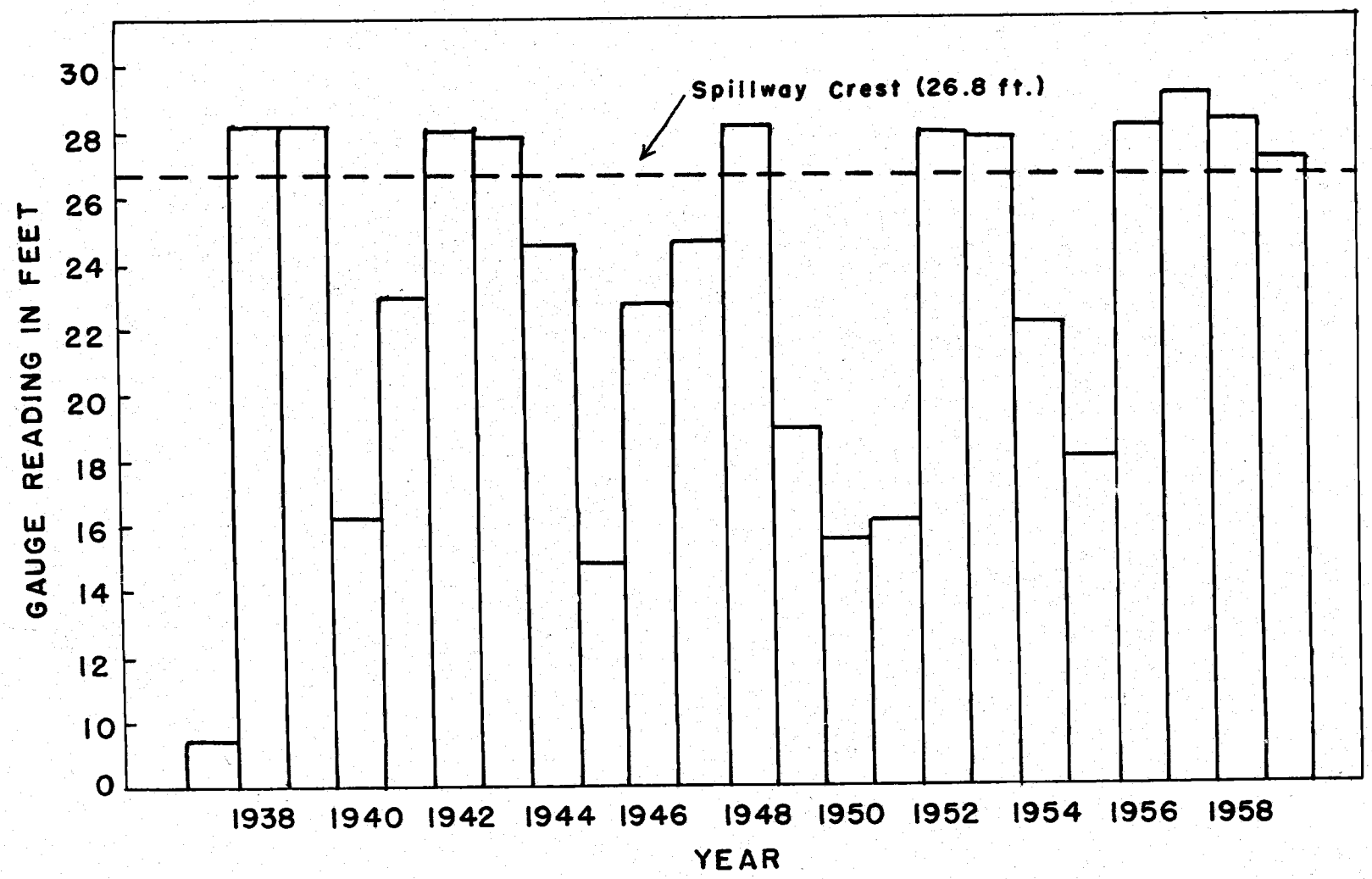


FIGURE 3. YEARLY MAXIMUM WALLOWA LAKE GAUGE READINGS, 1937-59

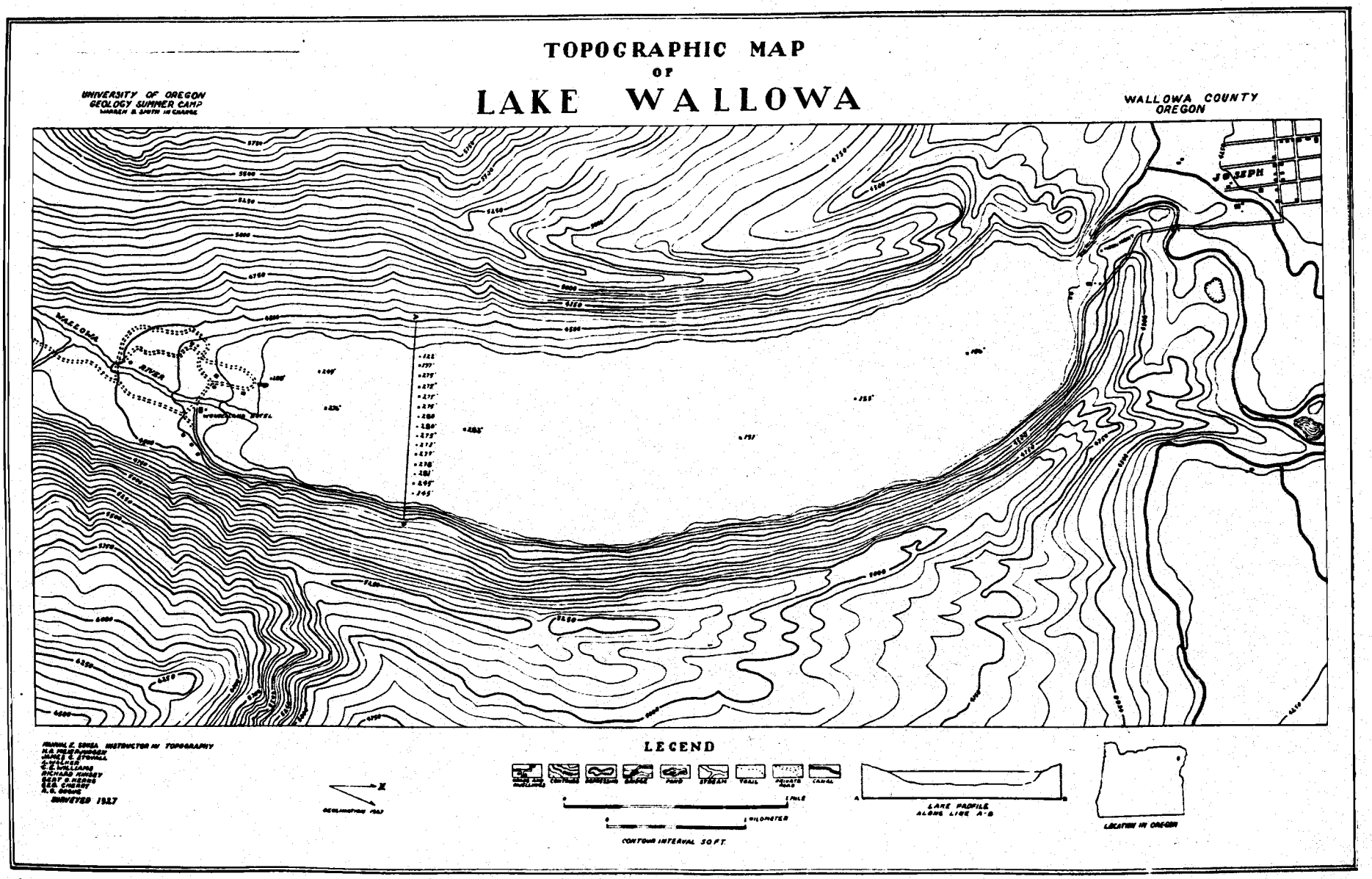


Figure 4. Topographic Map of Wallowa Lake.

(Courtesy of Mr. James C. Stovall, University of Oregon).

Physical Description of the Wallowa River Above and Below the Lake

River Above the Lake

The Wallowa River flows into the lake from the Wallowa Mountains. There are two forks to the river (Figures 5 and 6). The East Fork originates in the area near Aneroid and Roger Lakes. These high lakes are at an elevation of 7,550 and 7,800 feet, respectively, and receive drainage from the towering 9,000-to 10,000-foot mountains surrounding them. The six mile flow down to the junction with the West Fork is extremely precipitous and represents a total drop of 3,500 feet. One and a half miles above the junction at an elevation of 5,800 feet on the East Fork, there is a Pacific Power and Light Company dam for impounding water, and an 18-inch steel pipe for transporting the water to the Falls Generating Plant near the confluence of the two forks. The log dam is 12 to 14 feet high and overflows 6 months of the year during spring and summer.

