on approach to Marias Pass; also domestic supply used at hotel (Great Northern Railway).
West Glacier	Middle Fork Flathead River.	.01	----	Domestic supply for village and Glacier National Park Headquarters.
Columbia Falls.	Springs in Cedar Creek basin, 3½ miles north of town.	Not measured.	No municipal system.	Served 750 people in 1940; 1,493 in 1950.
Whitefish	Tributaries of Haskill Creek.	1.9	Three septic tanks discharge into Whitefish Creek within the city.	Emergency supply can be pumped from Whitefish Lake. Great Northern Railway shops pump some water from lake.
Kalispell	Springs in sec. 6, T. 28 N., R. 21 W.	2.0	Empties into Ashley Creek near west line sec. 20, T. 28 N., R. 21W.	Served 12,000 people in 1950.
Polson	Big Creek in the NW¼ sec. 4, T. 22 N., R. 19 W.	2	Sewage discharged into Flathead Lake after treatment.	Supply formerly pumped from Flathead Lake (1911 to 1919).
Ronan	Second Creek, 4 miles east and above Pablo Feeder Canal.	.01 (in 1928)	No municipal system.	Population 1,032 in 1940
St. Ignatius.	Infiltration galleries under Mission Creek downstream from Mission Reservoir.	No records available.	No municipal system.	System completed in 1940. Population 768 in 1940.
Hot Springs	Warm Springs Creek in sec. 6 or 7, T. 21 N., R. 25 W.	No records available.	No municipal system.	System completed about 1936.
Paradise	Well owned by Northern Pacific Railway 4,300 ft west of station.	No records available.	No municipal system.	Well supplies water for trains and also residents of Paradise.
Charlo	Drilled well 488 ft deep in town.	No records available.	No municipal system.	Supplies 58 residences.

with establishment of stations on the three forks of Flathead River about 1910, but although these stations are in operation at present, the records are not continuous for the whole period. Few additional stations were added until about 1930 and after, when most of the stations now in operation were established. The record for Flathead River near Polson is the only one that is continuous for the whole period. Water-supply papers published by the U. S. Geological Survey on surface-water supply in the Flathead River basin contain records from 1899 to 1950, and are listed on the following page.

The stream-gaging program in the area above Flathead Lake has been carried on with a wide variety of purposes, among them investigation of power potentialities, irrigation and industrial water supplies, and runoff data of value in general hydrologic studies. Stations now in operation have continuous records, but in earlier years no winter records were obtained at many of the stations.

Streamflow records available for the basin are shown in table 2. Numbers opposite the gaging stations listed in this table refer to locations on the map, plate 1.

Storage Reservoirs

The largest amount of storage in the basin at present is in Flathead Lake, a natural lake regulated at the outlet by Kerr Dam to develop 1,219,000 ac-ft between elevations 2,883 and 2,893 ft. The Hungry Horse project, when completed, will provide an additional 3,500,000 acre-ft of storage for power and flood control. Several smaller reservoirs are operated for irrigation purposes, principally in the Flathead Indian Project. Table 3 includes a list of all reservoirs in the basin, their usable capacities, and other information.

Surface-water supply in the years mentioned

Year	Water-Supply Paper	Year	Water-Supply Paper	Year	Water-Supply Paper	Year	Water-Supply Paper	Year	Water-Supply Paper
1899 a/	38	1910	292	1921	532	1931	722	1941	932
1900 b/	51	1911	312	1922	552	1932	737	1942	962
1901	66, 75	1912	332-A	1923	572	1933	752	1943	982
1902	85	1913	362-A	1924	592	1934	767	1944	1012
1903	100	1914	392	1925	612	1935	792	1945	1042
1904	135	1915	412	1926	632	1936	812	1946	1062
1905	178	1916	442	1927	652	1937	832	1947	1092
1906	214	1917	462	1928	672	1938	862	1948	1122
1907-8	252	1918	482	1929	692	1939	882	1949	1152
1909	272	1919-20	512	1930	707	1940	902	1950	1182

a/ Rating tables and index to Water-Supply Papers 35-39 contained in Water-Supply Paper 39. Monthly discharge for 1899 in 21st Annual Report, part 4.
b/ Rating tables and index to Water-Supply Papers 47-52 contained in Water-Supply Paper 52. Monthly discharge for 1900 in 22d Annual Report, part 4.

Daily records of the elevation of Flathead Lake are collected by the U. S. Geological Survey and published annually. Records of the irrigation reservoirs in the Flathead Indian Project are collected by the U. S. Bureau of Indian Affairs, and the monthly records of contents published by the Geological Survey or filed for public inspection. Records of certain groups of reservoirs are combined for publication: "Camas Reservoirs" and "Mission Valley Reservoirs." Records of other reservoirs are published separately.

Adequacy of Data

For consideration of the adequacy of records collected at gaging stations, table 2 and figure 1 give a graphic representation of records available with respect to length and time of operation and their geographical distribution. The key stations for the basin as a whole are the two main-stem stations at Columbia Falls and near Polson and the stations located near the mouths of the three main forks of the Flathead River. A measure of their relative size is shown in the following tabulation, which lists the average discharge at each station for the 10-yr period October 1939 to September 1949, the longest period of concurrent record available at this time:

Gaging station	Average discharge (cfs)
Middle Fork Flathead River near West Glacier.	2,492
South Fork Flathead River near Columbia Falls.	3,127
Flathead River at Columbia Falls.	8,474
Swan River near Big Fork	1,007
Flathead River near Polson.	10,090

Records of these stations, while not all continuous, have an aggregate length that covers a wide range of hydrologic events and conditions; discharges passing these stations are not significantly affected by depletion. Flow of the Flathead River near Polson has been subject to regulation by storage in Flathead Lake since 1938; however, lake records are available, which permit adjustment of the discharge records for storage. Records of varying length also are available for all the major tributaries above Flathead Lake, but records for smaller drainage basins within the area are few and cover only a short period. Establishment of stations on Bear Creek and Skyland Creek near Essex in 1946 and on several tributaries of the South Fork of Flathead River in 1948 will yield records of increasing value in basin development.

In the large part of the basin that lies below Flathead River near Polson, gaging stations have not been operated by the U. S. Geological Survey since 1918. Those records that were collected between 1906 and 1918 are of short duration, and winter records are lacking for several of the stations. Most of these records were obtained prior to construction of the Flathead Project, or the stations were located above all diversions. The records, therefore, are closely representative of the natural flow during the periods covered.

In table 4, all stations are listed, together with comments on factors in their tributary basins that have a significant effect in depleting or modifying the natural flow to the discharge shown in records for the stations.

Detailed information concerning the use of water by private individuals never has been collected systematically. Most of the counties of Montana made surveys to classify land for tax purposes about 1920, and, consequently, records of the privately irrigated land as of that time are available. This was not done, however, in Flathead County, which includes nearly all the Flathead River basin above Flathead Lake, except for the headwaters of the North Fork in Canada and some smaller areas. All irrigation has been done by private individuals, except on land in the Ashley Irrigation District, and information given in this report is based on estimates taken from several sources. The breakdown of these estimated amounts of irrigation for the various drainage basins is subject to much uncertainty, owing to the lack of information about the exact location of the many small private diversions.

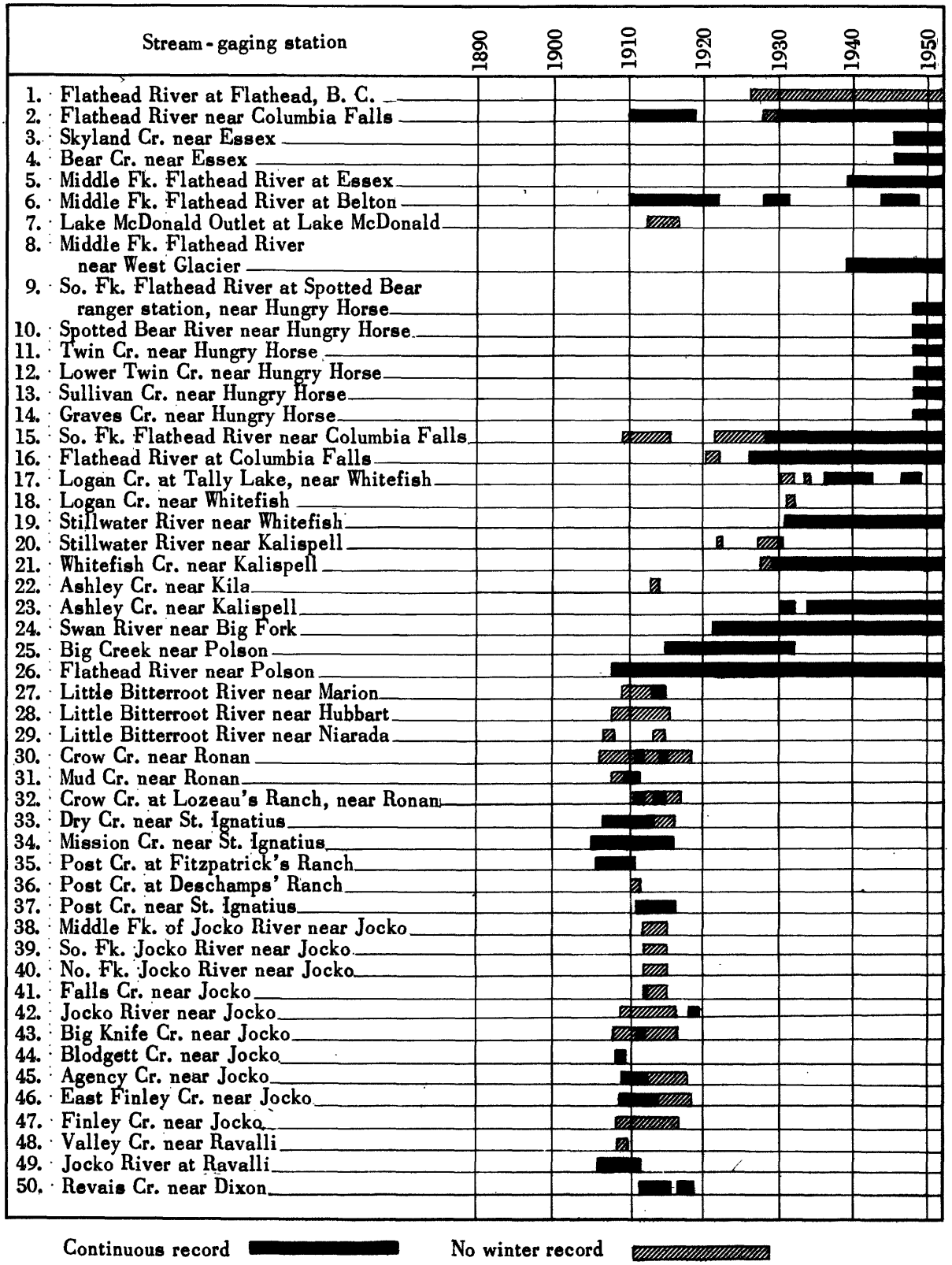

Table 2.--Index of streamflow records in Flathead River basin

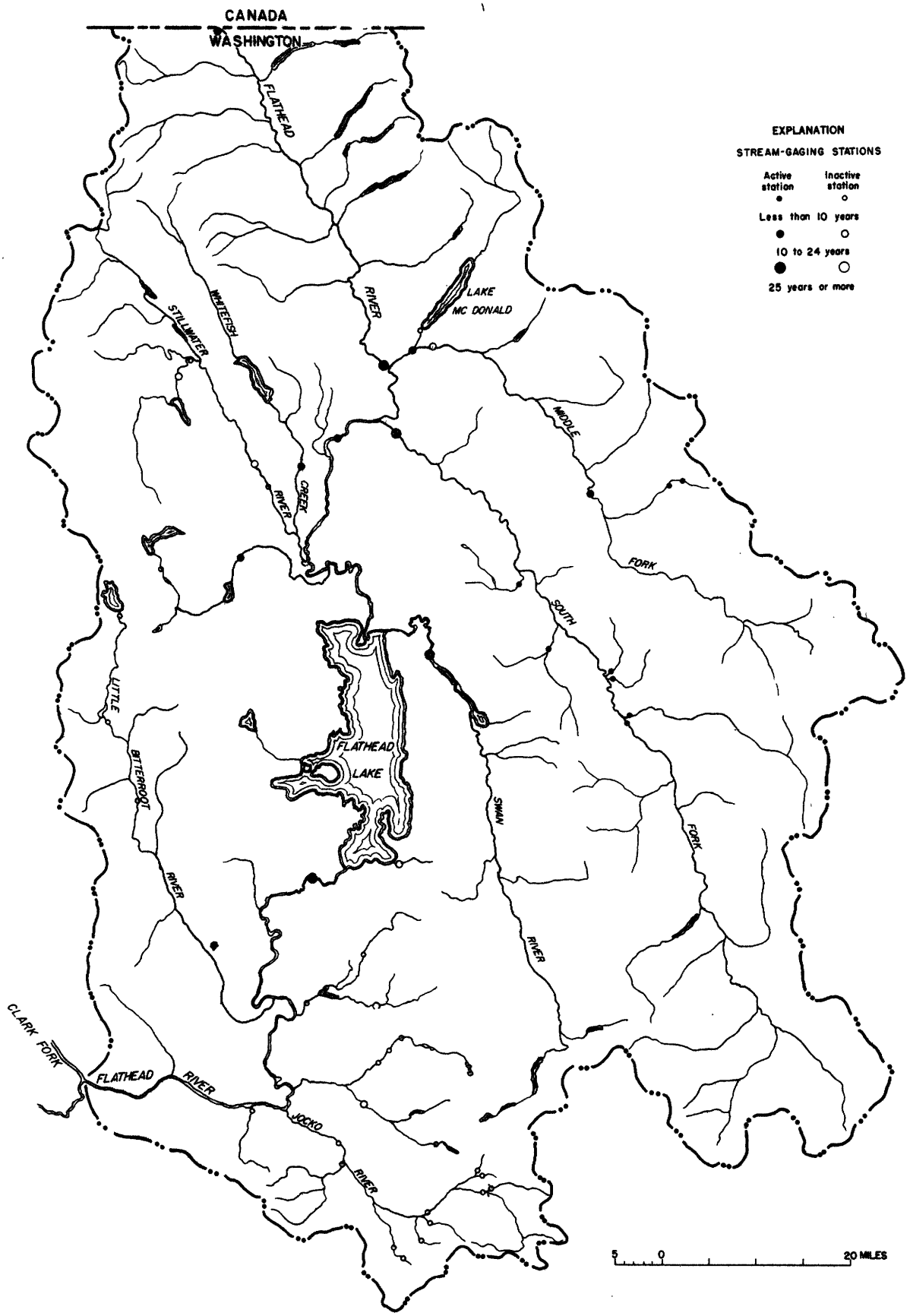

Figure 1.--Map showing location and duration of streamflow records.

Table 3.--Storage reservoirs in Flathead River basin

Name	Location	Date constructed	Purpose	Operating agency	Usable capacity (acre-ft)	Method of operation
Hungry Horse Reservoir.	On South Fork of Flathead River.	Started June 1948.	Power, flood control, irrigation on Kalispell Project.	Bureau of Reclamation.	3,500,000	
Whitefish Lake.	Columbia Avenue Dam in Whitefish.	Present dam built 1930. Old dam at outlet many years before.	To hold Whitefish Lake at constant level for convenience of homes and lake resorts along shore.	City of Whitefish.		Gates opened only at high water to prevent flooding at upper end of lake. Gates closed and flashboards in place during remainder of the year.
Ashley Lake	Sec. 23, T. 28 N., R. 24 W.	1897	Storage for Ashley Irrigation District.	Ashley Irrigation District.	20,000	Stored water released to Ashley Creek during irrigation season.
Mission Range Power Co. Reservoir.	Big Creek	Storage began about 1923.	Power	Mission Range Power Co.		Spring flood waters stored to the capacity of reservoir for use during low water period.
Flathead Lake	Sec. 12, T. 22 N., R. 21 W.	April 1938	Power generation at Kerr Dam.	Montana Power Co. (FPC permit,)	1,219,000	Storage between elevations 2,883 and 2,893 used for power generation. Releases based partially on requirements of Northwest Power Pool.
Little Bitterroot Lake.	Sec. 21, T. 27 N., R. 24 W.	1918	Irrigation	U. S. Indian Irrigation Service,	24,000	
Hubbart Reservoir.	Sec. 18, T. 25 N., R. 24 W.	1923	---do-----	--do---	12,100	
Lower Jocko Lake.	Sec. 28, T. 17 N., R. 17 W.	1937	---do-----	--do---	7,600	Outlet seldom opened; seepage under dam gradually releases water during irrigation season.
Upper Dry Fork Reservoir.	Sec. 16, T. 23 N., R. 24 W.	1940	---do-----	--do---	2,700	
Dry Fork Reservoir.	Sec. 3, T. 22 N., R. 24 W.	1934	---do-----	--do---	4,000	
Twin Reservoir.	Sec. 18, T. 22 N., R. 19 W.	1932	---do-----	--do---	1,210	Fed entirely by canals.
Pablo Reservoir.	Sec. 27, T. 22 N., R. 20 W.	1914	---do-----	--do---	25,000	Fed entirely by canals; some water supplied by Flathead pumping plant.
Lower Crow Reservoir.	Sec. 11, T. 20 N., R. 21 W.	1933	---do-----	--do---	10,350	
Kicking Horse Reservoir.	Sec. 31, T. 20 N., R. 19 W.	1930	---do-----	--do---	8,350	Fed entirely by canals.
Ninepipe Reservoir.	Sec. 27, T. 20 N., R. 20 W.	1923	---do-----	--do---	14,870	Do.

Table 3.--Storage reservoirs in Flathead River basin--Continued

Name	Location	Date constructed	Purpose	Operating agency	Usable capacity (acre-ft)	Method of operation
McDonald Reservoir.	Sec. 10, T. 19 N., R. 19 W.	1919	Irrigation	U. S. Indian Irrigation Service.	8,220	Fed entirely by canals.
Mission Reservoir.	Sec. 16, T. 18 N., R. 19 W.	1935	---do----	--do---	7,250	Do.
Tabor Reservoir.	Sec. 6, T. 17 N., R. 18 W.	1919	---do----	--do---	23,000	Do.

Note: Off-stream reservoirs, in general, do not store water during the winter months, because the feeder canals cannot be operated under severe freezing conditions. Reservoirs on the streams are normally closed during the winter and store any runoff that becomes available during the entire year. Irrigation reservoirs of both classes receive most of their supply during the spring and early-summer flood season, and withdrawals are made during the irrigation season, as required.

Table 4.--Streamflow records in relation to natural yield

[For details of regulation, diversion, and other exceptions to natural yield see station descriptions beginning on page 12]

No.	Gaging station	Upstream regulation and depletion
1	Flathead River at Flathead, B. C.	None of consequence.
2	Flathead River near Columbia Falls	Do.
3	Skyland Creek near Essex	Do.
4	Bear Creek near Essex	Do.
5	Middle Fork Flathead River at Essex	Do.
6	Middle Fork Flathead River at Belton	Do.
7	Lake McDonald outlet at Lake McDonald	Do.
8	Middle Fork Flathead River near West Glacier.	Do.
9	South Fork Flathead River at Spotted Bear ranger station near Hungry Horse.	Do.
10	Spotted Bear River near Hungry Horse	Do.
11	Twin Creek near Hungry Horse	Do.
12	Lower Twin Creek near Hungry Horse	Do.
13	Sullivan Creek near Hungry Horse	Do.
14	Graves Creek near Hungry Horse	Do.
15	South Fork Flathead River near Columbia Falls.	Do.
16	Flathead River at Columbia Falls	Do.
17	Logan Creek at Talley Lake, near Whitefish.	None of consequence; some minor regulation by Talley Lake prior to period of record.
18	Logan Creek near Whitefish	Do.
19	Stillwater River near Whitefish	Minor regulation by Stillwater Lakes; few small diversions.

Table 4.--Streamflow records in relation to natural yield--Continued

No.	Gaging station	Upstream regulation and depletion
20	Stillwater River near Kalispell	Minor regulation by Stillwater Lakes; few small diversions.
21	Whitefish Creek near Kalispell	Minor regulation by Whitefish Lake; few small diversions.
22	Ashley Creek near Kila	Minor regulation by Ashley Lake.
23	Ashley Creek near Kalispell	Do.
24	Swan River near Big Fork	A few minor diversions above Swan Lake.
25	Big Creek near Polson	None of consequence; minor regulation by power plant.
26	Flathead River near Polson	Regulated by Flathead Lake for power generation; no depletion of consequence.
27	Little Bitterroot River near Marion	Regulation by Little Bitterroot Lake.
28	Little Bitterroot River near Hubbart	Regulation by two lakes; one major diversion.
29	Little Bitterroot River near Niarada	Regulation by two lakes; two major diversions.
30	Crow Creek near Ronan	Several diversions.
31	Mud Creek near Ronan	Do.
32	Crow Creek at Lozeau's ranch, near Ronan	Regulation by one lake; several large diversions.
33	Dry Creek near St. Ignatius	None during period of record.
34	Mission Creek near St. Ignatius	Regulation by two reservoirs; several large diversions.
35	Post Creek at Fitzpatrick's ranch, near Ronan	Regulation by one lake; one large and two small diversions.
36	Post Creek at Deschamps' ranch, near Ronan	No regulation during period of record; several minor diversions.
37	Post Creek near St. Ignatius	No regulation during period of record; several minor diversions.
38	Middle Fork Jocko River near Jocko	None of consequence during period of record. Regulation by one reservoir, and two major diversions at present.
39	South Fork Jocko River near Jocko	None of consequence.
40	North Fork Jocko River near Jocko	None of consequence during period of record; one major diversion at present.
41	Falls Creek near Jocko	Do.
42	Jocko River near Jocko	None of consequence during period of record. Regulation by one reservoir, and three major and several minor diversions at present.
43	Big Knife Creek near Jocko	None of consequence.
44	Blogett Creek near Jocko	None of consequence known.
45	Agency Creek near Jocko	None of consequence.
46	East Finley Creek near Jocko	One major diversion.
47	Finley Creek near Jocko	One large and two small diversions.
48	Valley Creek near Ravalli	None of consequence.
49	Jocko River at Ravalli	Many small diversions during period of record.
50	Ravais Creek near Dixon	Several small diversions.

The land classification made about 1920 in Lake, Missoula, and Sanders Counties covered only that land not included in the Flathead Project. No new classification has been made since, but probably there has been little change in total amount of irrigation since that time. Complete records of the amount of land irrigated by the Flathead Project have been kept since 1910, but a breakdown into the individual drainage basins is not possible in some parts of the project and in others is only approximate.

There is some interchange of surface water and ground water in parts of the basin, but no attempt is made in this report to evaluate the resultant effects on streamflow at the gaging points. For example, streams entering the valley lands in the vicinity of Kalispell appear to lose considerable water by seepage into the alluvial deposits over which they flow. Some studies of ground-water levels have been made adjacent to the lake, but no basis exists for evaluation of the movement of ground water for the valley as a whole. Return flow by seepage from irrigated land on the Flathead Project has become a factor of some importance in the yield of several streams in the area. These streams are not gaged now at the sites of the original stations. No systematic ground-water investigation has been made on the Flathead Project.