U.S. Geological Survey records (1950) show that the steel pipe averaged 8.25 c.f.s. flow over 26 years, 1924 to 1950. The extreme flows for this period varied between 0 and 17 c.f.s. for the same 26-year period. The maximum discharge for this period was 450 c.f.s. and the minimum discharge was 0.1 c.f.s. in the East Fork. USGS records (1956) indicate the total discharge of the East Fork averaged 20.9 c.f.s. for the 32-year period, 1924 to 1956.

The gauging station is located in the East Fork 0.25 mile above its mouth. There is an impassable falls, 30 to 40 feet high, one half mile above the junction of the forks on the East Fork, which would definitely limit upstream migration. Between the dam and falls is a precipitous area in which the flow is torrential.

The West Fork flows between 10,000-foot Matterhorn Mountain and 9,000-foot Mount Bonneville. Numerous small lakes, Horseshoe, Lee, Douglas, and Ice, empty into tributaries of this fork. There are two adjacent falls on this fork; one is 15 feet high and the other is 25 to 30 feet high. The 25-to 30-foot falls drops into a pool and then tumbles down the 15-foot falls 0.25 mile above the confluence with the East Fork. There are few good spawning areas for a distance of 6 miles above the junction with the East Fork due to the steep gradient. Excellent spawning beds are present in the meadows 6 miles up from the junction and extend upstream in the West Fork approximately 1.5 miles. Additional impassable falls are located approximately 8.5 miles in the West Fork headwaters above the lower 15 and 25-30 foot falls near the mouth.

There is no water gauge in the West Fork, and consequently, no records of the flow. It can be inferred, however, from the 32-year average of 20.9 c.f.s. in the East Fork and the 11-year (1925-33, 1936-38, 1940-41) average of 107 c.f.s. in the Wallowa River below the confluence of the East and West Forks (but above the lake), that the average flow in the West Fork would be approximately 86 c.f.s.

After the East and West Forks join, the Wallowa River flows for 1.25 miles before entering the southern end of Wallowa Lake. Stream channelization in 1950 by the Oregon State Highway Commission, to control flooding at head of lake, drastically reduced the natural spawning area. This area was once a maze of small channels that were utilized by the kokanee and bluebacks. One main channel now exists. The Oregon Game Commission has opened 2 of the original small spawning channels for utilization by the present stocks of kokanee.