SYLLABUS OF GAGING-STATION RECORDS

Explanation of Data

The data presented in the following pages apply to the physical and hydrologic setting at and above the gaging stations. Location, records available, and bypass channels refer to the gaging station and the records of discharge at that site. Data on diversions, return flow, and utilization refer to the area between that gaging station and the next gaging station upstream. Drainage area refers to all above the station site.

Gaging stations on the stream are presented in downstream order from headwater to mouth, with stations on tributaries to that stream being inserted in the order in which the tributaries enter that stream. Diversions and return flows are listed in the same downstream order. The relative rank of the tributaries is indicated in the table of contents by indention.

The "location" paragraph shows the location of the gaging station with respect to latitude and longitude or to land subdivisions, as well as with respect to the nearest town or prominent feature of the stream.

"Drainage area" refers to the entire drainage area above the gaging station. Where this information is not available the paragraph has been omitted.

"Records available" indicates the periods for which discharge records are known to be available. Unless another source is shown, these records are published by the Geological Survey in its series of annual water-supply papers (see p. 6).

"Bypass channels" are those carrying surface flow which bypasses the gaging station and which, therefore, is not measured at the station and may or may not be included in the station record. In this report most such channels are canals or ditches that carry water past the station, or past several stations in succession, for use downstream. Any unusual circumstances in connection with the bypass flow are explained. At certain stations the flow of the canal is, or can be, added to that of the gaging station to give the total surface flow at that site; however, for most bypassing canals a certain part of the water originally diverted is used upstream or lost through seepage and the amount actually bypassing the station is less than that diverted.

"Diversion" applies to water removed from the natural channel by artificial means such as a ditch, canal, pipe, or pump. Here, "location" refers to the headgate or point at which water is caused to leave the stream. Although the larger canals and ditches have continuous water-stage recorders in operation during the irrigation season or a staff gage read by an observer, the accurate flow of most diversions is not known. Therefore, an "approximate normal flow" is given as an approximation of the quantities of water involved. From necessity most such values are estimates. If a reliable estimate is not possible, the amount of the water right is given, even though this amount may not always be equal to the amount used. When dates of establishment of canals and ditches are not available, an approximation is made with relation to the establishment of the gaging station. Although the capacities of ditches and canals are not given, some indication as to size may be obtained from the "maximum recorded flow," which has been included where available. The purpose of the diversion is usually shown. Diversions for irrigation usually occur only during the irrigation season, generally from April through September. During the remainder of the year there may be little or no water used for this purpose.

"Return flow" refers to water returning to the stream from irrigated tracts, by overland flow within the area indicated. Location of wasteways, their approximate flow, and source of the flow are listed if known. Some large amounts of subsurface flow are mentioned, although data in this report usually are confined to surface conditions.

"Storage and regulation" refer to operation of reservoirs or other structures that affect the normal regimen of flow at the particular gaging station. So considered, regulation is the alternate storage and release of water, excluding withdrawals by diversion from the stream channel. Regulation at the station also may be caused by structures situated in areas above successive upstream gaging stations, but such regulation is mentioned only in the records of the gaging station immediately above which the structure is situated.

"Utilization" is the use of water in the area indicated, regardless of the ultimate source of that water. Changes in utilization from its beginning to the present are given if known.

Gaging-Station Records

1.--Flathead River at Flathead, British Columbia
(Published as Flathead River near Trail Creek, Mont., prior to 1935; International gaging station)

Location.--Staff gage, lat 49°00', long. 114° 29', at highway bridge 0.2 mile north of international boundary, 0.2 mile northwest of Flathead British Columbia, and 7 miles northwest of Trail Creek, Mont.

Drainage area.--450 sq mi.

Records available.--March 1929 to September 1950 (no winter records).

Diversions.--None of consequence.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

2.--Flathead River near Columbia Falls, Mont.

Location.--Water-stage recorder, lat 48°29', long. 114°05', in the NW¼ sec. 7, T. 31 N., R. 19 W., three-quarters of a mile upstream from Middle Fork and 10 miles northeast of Columbia Falls. Datum of gage is 3,109.70 ft above mean sea level, datum of 1929 (levels by Bureau of Reclamation).

Drainage area.--1,620 sq mi.

Records available.--September 1910 to September 1917, April 1929 to September 1950.

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--No significant diversion above station.

Return flow.--None.

Storage and regulation.--None.

Utilization.--About 30 acres of hay land reported to be irrigated in Flathead River Valley above Coal Creek. (U. S. Forest Service, Kalispell, Mont.)

3.--Skyland Creek near Essex, Mont.

Location.--Water-stage recorder, lat 48°17'30", long. 113°23'20", in the NW¼ sec. 9, T. 29 N., R. 14 W., 150 ft upstream from mouth and 10 miles northeast of Essex.

Drainage area.--8.09 sq mi.

Records available.--January 1946 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

Remarks.--Station operated to provide data for studies made at Upper Columbia River Snow laboratory.

4.--Bear Creek near Essex, Mont.

Location.--Water-stage recorder, lat 48°16'50", long. 113°25'30", near south line of sec. 7, T. 29 N., R. 14 W., three-quarters of a mile downstream from Autumn Creek and 8½ miles northeast of Essex. Wire-weight gage prior to March 19, 1947.

Drainage area.--20.7 sq mi.

Records available.--January 1946 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

5.--Middle Fork Flathead River at Essex, Mont.

Location.--Water-stage recorder, lat 48°16', long. 113°36', in the SW¼ sec. 14, T. 29 N., R. 16 W., 0.6 mile upstream from Ole Creek, 0.7 mile southeast of Essex, and 4 miles downstream from Bear Creek.

Drainage area.--517 sq mi.

Records available.--October 1939 to September 1950.

Bypass channels.--None.

Diversions.--No significant diversion above station.

Return flow.--None.

Storage and regulation.--None.

Utilization.--Great Northern Railway uses some water from Middle Fork Flathead River and Bear Creek, mostly for watering locomotives. (Oral report, U. S. Forest Service officials, Kalispell, Mont.) Occasional irrigation of less than 100 acres of hay land along Bear Creek. (Field observation by Geological Survey engineers.) No records available.

6.--Middle Fork Flathead River at Belton Mont.

Location.--Staff gage, lat 48°30'00", long. 113°58'30", in the NW¼ sec. 36, T. 32 N., R. 19 W., at Belton, half a mile upstream from highway bridge and 2 miles upstream from McDonald Creek.

Drainage area.--950 sq mi.

Records available.--October 1910 to September 1923, February 1929 to June 1933, August 1943 to November 1947 (discontinued).

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--No significant diversion above station.

Return flow.--None.

Storage and regulation.--None.

Utilization.--The Great Northern Railway diverts a small amount of water from Essex Creek for domestic use and the watering of locomotives at Essex. Facilities are available for irrigating an estimated 300 acres of hay land in Middle Fork Flathead Valley near Nyack ranger station. However, it is reported (field observations by Geological Survey engineers) that none or only a small part of this land is irrigated each season. No records available.

7.--Lake McDonald outlet at Lake McDonald, Mont.

Location.--Staff gage, lat 48°32', long. 114°00', in the NW¼ sec. 23, T. 32 N., R. 19 W., at lower end of Lake McDonald, in Glacier National Park.

Drainage area.--174 sq mi.

Records available.--August 1912 to September 1914 (fragmentary; no winter records).

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--Natural storage only in Lake McDonald.

Utilization.--None.

8.--Middle Fork Flathead River near West Glacier, Mont.

Location.--Staff gage, lat 48°29'50", long. 114°00'30", in NE¼ sec. 34, T. 32 N., R. 19 W., three-quarters of a mile downstream from McDonald Creek, 1¼ miles west of West Glacier, and 3½ miles upstream from mouth.

Drainage area.--1,140 sq mi.

Records available.--October 1939 to September 1950.

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--No significant diversion above station. Domestic water supply for village of West Glacier and the Glacier National Park headquarters taken from Middle Fork Flathead River. No records available.

Return flow.--None.

Storage and regulation.--None.

Utilization.--The domestic water supply for the village of West Glacier and the Glacier National Park headquarters is taken from the Middle Fork Flathead River. There is no other known utilization above the station.

9.--South Fork Flathead River at Spotted Bear ranger station near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 47°55'20", long. 113°31'25", in SW¼ sec. 17, T. 25 N., R. 15 W., 1,000 ft upstream from Spotted Bear River and 40 miles southeast of Hungry Horse.

Drainage area.--959 sq mi.

Records available.--August 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

10.--Spotted Bear River near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 47°55'40", long. 113°31'10", near center of sec. 17, T. 25 N., R. 15 W., a third of a mile upstream from mouth and 40 miles southeast of Hungry Horse.

Drainage area.--180 sq mi.

Records available.--October 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

11.--Twin Creek near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 47°59'10", long. 113°33'30", in the E½ sec. 25, T. 26 N., R. 16 W., a quarter of a mile upstream from mouth and 36 miles southeast of Hungry Horse.

Drainage area.--47.6 sq mi.

Records available.--August 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

12.--Lower Twin Creek near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 47°59'40", long. 113°33'20", in the SE¼ sec. 24, T. 26 N., R. 16 W., half a mile upstream from mouth and 35 miles southeast of Hungry Horse.

Drainage area.--22.2 sq mi.

Records available.--August 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

13.--Sullivan Creek near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 48°01'45", long. 113°42'10", in the W½ sec. 12, T. 26 N., R. 17 W., a quarter of a mile downstream from Quintonkon Creek, 3 miles upstream from mouth, and 30 miles southeast of Hungry Horse.

Drainage area.--73 sq mi.

Records available.--September 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

14.--Graves Creek near Hungry Horse, Mont.

Location.--Water-stage recorder, lat 48°07'50", long. 113°46'10", in the W½ sec. 4, T. 27 N., R. 17 W., 2 miles upstream from mouth and 22 miles southeast of Hungry Horse.

Drainage area.--33 sq mi.

Records available.--August 1948 to September 1950.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None.

15.--South Fork Flathead River near Columbia Falls, Mont.

Location.--Water-stage recorder, lat 48°22', long. 114°03', in the NE¼ sec. 17, T. 30 N., R. 19 W., 2 miles upstream from mouth and 9 miles east of Columbia Falls. Datum of gage is 3,031.3 ft above mean sea level, datum of 1929 (Corps of Engineers, bench mark).

Drainage area.--1,640 sq mi.

Records available.--September 1910 to September 1916, April 1923 to September 1950. (No winter records prior to 1929 water year.)

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None. Construction on Hungry Horse Dam 2 miles upstream began in June 1948. Some storage scheduled to begin during 1952.

Utilization.--None.

16.--Flathead River at Columbia Falls, Mont.

Location.--Water-stage recorder, lat 48°22', long. 114°11', in the SW¼ sec. 17, T. 30 N., R. 20 W., 200 ft downstream from highway bridge at Columbia Falls and 5 miles downstream from South Fork. Datum of gage is 2,978.00 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--4,440 sq mi.

Records available.--May 1922 to September 1923 (fragmentary), June 1928 to September 1950.

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--Water supply for town of Columbia Falls diverted from tributaries to Cedar Creek. No record found of any diversion for irrigation; little, if any, irrigable land above station

Return flow.--None.

Storage and regulation.--None.

Utilization.--The town of Columbia Falls uses water from several springs about 3½ miles north of town near Cedar Creek, collected in a small reservoir and conveyed to distribution system by gravity pipe. In 1940, the system served 750 people (300 services); in 1950, 1,493 people (440 services). Disposal by individual septic tanks (according to public water-supply records, Montana State Board of Health).

17.--Logan Creek at Tally Lake, near Whitefish, Mont.

Location.--Staff gage, lat 48°27', long. 114°34', in the NW¼ sec. 17, T. 31 N., R. 23 W., 2½ miles north of Tally Lake and 10 miles west of Whitefish. August 1931 to September 1934, water-stage recorder or staff gage at site 2½ miles upstream at outlet of Tally Lake.

Records available.--April 1936 to September 1942, May 1945 to September 1947. August 1931 to April 1933 and May to September 1934 at former site.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--Small timber splash dam at outlet of Tally Lake was used at times during period 1910 to 1934 to flush logs down the Stillwater River. No artificial regulation or storage after September 15, 1934, when dam was removed. Dam was constructed and operated by Somers Lumber Company, Somers, Mont.

Utilization.--None.

18.--Logan Creek near Whitefish, Mont.

Location.--Staff gage, lat 48°29', long. 114° 33', in the NE¼ sec. 4, T. 31 N., R. 23 W., just upstream from Good Creek, 20 miles west of Whitefish.

Records available.--April to September, 1931.

Bypass channels.--None.

Diversions.--None known.

Return flow.--None.

Storage and regulation.--None, except as noted by stations upstream.

Utilization.--None.

19.--Stillwater River near Whitefish, Mont.

Location.--Water-stage recorder, lat 48°19', long. 114°23', in the SW¼ sec. 34, T. 30 N., R. 22 W., 600 ft downstream from highway bridge, 7 miles southwest of Whitefish, and 10 miles upstream from Whitefish Creek.

Drainage area.--529 sq mi.

Records available.--November 1930 to September 1950 (discontinued).

Bypass channels.--None.

Diversions.--Some small diversions above station for irrigation; no detailed information available.

Return flow.--No known return surface flow.

Storage and regulation.--Minor regulation during early years of record in summer, due to use of splash dams at lake outlets in upper valley for log drives. Dates not recorded.

Utilization.--A study by the U. S. Bureau of Reclamation in 1946 found 7 acres irrigated in sec. 7, and 2 acres in secs. 6 and 7, T. 30 N., R. 22 W., but this study was confined to the Kalispell Project area which includes only a small part of the basin above this station. (U. S. Bureau of Reclamation, Supporting Data and Economics, Kalispell Project Planning Office, Kalispell, Mont.)

It is the opinion of U. S. Forest Service officials at Kalispell (oral communication) that about 2,000 acres in the entire Stillwater River basin are being irrigated at present. The major part of this land lies downstream from the station. Land irrigated above the station includes some in the Bootjack Creek basin and scattered tracts along the Stillwater River which have been cleared and irrigated by sprinklers since about 1946. No official record appears to be available to show location of diversions, the amount of water diverted, or the period of time during which water has been used.

20.--Stillwater River near Kalispell, Mont.

Location.--Staff gage, lat 48°17', long. 114° 20', in the NE¼ sec. 14, T. 29 N., R. 22 W., on highway bridge 5 miles north of Kalispell.

Records available.--September 1906 to June 1907 (gage heights only); April to August, 1922, June 1928 to September 1930.

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--No known diversions above station prior to 1946. Since that time the practice of sprinkler irrigation has been introduced into the valley to a small extent but record of diversion is not available for this report. (Oral report, U. S. Bureau of Reclamation engineers, Kalispell Project planning office, Kalispell, Mont.)

Return flow.--None.

Storage and regulation.--None, except as noted for station upstream.

Utilization.--No official data appear to be on file showing extent of water use in the Stillwater River basin; any utilization during period of record appears to have been negligible. See record for station on Stillwater River near Whitefish (no. 19).

21.--Whitefish Creek near Kalispell, Mont.

Location.--Water-stage recorder, lat 48°19', long. 114°16', in the SW¼ sec. 34, T. 30 N., R. 21 W., 8 miles north of Kalispell and 8 miles upstream from mouth. Datum of gage is 2,969.7 ft above mean sea level, datum of 1929 (Corps of Engineers, bench mark).

Drainage area.--173 sq mi.

Records available.--November to December 1906 (gage heights only), July 1928 to September 1950 (discontinued).

Bypass channels.--None.

Diversions.--Four small diversions for irrigation above station (see table 5). (U. S. Bureau of Reclamation investigation for Kalispell Project, 1946, Kalispell Planning Office, Kalispell, Mont.) City of Whitefish diverts its water supply from upper tributaries of Haskill Creek. (Oral report

by City Water Department, Whitefish, Mont.) No other significant diversion.

Return flow.--No known return surface flow. City of Whitefish returns sewage through three septic tanks at points on Whitefish Creek within the city. (Oral report by City Water Department, Whitefish, Mont.)

Storage and regulation.--Minor regulation of level of Whitefish Lake by city-owned dam (oral report by City Water Department, Whitefish, Mont.); see table 3 for data on Whitefish Lake.

Utilization.--About 120 acres irrigated from several diversions above station. Municipal water supply for Whitefish obtained from tributary stream. No other significant water use known.

Table 5.--Diversions in Whitefish Creek basin, above Whitefish Creek near Kalispell, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Hori Ranch (truck farm).	Haskill Creek	---	---	Irrigation	Used for past 20 or 30 yr on 60 acres in secs. 32 and 33, T. 31 N., R. 21 W. 1/
Van Aiken truck farm.	Pumping from Whitefish Creek 2 miles downstream from Whitefish.	---	---	----do----	Used for past 20 or 30 yr on 40 acres about 2 miles downstream from Whitefish. 1/
Unnamed ditch	Whitefish Creek.	---	---	----do----	Used on 9 acres in sec. 5, T. 30 N., R. 21 W. 1/
Unnamed ditch	Whitefish Creek.	---	---	----do----	Used on 15 acres in sec. 22, T. 30 N., R. 21 W. 1/
Whitefish water supply.	Upper tributaries of Haskill Creek (called First, Second, Third Creeks) secs. 7, 8, 12, T. 31 N., R. 21W.	1919	1.9	Municipal water supply.	Whitefish also pumps supplemental water from Whitefish Lake during emergencies. Prior to 1919 all water from this source. Great Northern Railway shops at Whitefish pump water from Whitefish Lake, or can be served by city water system.

1/. 1946 investigation by U. S. Bureau of Reclamation lists only irrigation actually found in 1946; no information given for length of time diversion has been in use.

22.--Ashley Creek near Kila, Mont.

Location.--Staff gage, lat 48°10', long. 114° 36', in sec. 25, T. 28 N., R. 24 W., about 1½ miles below outlet of Ashley Lake, 7 miles northwest of Kila.

Records available.--July to December 1916.

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--Water stored in Ashley Lake for irrigation (see table 3).

Utilization.--None.

23.--Ashley Creek near Kalispell, Mont.

Location.--Wire-weight gage and Cippoletti weir, lat 48°10', long. 114°26', in the NE¼ NW¼ sec. 29, T. 28 N., R. 22 W., 5 miles west of Kalispell.

Drainage area.--203 sq mi.

Records available.--April 1931 to March 1933, April 1934 to September 1950 (discontinued).

Bypass channels.--None.

Diversions.--No important diversions known.

Return flow.--None.

Storage and regulation.--None.

Utilization.--An estimated total of 80 to 100 acres (mostly hay or pasture) may be irrigated above Smith Lake. (According to an oral report by U. S. Bureau of Reclamation engineers, Kalispell Planning Office, Kalispell, Mont.) Headgate of Ashley Irrigation District Canal is about 1½ miles downstream from this station.

24.--Swan River near Big Fork, Mont.

Location.--Water-stage recorder, lat 48°01', long. 113°59', in the NW¼ sec. 14, T. 26 N., R. 19 W., at outlet of Swan Lake, 7 miles southeast of Big Fork. Datum of gage is 3,062.6 ft above mean sea level (river profile survey).

Drainage area.--647 sq mi.

Records available.--April 1922 to September 1950. October 1910 to May 1911 at site 2 miles upstream from Swan Lake.

Bypass channels.--None.

Diversions.--Small diversions for irrigation above station, no known record of magnitude or duration.

Return flow.--None.

Storage and regulation.--Natural storage only in Swan Lake.

Utilization.--About 360 acres irrigated in Missoula County above Swan Lake.

25.--Big Creek near Polson, Mont.

Location.--Water-stage recorder, lat 47°42', long. 114°02', in the NW¼ sec. 4, T. 22 N., R. 19 W., just downstream from Mission Range Power Co.'s plant, three-quarters of a mile upstream from mouth, and 7 miles east of Polson.

Drainage area.--5.0 sq mi.

Records available.--June 1917 to September 1932.

Bypass channels.--None.

Diversions.--Three diversions above station, shown in table 6. Published discharge records for this station include water diverted.

Return flow.--None above station.

Storage and regulation.--Operation of power plant upstream causes diurnal fluctuation at gage; a small amount of storage (possibly as much as 1,000 acre-ft) of spring flood waters carried over for use during period of summer low flows. Polson Reservoir stores water for municipal water supply.

Utilization.--No irrigation above station. Water diverted by Twin Feeder is conveyed to Twin Reservoir for storage, and used for irrigation of lands at the foot of Flathead Lake east of Polson, or can be fed into the distribution system directly at points on the canal above the reservoir (East Polson subdivision of Flathead Project).

The Big Creek power station was in operation during all of the period of record and up to the present. Natural flow of Big Creek, supplemented by some stored water accumulated during period of spring runoff, is developed by a penstock pipe under head of 585 ft, but water supply is insufficient to develop full 320 kw rated capacity of the plant except at high water season. The plant was acquired from the private owners in 1931, and is now part of the Flathead Project's power system. Polson water supply serves a population of 2,217 (2,156 in 1940).

Table 6.--Diversions in Big Creek basin, above Big Creek near Polson, Mont. 1/

Name	Point of diversion	Date of establ	Approx. normal flow (cfs)	Purpose	Remarks
Hell Roaring Creek Canal.	Sec. 23, T. 23 N., R. 19 W.	1923	5.00 (designed capacity; amount diverted depends on water available)	Irrigation	Canal diverts from Hell Roaring Creek to Big Creek to supplement Big Creek water for irrigation. Records available in files of U.S. Bureau of Indian Affairs, St. Ignatius, Mont.
Twin Feeder Canal (formerly Polson "A" Canal).	NW¼ sec. 4, T. 22 N., R. 19 W.	Prior to 1917	15.00 (designed capacity); 3,686 acre-ft per year, average 1907-43)	Part of supply for Twin Reservoir.	May be diverted for irrigation in area east of Polson before reaching Twin Reservoir.
Polson water supply intake.	NW¼ sec. 4, T. 22 N., R. 19 W.	1919	2.49 (maximum; normally 2 cfs. used)	Municipal water supply.	From establishment of city water system in 1911 to completion of present gravity-supply system in 1919, the municipal water supply was pumped from Flathead Lake.

1/. Data from U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

26.--Flathead River near Polson, Mont.

Location.--Water-stage recorder, lat 47°41', long. 114°15', in the NW¼ SE¼ sec. 11, T. 22 N., R. 21 W., half a mile downstream from Kerr Dam and 6 miles downstream from Polson. Prior to Oct. 1, 1941 at site 6 miles downstream at different datum. (Old location: Water-stage recorder, lat 47°39', long. 114°20', in sec. 19, T. 22 N., R. 21 W. at highway bridge at Norrisvale, 12 miles downstream from Polson. Drainage area: 7,010 sq mi).

Drainage area.--6,990 sq mi.

Records available.--July 1907 to September 1950.

Bypass channels.--Water diverted by Flathead Project Pumps to supply the Mission Division bypasses the station. This amount constitutes more than 90 percent of that pumped; the remainder is used on the West Polson Project above the station. Records of flow are on file with the U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--

1. The Flathead Project Pumps, operated by the U. S. Indian Irrigation Service, take water from the Flathead River in the SW¼NW¼ sec. 17, T. 22 N., R. 20 W. Three electrically driven pumps each deliver 67 cfs to 48-in. pipes, 650 ft long. The water is lifted 335 ft to a canal from which it can be delivered to Pablo Reservoir or used directly on land in the vicinity of Polson. Operation began in 1939. The pumps deliver about 12,000 acre-ft per month when operated continuously. Records of pumpage are on file at U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

2. U. S. Bureau of Reclamation engineers at Kalispell Planning Office estimate that about 6,000 acres of valley lands near Kalispell were irrigated by about 100 sprinkler systems in 1950. The sources of water used are various small streams, lakes, or wells, and many of the units are moved from year to year to serve different lands. The lands irrigated in this manner receive about one inch of water three or four times during the growing season. Diversions of water for this purpose began about 1946. No detailed information on individual sprinkler units is available.