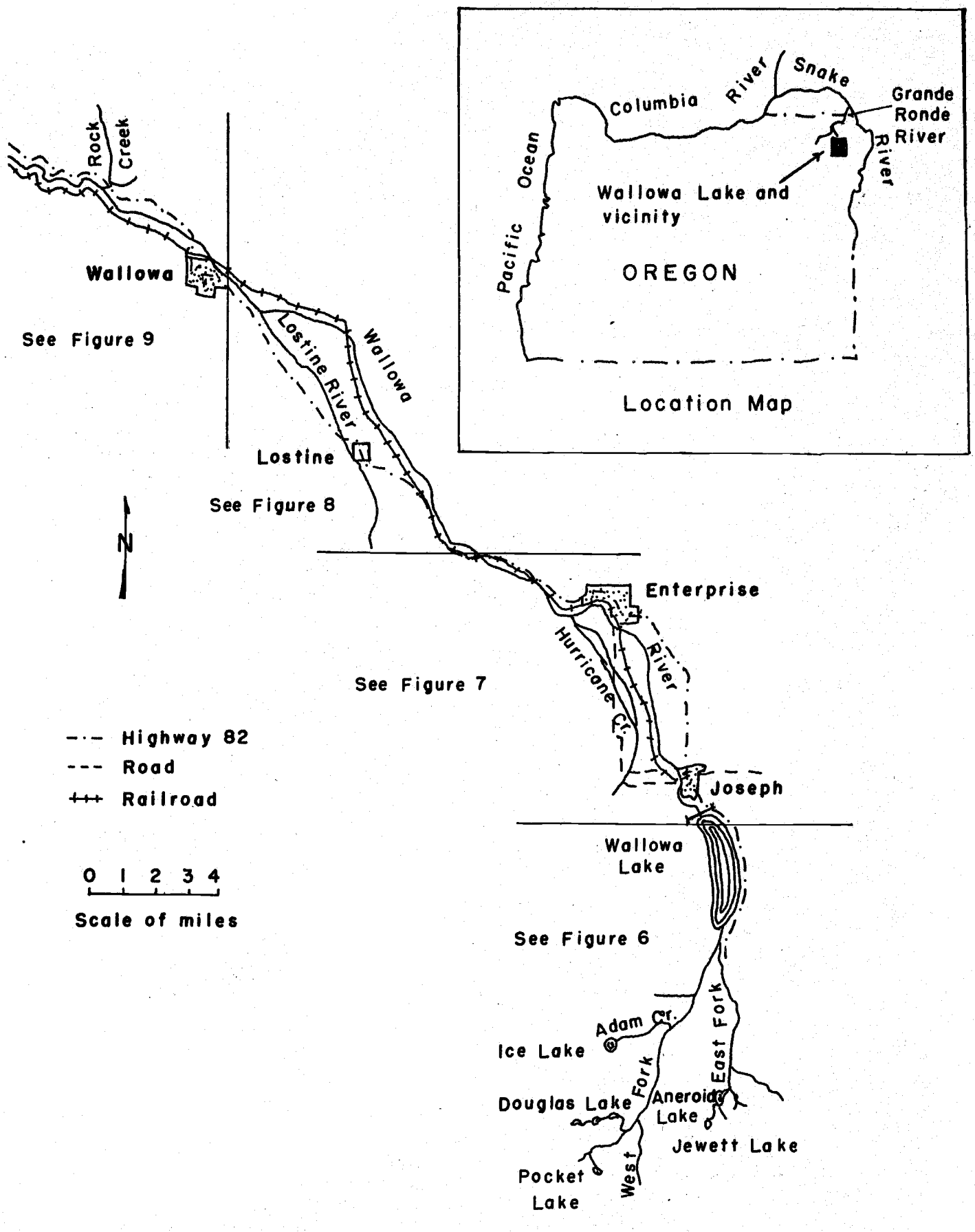


FIGURE 5. KEY MAP OF STUDY AREA, WALLOWA RIVER ABOVE WALLOWA LAKE TO THE MOUTH OF ROCK CREEK

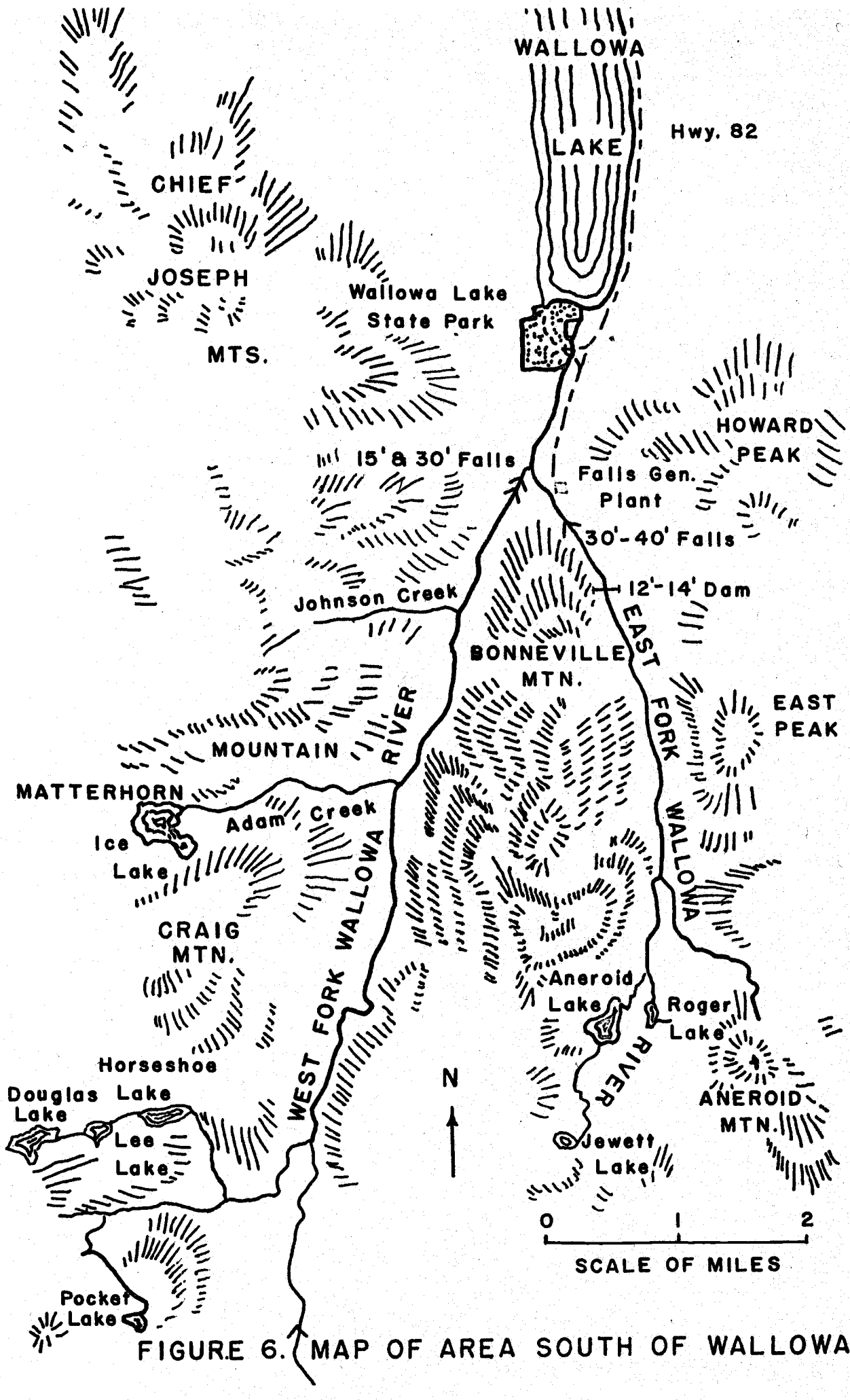


FIGURE 6. MAP OF AREA SOUTH OF WALLOWA LAKE

River Below the Lake

The Wallowa River flow below the lake is controlled at the dam. The river channel is stable in general and there is usually good cover by vegetation.
Dam to the Wilson Ditch (Figure 7). The river is 50 to 100 per cent shaded by cottonwood, willow, ponderosa pine, alder, Douglas fir, and spruce trees from the dam to the Wilson Ditch. The channel contains small pools and shelter areas are formed by occasional logs over and in the river.
Wilson Ditch to Russel Lane (Figure 7). The river is generally 0 to 50 per cent shaded by willow, cottonwood, ponderosa pine, spruce, and Douglas fir trees from the Wilson Ditch to Russel Lane. The river forms a large pool 0.25 to 0.5 mile below the Wilson Ditch. A spring discharging 2 to 3 c.f.s. flowed into this pool at a temperature of 59 degrees F. when observed at noon on August 8, 1959. There is some undercutting of banks and the pools are narrower and shorter than the average river width.
Russel Lane to Dorrance Lane (Figure 7). At Russel Lane the river was 27 feet wide and averaged 8 inches in depth on August 11, 1959. The river from Russel Lane to Dorrance Lane is open to 50 per cent shaded with cottonwood, spruce, willow, Douglas fir, and ponderosa pine trees. There is considerable shelter provided by undercutting banks and log and debris jams. The river divides into the east and west branches just before it crosses under Dorrance Lane. The west branch is the largest of the two.
Dorrance Lane to "Market Road" (Figure 7). The west branch downstream from Dorrance Lane has a rapid flow with 0 to 50 per cent shaded areas. Many springs enter the river above here.

The first two branches join approximately 0.75 mile north of Dorrance Lane but separate again into the second east and west branches before crossing "Market Road". The second east branch is utilized almost exclusively for irrigation south of "Market Road".

"Market Road" to Enterprise (Figure 7). The east branch of the Wallowa River north of "Market Road" was 25 feet wide and averaged 12 inches in depth on August 14, 1959. There are undercut banks, pools, and the river is from 0 to 50 per cent sheltered with willow, cottonwood, spruce, and juniper trees.

The west branch of the Wallowa River north of "Market Road" was approximately 22 feet wide and averaged 12 inches in depth on August 14. The two second branches resembled one another in shelter and vegetation.

The second branches join approximately 1 mile north of "Market Road". Here, the river was 27 feet wide and averaged 16 inches in depth on the above date. The river separates into two branches for the third time and then joins again 0.38 mile west of Hurricane Creek Road.