3. Numerous diversions for irrigation of small acreages of private land in the Kalispell Project Area exclusive of the Ashley Irrigation District. An unpublished report by the U. S. Bureau of Reclamation shows an estimated total of about 1,500 acres. No classification of land was done by Flathead County authorities, and detailed information concerning individual diversions is not available.

4. Ashley Irrigation District ditch constructed in 1897-99 diverts from Ashley Creek in the NW¼ sec. 21, T. 28 N., R. 22 W., during the irrigation season (usually April through September). No records of amounts diverted are kept by the watermaster, but the district permits 10 cfs of the flow of Ashley Creek to pass downstream to satisfy prior water rights. (Unpublished report on Ashley Irrigation District, U. S. Bureau of Reclamation, Kalispell, Mont. 1947).

Return flow.--A wasteway from Ashley Irrigation District ditch enters the Stillwater River in sec. 6, T. 28 N., R. 21 W. This wasteway seldom carries water, because normally the supply available from the ditch is inadequate for irrigation demands. Surface return flow from other sources is negligible.

Storage and regulation.--Water stored in Flathead Lake; see table 3.

Utilization.--

1. About 2,000 acres of land irrigated in the vicinity of Polson. Water is furnished principally from Pablo Feeder Canal; some supplemental water is pumped from Flathead River.

2. Land irrigated in the Kalispell area consists of 6,000 acres (at present) watered by private sprinkler systems, and about 1,500 acres supplied from private ditches. Ashley Irrigation district contains 1,637 acres considered irrigable, of which an average of 900 to 1,000 acres has been irrigated yearly.

3. Municipal water supply of Kalispell is obtained from springs near Stillwater River in sec. 6, T. 28 N., R. 21 W. Mean rate of use has been about 2 cfs in recent years, heaviest use being during the summer. Sewage is discharged after treatment into Ashley Creek near west line sec. 20, T. 28 N., R. 21 W.

4. Hydroelectric power plants: Big Fork plant of the Mountain States Power Company at the town of Big Fork on Swan River, rated at 4,000 kw. Kerr Dam on Flathead River, one-half mile above gage operated by Montana Power Company, has installed capacity of 56,000 kw and has been in operation since 1938.

27.--Little Bitterroot River near Marion, Mont.

Location.--Staff gage, lat 48°05', long. 114°41', in sec. 21, T. 27 N., R. 24 W., at log bridge downstream from outlet of Little Bitterroot Lake near Marion.

Records available.--January 1910 to September 1916. (No winter records prior to 1915).

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--Storage in Little Bitterroot Lake (see table 3). Water stored in this lake is used for irrigation on Camas Division of the Flathead Project. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Utilization.--None above station.

28.--Little Bitterroot River near Hubbart, Mont.

Location.--Staff gage, lat 47°53', long. 114° 40', about sec. 17, T. 25 N., R. 24 W., upstream from canyon leading to second fall of Little Bitterroot River, 1½ miles west of ranch buildings of Hubbart Cattle Co., near Hubbart Post Office, 15 miles south of Marion.

Records available.--October 1909 to September 1916. April to October 1909 at site about 1 mile downstream (no winter records).

Bypass channels.--None.

Diversions.--Briggs Creek Feeder, constructed in 1924 with 46 cfs capacity at head and 115 cfs at outlet, diverts the entire yield of Briggs Creek in the SW¼ sec. 24, T. 25 N., R. 25 W. and conveys it to Hubbart Reservoir in the NW¼ sec. 18, T. 25 N., R. 24 W. No records of diversion. The natural channel of Briggs Creek joins the Little Bitterroot River below Hubbart Reservoir, but above the probable site of the station.

Return flow.--Water diverted by Briggs Creek Feeder is returned to Hubbart Reservoir above the station.

Storage and regulation.--Storage in Hubbart Reservoir (see table 3).

Utilization.--None above station.

29.--Little Bitterroot River near Niarada, Mont.

Location.--Staff gage, lat 47°48', long. 114° 39', in sec. 34, T. 24 N., R. 24 W., at Angus McDonald ranch, 2 miles southwest of Niarada.

Records available.--April 1916 to September 1917. April 1908 to December 1909 published as Little Bitterroot River near Dayton (no winter records).

Bypass channels.--Nearly the entire flow of Camas "A" Canal bypasses this station.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--Since 1918, Camas "A" Canal has diverted much of the flow of Little Bitterroot River, in the SE¼ sec. 16, T. 24 N., R. 24 W., into the Camas Division, Flathead Project. Camas "A" Canal supplies a large part of the water carried by Camas "B", "C", and "D" Canals, which together with water from tributaries along west side of Little Bitterroot River irrigates the lands in Camas Division. The Canal was designed to carry 207 cfs but is seldom used to carry near capacity because of weak banks. The average delivery for a season extending from April to November is about 21,000 acre-ft. Records of flow are available from the project watermaster.

Return flow.--One small wasteway in the N½ sec. 34, T. 24 N., R. 24 W.

Storage and regulation.--None.

Utilization.--A small part of the flow of Camas "A" Canal is used to irrigate land in secs. 21, 22, 27, and 34, T. 24 N, R. 24 W., above the station.

30.--Crow Creek near Ronan, Mont.

Location.--Staff gage, lat 47°29', long. 114° 05', in SW¼ sec. 13, T. 20 N., R. 20 W., 500 ft upstream from old highway bridge, about a quarter of a mile upstream from present bridge on State road from St. Ignatius to Ronan, and 3 miles south of Ronan.

Records available.--September 1906 to September 1917 (no winter records).

Bypass channels.--Water diverted by Pablo Feeder Canal and Kicking Horse Feeder Canal may be used in other stream basins within Mission division of the Flathead Project, or in Crow Creek basin below this station. The municipal water supply of Ronan bypasses this station.

Diversions.--

1. Pablo Feeder Canal normally diverts the entire flow of South, Middle, and North Crow Creeks and several smaller tributaries in secs. 21, 28, 33, T. 21 N., R. 19 W., sec. 4, 9, 16, T. 20 N., R. 19 W., during the season (about April to November). This canal has operated subsequent to 1914, when storage began in Pablo Reservoir.

2. A ditch in sec. 19, T. 20 N., R. 19 W., may divert water to Kicking Horse Reservoir at times since 1930. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

3. Since 1929, the municipal water supply of Ronan has been diverted from a stream locally called Second Creek, 4 miles east of Ronan, and just above the Pablo Feeder Canal. (State of Montana, Board of Health, Helena, Mont.)

4. Probably a few minor ditches divert additional water for irrigation above this station at times. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Return flow.--The Pablo Feeder canal may supply water to Crow Creek drainage basin at the points of diversions, from other sources. It is not operated during freezing weather. No other surface return flow known. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Storage and regulation.--None.

Utilization.--Municipal water supply for Ronan is obtained from a small stream above the Pablo Feeder Canal. No substantial irrigation above station.

31.--Mud Creek near Ronan, Mont.

Location.--Staff gage, lat 47°33', long. 114° 08', in about sec. 26, T. 21 N., R. 20 W., at Jeffrey ranch, 3 miles northwest of Ronan.

Records available.--March to December 1909, March to December 1910, (1908 gage heights only).

Bypass channels.--Pablo Feeder Canal carries water from Crow Creek basin to Pablo Reservoir, outside this basin.

Diversions.--

1. Pablo Feeder Canal normally diverts the entire flow of Mud Creek and several tributaries of Mud Creek in secs. 5, 8, T. 21 N., R: 19 W., sec. 28, 33, T. 22 N., R. 19 W., during the season (about April to November). This canal was not in operation until storage began in Pablo Reservoir in 1914.

2. Probably a few minor ditches divert additional water above this station for irrigation in the vicinity of Pablo at times.

Return flow.--The Pablo Feeder Canal may supply water to Mud Creek drainage basin from other sources at the points of diversion. Not operated during freezing weather. No other surface return flow known. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Storage and regulation.--None.

Utilization.--Some irrigation above station. The water used may be taken from Pablo Feeder Canal, or drawn from Pablo Reservoir, in addition to direct diversions from Crow Creek.

32.--Crow Creek at Lozeau ranch near Ronan, Mont.

Location.--Chain gage, lat 47°30', long. 114° 15', in the E½ sec. 15, T. 20 N., R. 21 W., at Louis Lozeau ranch, about a mile downstream from Mud Creek, 2½ miles upstream from mouth and 8 miles southwest of Ronan.

Records available.--April 1911 to September 1916 (no winter records except 1912 and 1914 water years).

Bypass channels.--Water pumped by the Crow Creek pumping plant is removed from Crow Creek drainage basin and used in the Post Creek basin. The Moiese "A" Canal diverts water past this station downstream on areas tributary to the Flathead River.

(The information that follows applies only to the drainage area between this station and the next stations upstream.)

Diversions.--

1. Crow Creek pumping plant diverts water from Crow Creek in the SE¼ sec. 16, T. 20 N., R. 20 W. and discharges into Post "A" Canal for direct irrigation, or to Ninepipe Reservoir for storage. Operation began in 1937, and the plant is used during the irrigation season; amounts pumped after September 30 are negligible. As much as 10,900 acre-ft have been pumped during one season, much less required in some seasons. Records of pumpage each season are available at U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

2. Moiese "A" Canal diverts water from Crow Creek in the NW¼ sec. 14, T. 20 N., R. 21 W., for use on Moiese subdivision of Flathead Project. Some operation records on file at U. S. Bureau of Indian Affairs. This canal supplies irrigation water to about 3,800 acres at present.

3. Probably some minor ditches divert additional water for irrigation above the station; detailed information not available.

4. Prior to 1929, the municipal water supply of Ronan was pumped from Spring Creek in the town. In 1928, the mean rate of pumping was about 0.01 cfs, according to information on file at the State Board of Health, Helena, Mont.

Return flow.--Some ground water seepage from irrigation upstream; surface return flow is insignificant.

Storage and regulation.--Water stored in Lower Crow Reservoir (see table 3 for details).

Utilization.--A large acreage of land is irrigated above the station. The water used is largely drawn from Pablo, Kicking Horse, and Ninepipe Reservoirs, which are supplied with water from several sources. The municipal water supply of Ronan is obtained within the basin.

33.--Dry Creek near St. Ignatius, Mont.

Location.--Staff gage, lat 47°17', long. 114° 00', in sec. 36, T. 18 N., R. 19 W., at Felsman ranch, 1½ miles downstream from St. Marys Lake, upstream from the only tributary, and 5 miles southeast of St. Ignatius.

Records available.--April 1908 to September 1916.

Bypass channels.--Dry Creek Canal is a concrete-lined canal built along the bank of Dry Creek, and bypasses the former station site in the original river bed.

Diversions.--None during period of record. Dry Creek Canal normally has carried the entire flow of Dry Creek since the completion of Tabor Reservoir in 1919. Dry Creek Canal diverts from Tabor Reservoir in sec. 6, T. 17 N., R. 18 W., and follows approximately the natural course of Dry Creek to Pablo Feeder Canal in the SE¼ sec. 29, T. 18 N., R. 19 W.

Return flow.--Tabor Feed canal carries water from the Jocko River basin into Tabor Reservoir located on Dry Creek. This canal, completed in 1923, delivers surplus Jocko River and Placid Creek water not needed on the Jocko Division to Mission Division of the Flathead Project. Records of water delivered by Tabor Feed canal are on file at U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Storage and regulation.--Water stored in Tabor Reservoir (formerly St. Marys Lake; see table 3 for details).

Utilization.--None above station.

34.--Mission Creek near St. Ignatius, Mont.

Location.--Staff gage, lat. 47°20', long. 114° 07', in the SW¼ sec. 10, T. 18 N., R. 20 W., about 1 mile downstream from St. Ignatius.

Records available.--September 1906 to September 1917.

Bypass channels.--Much of the water diverted by Pablo Feeder canal is carried out of Mission Creek basin for storage in Pablo Reservoir. Some water diverted by Mission "B" and "C" canals is used on lands tributary to Post Creek.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--

1. Pablo Feeder Canal intercepts Mission Creek below Mission Reservoir in sec. 16, T. 18 N., R. 19 W., Dry Creek in the SE¼ sec. 29, T. 18 N., R. 19 W., and several smaller tributaries. Water may be taken from Mission Creek at these points, or released into Mission Creek basin from the Pablo Feeder Canal.

2. Mission "B" canal diverts water in sec. 19, T. 18 N., R. 19 W., for irrigation.

3. Mission "C" canal diverts water in sec. 13, T. 18 N., R. 20 W., for irrigation.

4. Probably several minor diversions for irrigation; detailed information not available.

5. The municipal water-supply system of St. Ignatius obtains water from infiltration galleries under Mission Creek about 2 miles below Mission Reservoir. This system was completed in 1940, and in 1948 was extended to a point half a mile below Mission Reservoir. The water is conveyed to St. Ignatius by a gravity pipeline; no information is available to show amounts used. There is no municipal sewage plant; disposal is by individual septic tanks. Information about St. Ignatius water supply is on file at State Board of Health, Helena, Mont.

Return flow.--The Pablo Feeder Canal may supply water from other sources to Mission Creek drainage basin at the points of diversion. Not operated during freezing weather. No other surface return flow known.

Storage and regulation.--Water stored in Mission Reservoir; (see table 3 for details).

Utilization.--A large acreage of land is irrigated above the station. The water used may be drawn from Mission and Tabor Reservoirs and includes some water carried into the basin by Tabor Feed Canal. The town of St. Ignatius uses water from Mission Creek.

35.--Post Creek at Fitzpatrick ranch near Ronan, Mont.

Location.--Staff gage, lat 47°28', long. 114° 01', in sec. 4 or 5, T. 19 N., R. 19 W., near the house of J. G. Fitzpatrick, 8 miles southeast of Ronan, 10 miles north of St. Ignatius, and 2 miles upstream from North Fork of Post Creek.

Records available.--September 1906 to May 1911.

Bypass channels.--Much of the water diverted by Pablo Feeder Canal is carried out of Post Creek basin for storage in Pablo Reservoir.

Diversions.--

1. Two small private diversions above gage during period of record, of which no detailed record is now available.

2. Pablo Feeder Canal intercepts Post Creek in sec. 4, T. 19 N., R. 19 W. This canal carries water to Pablo Reservoir, which has been in use since 1914.

Return flow.--The Pablo Feeder Canal may supply water from other sources to Post Creek Basin at the point of diversion. Not operated during freezing weather. No other surface return flow known.

Storage and regulation.--Water stored in McDonald Reservoir (see table 3 for details).

Utilization.--No significant use of water above station.

36.--Post Creek at Deschamp ranch, near Ronan, Mont.

Location.--Staff gage, lat 47°28', long. 114° 02', in about sec. 7, T. 19 N., R. 19 W., at Deschamp ranch, just upstream from North Fork of Post Creek, 7 miles southeast of Ronan, and 10 miles north of St. Ignatius.

Records available.--April to November 1911.

Bypass channels.--Water diverted by Kicking Horse Feeder may be used on lands outside this basin. Mission "B" Canal delivers water to lands in Post Creek basin below the station site.

Diversions.--

1. Several small private diversions above gage during period of record, of which no detailed record is now available.

2. Pablo Feeder Canal intercepts tributaries of North Fork of Post Creek in secs. 22, 27, T. 20 N., R. 19 W. Not operated until after period of record.

3. Kicking Horse Feeder diverts water in sec. 5, T. 19 N., R. 19 W., for storage in Kicking Horse Reservoir, which was completed in 1930.

4. Mission "B" Canal diverts water in sec. 7, T. 19 N., R. 19 W., and intercepts several small tributaries of Post Creek in secs. 8, 17, 20, T. 19 N., R. 19 W. Not in operation during period of record.

Return flow.--Pablo Feeder Canal may supply water from other sources to Post Creek basin at points of diversion. Not operated during freezing weather. No other surface return flow known.

Storage and regulation.--None.

Utilization.--A considerable acreage of land is irrigated above the site of this station at present; the water is supplied in part by diversions from Post Creek, and also by withdrawals from Pablo Feeder Canal.

37.--Post Creek near St. Ignatius, Mont.

Location.--Chain gage, lat 47°24', long. 114° 05', on line between the SW¼ sec. 24 and SE¼ sec. 23, T. 19 N., R. 20 W., on highway bridge on State road between St. Ignatius and Ronan, 1 mile downstream from North Fork of Post Creek, and 5 miles north of St. Ignatius.

Records available.--September 1911 to September 1917.

Bypass channels.--Mission "C" and Post "F" Canals bypass the station and supply water to irrigate land in Post Creek basin below this station.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--

1. Mission "C" Canal diverts water from a tributary of Post Creek in sec. 18, T. 19 N., R. 19 W.

2. Post "F" Canal diverts water from Post Creek near the southwest corner of sec. 7, T. 19 N., R. 19 W.

3. Probably a few minor private ditches divert water above the station at times; no detailed information of private ditches available.

Return flow.--No surface return flow known.

Storage and regulation.--None.

Utilization.--Large amounts of water used for irrigation above the station at present. In addition to water diverted from Post Creek, some water used is drawn from Pablo Feeder Canal. Water use in the basin during period of record was not extensive.

38.--Middle Fork Jocko River near Jocko, Mont.

Location.--Staff gage, lat 47°11', long. 113° 50', near north line of sec. 35, T. 17 N., R. 18 W., 300 ft upstream from confluence with South Fork and 10 miles northeast of Jocko.

Records available.--May 1912 to September 1915.

Bypass channels.--Tabor Feeder Canal carries water out of Jocko River basin into other parts of Flathead Project at times.

Diversions.--None during period of record (see table 7 for diversions above site of gaging station).

Return flow.--Placid Creek Canal supplies water to this basin by transmountain diversion (see table 7).

Storage and regulation.--Water stored in Lower Jocko Lake (see table 3).

Utilization.--No utilization above station during period of record. At present, flow of the Middle Fork of Jocko River is supplemented by the transmountain Placid Creek Canal which imports water from Placid Creek in Clearwater River basin to Upper Jocko Lake. Irrigated lands in Jocko River basin customarily have priority for delivery of this and the natural flow of Jocko River, but surplus water not needed in the Jocko Division is available for diversion to Tabor Reservoir by the Tabor Feeder. Tabor Reservoir water is used where needed on the Mission Division. The usefulness of storage capacity in Lower Jocko Lake is limited by seepage through the outlet dam, which increased in rate with rising water level until a point is reached where no rate of inflow which has yet occurred will increase the contents, even when outlet gates are closed. No season-to-season carry-over is possible, and no other usable storage sites have been discovered in the Jocko River basin; hence the diversion to Tabor Reservoir is the only present means of storing surplus Jocko River water. In practice, the outlet gates of Lower Jocko Lake are seldom opened, since the natural seepage appears in the stream bed within a short distance below the reservoir and becomes available for use downstream. The gates are sometimes used when more water is needed than the seepage will provide. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

39.--South Fork Jocko River near Jocko, Mont.

Location.--Staff gage, lat 47°12', long. 113°51', in the NE¼ sec. 35, T. 17 N., R. 18 W., 300 ft downstream from confluence with Middle Fork, and 10 miles northeast of Jocko.

Records available.--May 1912 to September 1915 (no winter records).

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--No diversions above station.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None above station. Several large diversions from Jocko River and tributaries at points downstream from this station, for irrigation on Jocko Division of Flathead Project. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Table 7.--Diversions in Jocko River basin, above Middle Fork of Jocko River near Jocko, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Placid Creek Canal (Jocko Lakes Feeder).	SE¼ sec. 29, T. 17 N., R. 16 W. on Placid Creek in Clearwater River basin.	1937	Usually runs about 90 cfs during high water.	Supplemental water supply to Jocko Division of Flathead Project.	Placid Creek Canal takes water from Placid Creek in the Clearwater River basin and carries it by transmountain diversion to Upper Jocko Lake in the NE¼ sec. 36, T. 17 N., R. 17 W. Canal operates throughout the year. Records on file with U.S. Bureau of Indian Affairs, St. Ignatius, Mont.
Tabor Feeder	SE¼ sec. 19, T. 17 N., R. 17 W.	Operated several years prior to 1938. Enlarged to present capacity in 1938.	About 125 cfs; about half that size prior to 1938.	Delivers surplus Jocko River water to Tabor Reservoir.	Takes excess flow to feed Tabor Reservoir during high-water season. Not usually used later, when flow of Jocko River is needed for use downstream in irrigation season. Records kept by U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

40.--North Fork Jocko River near Jocko, Mont.

Location.--Staff gage, lat 47°12', long 113°50', in the NW¼ sec. 23, T. 17 N., R. 18 W., three-quarters of a mile upstream from Falls Creek, and about 11 miles northeast of Jocko.

Records available.--May 1912 to September 1915 (no winter records).

Bypass channels.--None.

Diversions.--Tabor Feeder Canal is used to carry the excess flow of North Fork Jocko River during high-water season to supply water to Tabor Reservoir on Dry Creek for irrigation in Mission Division of Flathead Project. No other diversion above station. Canal diverts in the N½ sec. 24, T. 17 N., R. 18 W., began operation during 1924 and has a design capacity of 175 cfs. Records of flow available at U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None above station.

41.--Falls Creek near Jocko, Mont.

Location.--Staff gage, lat 47°13', long. 113° 51', in the NE¼ sec. 22, T. 17 N., R. 18 W., about a quarter of a mile upstream from mouth, and 10 miles northeast of Jocko.

Records available.--May 1912 to September 1915. (No winter records.) Records of discharge (in acre-ft by months) of Falls Creek for calender years 1916-18, 1921, 1922 are available at U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Bypass channels.--Tabor Feeder Canal, built since period of record, bypasses site of this station.

Diversions.--Tabor Feeder Canal built in 1923, crosses Falls Creek just above station site and diverts entire flow of Falls Creek into Tabor Reservoir in Mission Division of Flathead Project. Estimates of yield of Falls Creek available in records of U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Return flow.--None

Storage and regulation.--None.

Utilization.--None above station.

42.--Jocko River near Jocko, Mont.

Location.--Staff gage, lat 47°10', long. 113° 59', in sec. 10, T. 16 N., R. 19 W., 500 ft upstream from headworks of Jocko "K" Canal, 800 ft upstream from Big Knife Creek, and 2 miles northeast of Jocko.

Records available.--April 1918 to September 1919. August 1908 to September 1916 at site 2 miles downstream (gage heights and discharge measurements only prior to April 1909).

Bypass channels.--Jocko "S" Canal bypasses station to serve lands in Jocko Division, Flathead Project.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--None during period of record. Two diversions of as much as 50 cfs during irrigation season at present (see table 8).

Return flow.--None.

Table 8.--Diversions in Jocko River basin, above Jocko River near Jocko, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Private ditch (unnamed)	Near north line sec. 28, T. 17 N., R. 18 W.	About 1931	20	Irrigation	Diverts flood water only from North Fork Jocko River, in early part of irrigation season. No records available. 1/
Jocko "S" Canal.	From South Fork of Jocko River in the SE¼ sec. 29, T. 17 N., R. 18 W.	1941	26	Irrigation on Jocko Division of Flathead Project.	This is one of the principal canals serving lands on south side of Jocko River. Canal picks up an additional 3 cfs from an unnamed tributary in the NW¼ sec. 1, T. 16 N., R. 19 W. Records available in files of U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

1/. Oral report of watermaster, Jocko Division, U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Storage and regulation.--None, except as noted for upstream stations.