Enterprise to Rock Creek (Figures 7, 8, and 9). From the town of Enterprise to Rock Creek (4 miles below the town of Wallowa) the Wallowa River flows mostly within one channel and receives water from such tributaries as Hurricane Creek and the Lostine River. This section of the river is abundantly supplied with water and has a moderate to steep gradient. The Wallowa Valley ends at Rock Creek and the river enters a narrow canyon.

Water Temperatures in Study Area

Biweekly maximum and minimum temperatures were taken at 3 stations over most of the period of this study. Stations were: (1) in the Wallowa River 0.75 mile

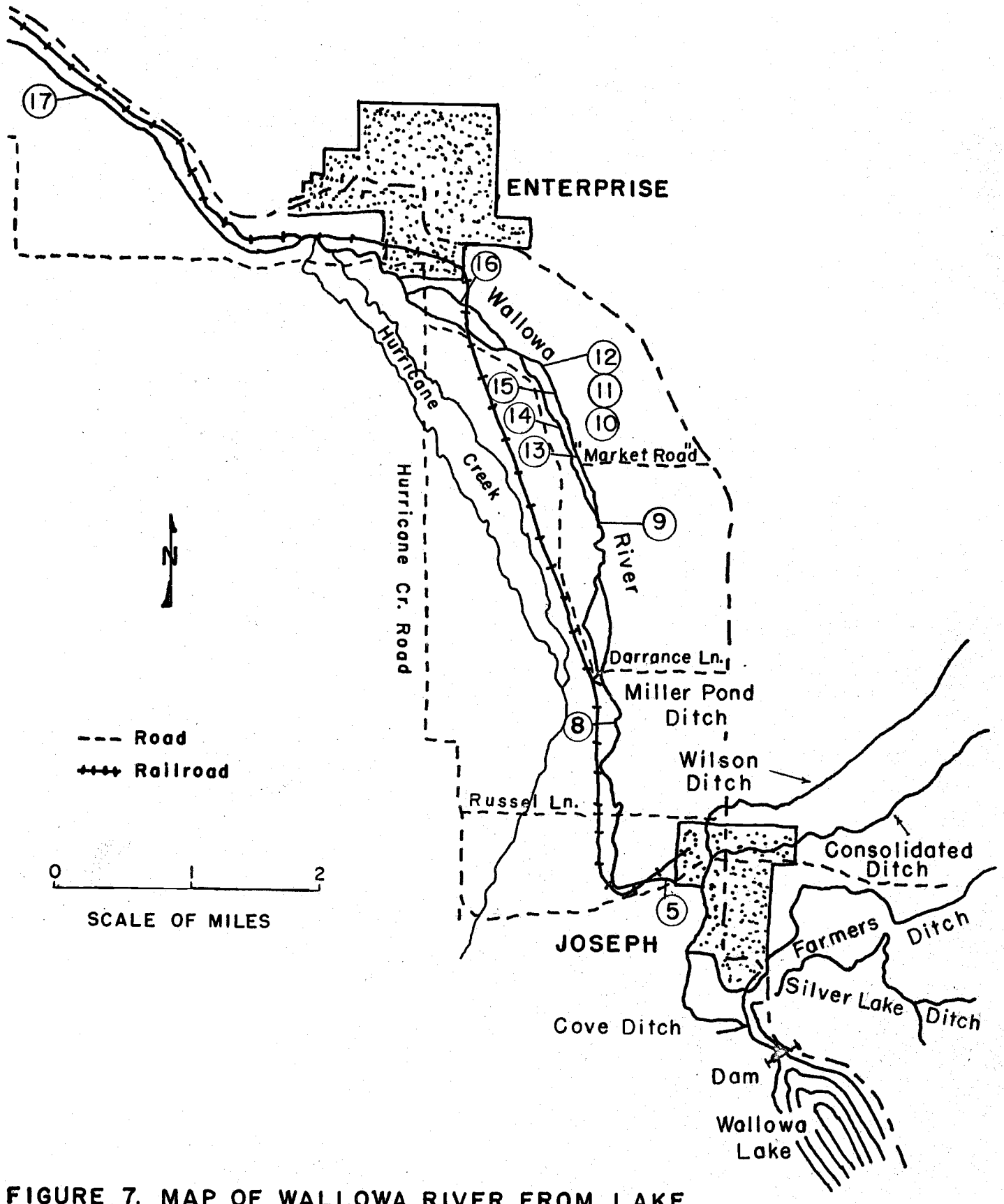


FIGURE 7. MAP OF WALLOWA RIVER FROM LAKE TO 3 MILES BELOW ENTERPRISE (See Table 2 for encircled numbers)