Utilization.--Small ditch for flood irrigation near mouth of North Fork. None during period of record.

43.--Big Knife Creek near Jocko, Mont.

Location.--Staff gage, lat 47°09', long. 113° 57', in the NW¼ sec. 14, T. 16 N., R. 19 W., 200 ft upstream from headgate of Big Knife Canal and 2½ miles northeast of Jocko.

Records available.--August 1910 to September 1916. August 1908 to August 1910 at site 1 mile downstream. (No winter records for most years).

Bypass channels.--None.

Diversions.--None during period of record. "Big Knife Canal" was put into operation on August 1, 1910 about a mile above original site of the station. On August 5, 1910 the station was reestablished at a point above the head gates. (See Water Supply Paper 292, U. S. Geological Survey.) This canal now appears to be part of the canal now called Jocko "S" Canal, which at present crosses Big Knife Creek just below the station site. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Return flow.--None.

Storage and regulation.--None.

Utilization.--No utilization above station. Maps based on a beneficial use study made about 1910 show 26.6 acres irrigated from private ditches in the vicinity of the mouth of Big Knife Creek. Jocko "S" canal now diverts most of the flow during the irrigation season, for use on the Jocko Division of the Flathead Project.

44.--Blodgett Creek near Jocko, Mont.

Location.--Staff gage, lat 47°09', long. 113° 58', in T. 16 N., R. 19 W., 1½ miles northeast of Jocko.

Records available.--May to December 1909.

Remarks.--Exact location of this station could not be determined. Flow of Blodgett Creek is now intercepted by various canals supplying Jocko Division of the Flathead Project, but whether above or below the former station site is not known. In view of this situation, and the short period for which periods were obtained, no evaluation is attempted.

45.--Agency Creek near Jocko, Mont.

Location.--Staff gage, lat 47°08', long. 113° 57', in the NW¼ sec. 27, T. 16 N., R. 19 W., just upstream from intake of Matt ditch, 2 miles east of Jocko.

Records available.--August 1908 to September 1916 (gage heights only prior to April 1909; no winter records for most years).

Bypass channels.--None.

Diversions.--None.

Return flow.--None.

Storage and regulation.--None.

Utilization.--None above station.

46.--East Finley Creek near Jocko, Mont.

Location.--Staff gage, lat 47°06', long. 114° 02', near south line of sec. 32, T. 16 N., R. 19 W., just upstream from intake of Indian ditch, 200 ft downstream from crossing

of Bureau of Reclamation service canal, 4 miles southwest of Jocko, and 6 miles southeast of Arlee.

Records available.--August 1908 to September 1915 (gage heights only prior to April 1909; no winter records for most years).

Bypass channels.--Jocko "N" Canal bypasses the station.

Diversions.--Jocko "N" Canal (formerly "Bureau of Reclamation Canal") diverts entire flow during irrigation season, in the SE¼SW¼ sec. 32, T. 16 N., R. 19 W., for use on lands of the Jocko Division, Flathead Project. Operation began August 1911. Records available in files of U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

Return flow.--No surface return flow.

Storage and regulation.--None.

Utilization.--Probably none above station.

47.--Finley Creek near Jocko, Mont.

Location.--Staff gage, lat 47°06', long. 114° 03', in sec. 31, T. 16 N., R. 19 W., at ford about 100 ft upstream from highway bridge, one-eighth of a mile downstream from confluence of East and West Forks, 4 miles southwest of Jocko, and 5 miles southeast of Arlee.

Records available.--August 1908 to September 1915 (gage heights only prior to April 1909).

Bypass channels.--A part of the water diverted by Jocko "N" Canal bypasses the station.

(The information that follows applies only to the drainage area between this station and the next station upstream.)

Diversions.--Jocko "N" Canal, Indian ditch, and two small private ditches (see table 9).

Return flow.--No known surface return flow.

Storage and regulation.--None.

Utilization.--Some irrigation immediately above station from older private ditches and since 1911 from Jocko "N" Canal.

Table 9.--Diversions in Jocko River basin, above Finley Creek near Jocko, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Jocko "N" Canal.	From Finley Creek in the SE¼ sec. 12, T. 15 N., R. 20 W. (not used).	1912	None at upper end. Designed for 60 cfs.	Irrigation	Constructed 1912, but would not hold water at upper end, just south of East Finley Creek. This canal diverts some water from Middle Fork Finley Creek and another small tributary (sec. 5, T. 15 N., R. 19 W.) 1/
Indian ditch (Indian Service).	From East Finley Creek in the SE¼SW¼ sec. 32, T. 16 N., R. 19 W.		Records of flow for period Aug. 1908 to Sept. 1916 published in reports of Geological Survey.	Irrigation stock water.	According to information furnished by U. S. Bureau of Indian Affairs, St. Ignatius Mont., water diverted by this ditch was used for stock water and irrigation on lands now included in Jocko Division of Flathead Project. Indian ditch was gradually abandoned subsequent to period of record and lands formerly served by it are now served by a lateral system from Jocko "N" Canal. Records available in U. S. Geological Survey water-supply papers, August 1908 to September 1916.
Private ditch (Pierre Bighawk).	From North Branch East Finley Creek in the NE¼ sec. 31, T. 16 N., R. 19 W.	1890	Unknown	Irrigation	Water used on 6.9 acres of hay land according to the Flathead Project, Water Rights - Beneficial Use Maps, 1913, 1914. No record of flow available.

1/. U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

48.--Valley Creek near Ravalli, Mont.

Location.--Staff gage, lat 47°14', long. 114° 10', in sec. 8, T. 17 N., R. 20 W., near mouth at crossing of highway between Jocko and Ravalli, 3 miles east of Ravalli, and 8 miles west of Arlee.

Records available.--May to December 1909; March to June 1910 (gage heights only).

Bypass channels.--None.

Diversion.--Several private ditches (see table 10); no organized irrigation district.

Return flow.--Probably no surface return flow.

Storage and regulation.--None.

Utilization.--Estimated acreage of irrigated land in recent years above site of station:

South Branch Valley Creek-----125 acres
West Branch Valley Creek------ 90 acres
Valley Creek-----------------350 acres.

This amount probably is not greatly in excess of acreage irrigated during period of record (according to an oral report by watermaster, Jocko Division of Flathead Project).

Table 10.--Diversions in Jocko River basin, above Valley Creek near Ravalli, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Unnamed ditch	From Hewolf Creek in the SW¼SE¼ sec. 27, T. 17 N., R. 21 W.	Unknown	Unknown	Irrigation	Water used on 21.3 acres in sec. 26 and 7.3 acres in sec. 27, T. 17 N., R. 21 W. 1/
Unnamed ditch	From North Fork Valley Creek near center sec. 23, T. 17 N., R. 21 W.	---do--	---do--	----do----	Water used on 8.3 acres in the SW¼ sec. 23, T. 17 N., R. 21 W. 1/
Unnamed ditch	From Valley Creek in the SW¼ sec. 25, T. 17 N., R. 21 W.	---do--	---do--	----do----	Water used on 65.7 acres in the W½ sec. 24 and the W½ sec. 25, T. 17 N., R. 21 W.
Unnamed ditch	Unnamed tributary stream.	May 1910	1.25 (decree)	Irrigation, domestic supply in the NW¼ sec. 13, T. 17 N., R. 21 W.	Reference: 1910 Project History, volume 4, Flathead Project.
Springs	Secs. 2 and 12, T. 17 N., R. 21 W.	1910	1.25 (decree)	Irrigation domestic supply.	Reference: 1910 Project History, volume 4, Flathead Project.

Note: The above list is of water appropriations and diversions of which some record was found. There may be others not contained in available records. The Flathead Project does not divert any water from Valley Creek.
1/. From Sheet No. 11, Water Rights-Beneficial Use Map, Flathead Project, dated Jan. 5, 1914, on file in office of U. S. Bureau of Indian Affairs, St. Ignatius. Mont.

49.--Jocko River at Ravalli, Mont.

Location.--Chain gage, lat 47°17', long. 114° 11', in sec. 32, T. 18 N., R. 20 W., 400 ft downstream from railroad station at Ravalli.

Records available.--October 1906 to April 1911.

Bypass channels.--None.

(The information that follows applies only to the drainage area between this station and the next stations upstream.)

Diversions.--Several major canals operated by the Flathead Project divert water from Jocko River or its tributaries above this station at present (see table 11). Many private ditches were in operation before and during the period of record, of which no detailed record is available. A few of these ditches are still being used, but in many cases lands formerly supplied from the old private ditches now receive water from the Flathead Project ditches. The present canal system is interconnected, making it possible to supply water to parts of the division from several sources.

Return flow.--Surface return flow from irrigated areas is negligible. Water can pass from tributary basins into others through the interconnected canal system, but this interchange is contained within the basin tributary to this station. The Jocko "S" Canal, however, carries water from the South Fork of Jocko River, some of which may be turned

into Big Knife and Agency Creeks. This canal normally carries about 26 cfs during the irrigation season.

Storage and regulation.--None, except as noted for stations upstream.

Utilization.--Water use in the basin is entirely for irrigation, there being no industrial use or municipal water systems. Table 13 shows the total irrigated acreage in Jocko Division; this is all in the basin upstream from the station with the exception of an estimated 800 acres located in the area near the mouth of the stream.

Table 11.--Diversions in Jocko River basin, above Jocko River at Ravalli, Mont.

Name	Point of diversion	Date of establ.	Purpose	Remarks
Matt ditch	Agency Creek, sec. 27, T. 16 N., R. 19 W.	Prior to 1906	Irrigation	At present land formerly served by Matt ditch is contained in Flathead Project, and most of supply comes from project ditches. No known records available.
Jocko "N" Canal.	Agency Creek, sec. 22, T. 16 N., R. 19 W.	1912	----do----	No known records available.
Jocko "S" Canal.	Intercepts Big Knife and Agency Creeks.	1941	----do----	No known records available.
Jocko "J" Canal.	Runs from Jocko "E" Canal to Agency Creek in sec. 21, T. 16 N., R. 19 W.	---	----do----	No known records available.
Jocko "E" Canal.	Finley Creek in sec. 30, T. 16 N., R. 19 W.	---	----do----	No known records available.
Jocko "K" Canal.	Jocko River in sec. 10, T. 16 N., R. 19 W.	About 1917	----do----	---
Jocko "R" Canal.	From Jocko "K" Canal in sec. 9, T. 16 N., R. 19 W.	---	----do----	---

Note: No data on flow available.

50.--Revais Creek near Dixon, Mont.

Location.--Staff gage, lat 47°17', long. 114° 23', in sec. 15, T. 18 N., R. 22 W., downstream from highway bridge 4 miles southwest of Dixon.

Records available.--April 1911 to September 1916, October 1917 to September 1919.

Bypass channels.--A part of the water diverted by Lateral "R" bypasses the station site.

Diversions.--Lateral "R" (Revais ditch) of Flathead Project diverts water above this station (subsequent to period of record); several smaller diversions diverted water before and during operation of this station under private water rights (see table 12).

Return flow.--Probably no surface return flow.

Storage and regulation.--None.

Utilization.--Private ditches irrigated several small plots of cultivated land and hay land (see diversion list for location). No information available about Ora Phena mining claim as to use of water for mining or power except record of filing made in 1910. Lateral "R" was constructed to supply irrigation water to about 800 acres between Revais Creek and the town of Dixon. This supply is now supplemented by pumping from Lower Jocko "R" Canal. (U. S. Bureau of Indian Affairs, St. Ignatius, Mont.)

Table 12.--Diversions in Revais Creek basin, above Revais Creek near Dixon, Mont.

Name	Point of diversion	Date of establ.	Approx. normal flow cfs)	Purpose	Remarks
No. 6 ditch	NE¼NW¼ sec. 22, T. 18 N., R. 22 W.	Appropriation 1891, found in use in 1910.	Unknown	Irrigation	Used to irrigate 4.3 acres in the NW¼SE¼ sec. 15, T. 18 N., R. 22 W. This ditch along with no. 4 ditch has a water right of 160 miners inches. No known records available. 1/
No. 4 ditch	------do------	-----do-----	---do--	----do----	Used to irrigate 19.3 acres in secs. I4, 15, and 23, T. 18 N., R. 22 W. 1/
Unnamed ditch	Sec. 8, T. 17 N., R. 22 W.	Unknown	---do--	----do----	Used to irrigate an estimated 40 to 80 acres in secs. 27 and 28, T. 18 N., R. 22 W. 1/.
Ora Phena Quartz Lode diversion.	East bank 500 ft south of claim.	Filing made June 10, 1910.	75 (water right)	Mining and power	Period of actual use not known. 1/
Lateral "R" (Revais ditch)	Near center of sec. 22, T. 18 N., R. 22 W.	Constructed 1923.	---	Irrigation	Used to irrigate about 800 acres. Information available from U. S. Bureau of Indian Affairs, St. Ignatius, Mont.

1/. From information furnished in U. S. Bureau of Indian Affairs Project History and Beneficial Use Maps, on file at office, St. Ignatius, Mont.

Flathead River at Mouth

The Flathead River near Polson (no. 26) is the farthest downstream gaging station on the main stem. Below this station, and below the stations farthest downstream on the tributaries entering Flathead River between the Polson station and the mouth, is a large area heretofore unaccounted for in this report. This area is delineated by gaging stations nos. 26, 29, 32, 34, 37, 49, and 50, and the mouth of Flathead River (see pl. 1). For convenience, the area is referred to in this section of the report as Flathead River at mouth.

Utilization of water in the area is largely confined to 1) irrigation in the Flathead Project under the supervision of the Bureau of Indian Arrairs, 2) irrigation of private lands, and 3) municipal consumption. Each item is handled under a separate heading below:

1. Flathead Project

Table 13 shows the acreages in the Flathead Project that have been irrigated over the period of operation. These acreages represent the total for the entire project and include some already listed above other stations. In the Jocko Division only about 800 acres of that shown in table 13 is land irrigated in the area Flathead River at mouth anytime since the start of the project. This acreage is located along the north side of Flathead River, opposite the reach between the town of Dixon and the mouth of Revais Creek. Accordingly, all but 800 acres of that shown in table 13 under "Jocko Division" is taken into account in areas above upstream gaging stations.

The Mission Division lies partly above gaging stations nos. 30-37 inclusive, and partly within the area Flathead River at mouth. Because of the extensive interchange of water between these tributary streams upon which these stations are located, it was found impractical to segregate the utilization for a single station. Therefore, the amounts shown in table 13 for the Mission Division include irrigated acreage for the area for Flathead River at mouth and for the areas upstream from stations nos. 30 to 37.

All of the irrigated land in the Camas Division shown in table 13 is included in the Flathead River at mouth with the exception of the small amount listed under Little Bitterroot River near Niarada (no. 29).

Practically all the water used in the Flathead Project is diverted from streams outside the area covered by Flathead River at mouth. These diversions have been appropriately noted by upstream gaging stations.

2. Private land

Privately irrigated land in Lake and Sanders Counties, outside the Flathead Project and tributary to the Flathead River is widely scattered in small tracts served by diversions from various tributaries of the Flathead River. According to an investigation by C. D. Bue in 1947, there was a total of 847 acres in Lake County and 1,183 acres in Sanders County. This is based on land classification for tax purposes made about 1920. It was assumed that the amount has not changed significantly during the period covered in this report.

3. Municipal water supply

Three small towns in the area tributary to Flathead River at mouth have municipal water-supply systems:

Table 13.--Flathead Project--irrigated land, in acres 1/

Year	Jocko Division	Mission Division	Camas Division	Total
1910	----------	----------	----------	*2,191
1911	----------	----------	----------	*2,369
1912	----------	----------	----------	*4,152
1913	----------	----------	----------	*4,507
1914	----------	----------	----------	6,416
1915	----------	----------	----------	3,241
1916	----------	----------	----------	4,373
1917	----------	----------	----------	15,863
1918	----------	----------	----------	27,128
1919	----------	----------	----------	34,453
1920	----------	----------	----------	32,836
1921	----------	----------	----------	30,485
1922	----------	----------	----------	30,357
1923	----------	----------	----------	18,495
1924	----------	----------	----------	29,840
1925	----------	----------	----------	32,487
1926	----------	----------	----------	33,947
1927	4,425	26,136.75	4,188.5	34,752.25
1928	4,419.5	25,620	4,096.5	34,136
1929	4,559	30,806.5	4,488	39,853.5
1930	4,613.25	33,874.25	5,388	43,875.5
1931	5,221.75	41,639.75	5,787.25	52,648.75
1932	5,089	46,210	6,354	57,653
1933	5,524	47,028.75	6,359.25	58,912
1934	4,550	48,645.25	7,020	60,215.25
1935	5,740	54,364	7,409	67,513
1936	5,807	54,975	7,345	68,127
1937	6,202	58,191	8,274	72,667
1938	6,323	61,614	8,065	76,002
1939	6,234	62,724	7,288	76,246
1940	6,572	63,258	7,504	77,334
1941	7,281	62,499	7,005	76,785
1942	7,474	57,005	7,265	71,744
1943	8,034.6	62,865	7,573	78,742
1944	8,313.7	64,215.6	8,003.0	80,532.3
1945	8,387.2	67,129.6	8,219.0	83,735.8
1946	7,975.1	70,044.0	7,984.0	86,003.1
1947	8,046.9	70,531.7	8,483	87,061.6
1948	9,595.0	80,096.7	8,491	98,182.7
1949	8,946.4	79,413.4	8,283	96,642.8
1950	8,339.4	76,770.0	8,696	93,805.4

1/ Files of U. S. Bureau of Indian Affairs, St. Ignatius, Mont.
* Bue, Conrad D., Irrigated Acreage in Columbia River basin (unpublished): U. S. Geol. Survey, Helena, Mont., 1948.

Hot Springs diverts water from Warm Springs Creek in sec. 6 or 7, T. 21 N., R. 25 W. The water is stored in a 200,000-gal steel storage tank for distribution. The system was completed about 1936; disposal is by individual septic tanks.

Paradise obtains water from a well owned by the Northern Pacific Railway, 4,300 ft west of its station. There is no municipal sewage system.

Charlo obtains water from a 488-ft drilled well in the town, which serves 58 residences. There is no municipal sewage system.

Return flow to the area is confined to importation of water from another basin. Alder Creek Feed Canal and McGinnis Creek Canal are interbasin diversions which carry water into the Flathead Basin for use in the Camas Division of the Flathead Project. (See table 14.)

Table 14.--Diversions in Flathead River basin, above Flathead River at mouth

Name	Point of diversion	Date of establ.	Approx. normal flow (cfs)	Purpose	Remarks
Interbasin diversions in Camas Division.					
Alder Creek Feed Canal.	From Alder Creek in SW¼ sec. 16, T. 23 N., R. 25 W. to Upper Dry Fork.	After 1933	Natural flow of Alder Creek.	To supplement water supply available for storage in Upper Dry Fork.	Feeds Upper Dry Fork Reservoir. No records of flow.
McGinnis Creek Canal.	Intercepts several tributaries of McGinnis Creek in N½ sec. 34; SW¼ sec. 27, T. 22 N., R. 25 W. to South Fork Garden Creek.	August 1941	Natural flow of McGinnis Creek.	To supplement water supply in lower portion of Camas Division, Flathead Project.	This water enters Camas "C" Canal through Garden Creek. No records of flow.

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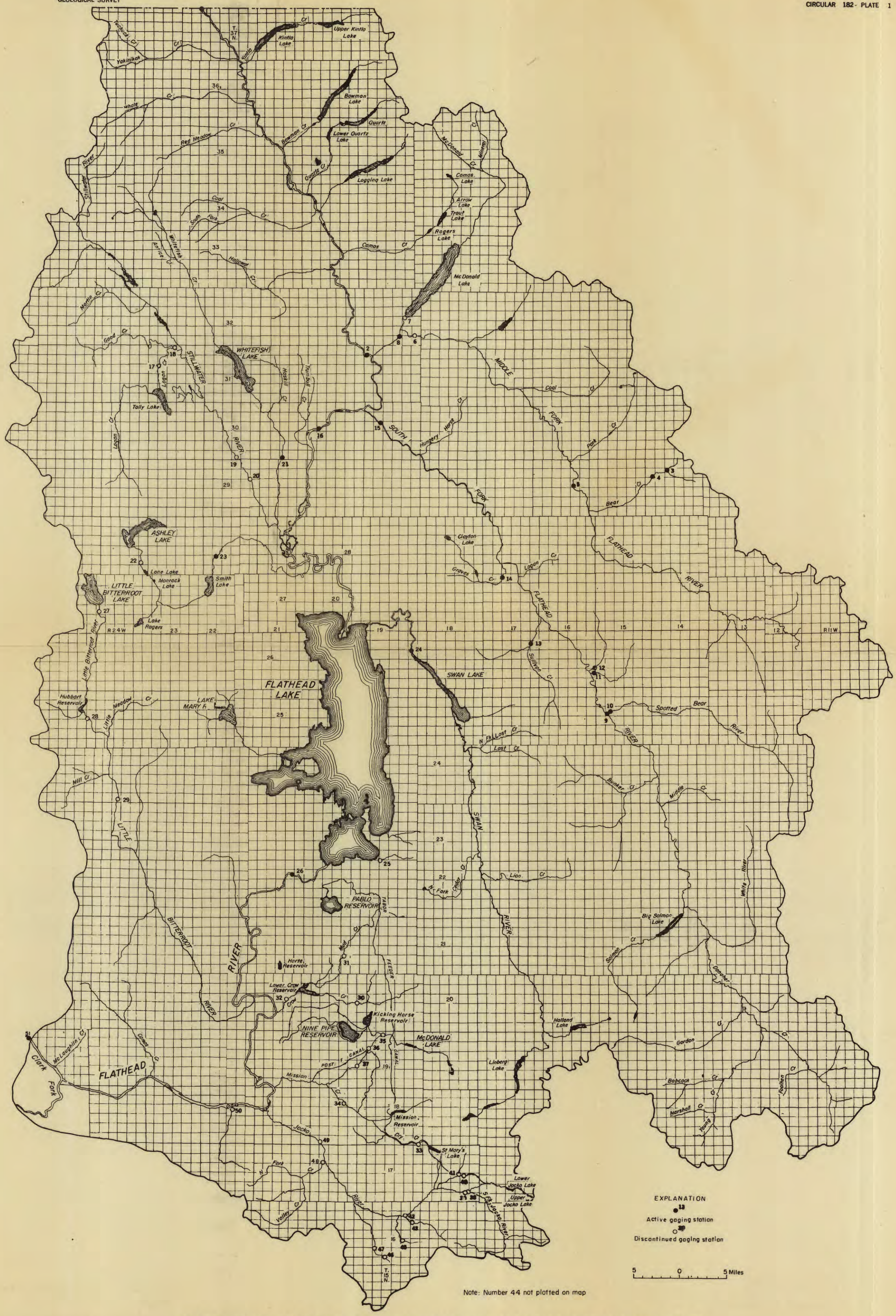

MAP SHOWING LOCATION OF GAGING STATIONS IN THE FLATHEAD RIVER BASIN