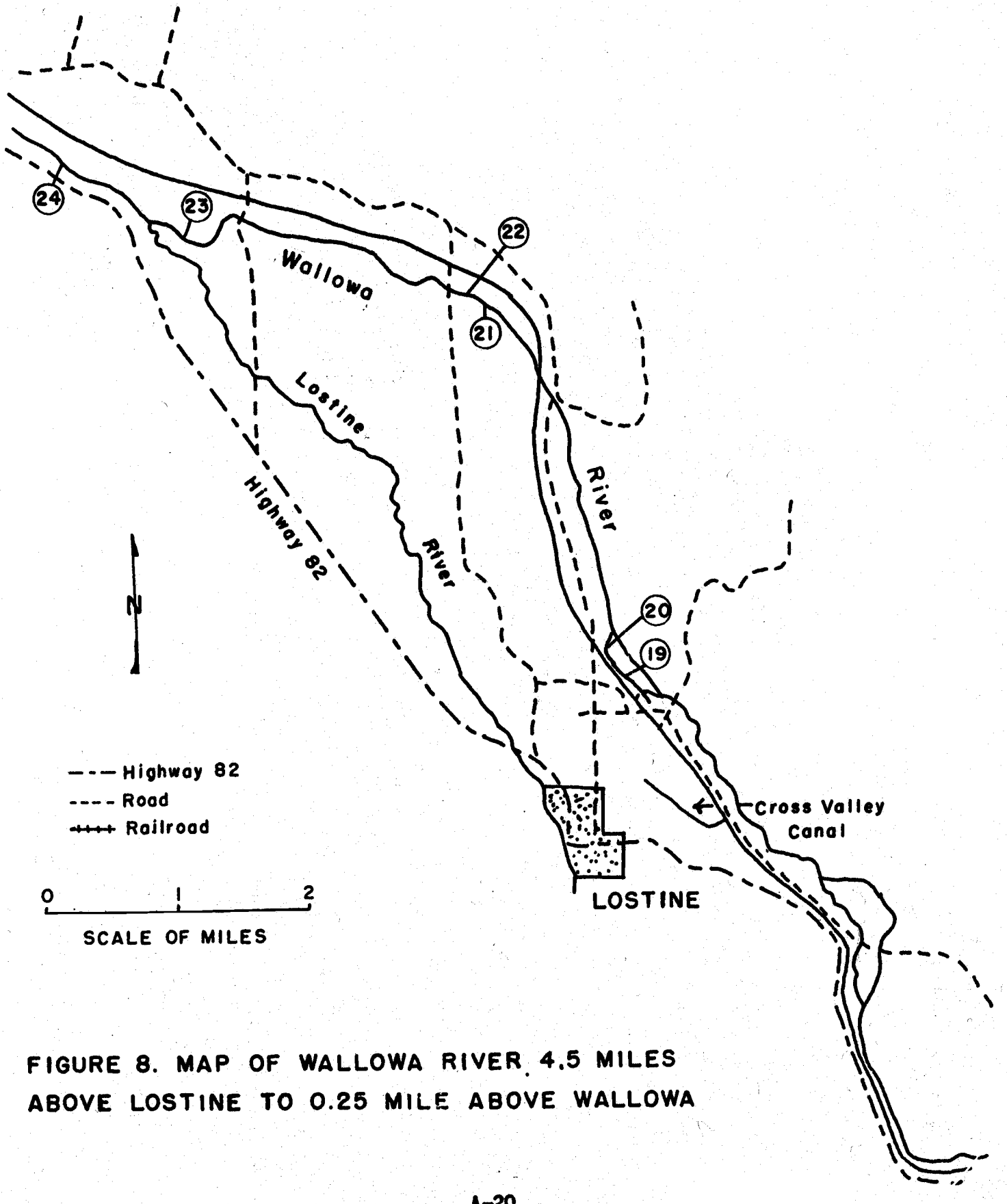


FIGURE 8. MAP OF WALLOWA RIVER 4.5 MILES ABOVE LOSTINE TO 0.25 MILE ABOVE WALLOWA

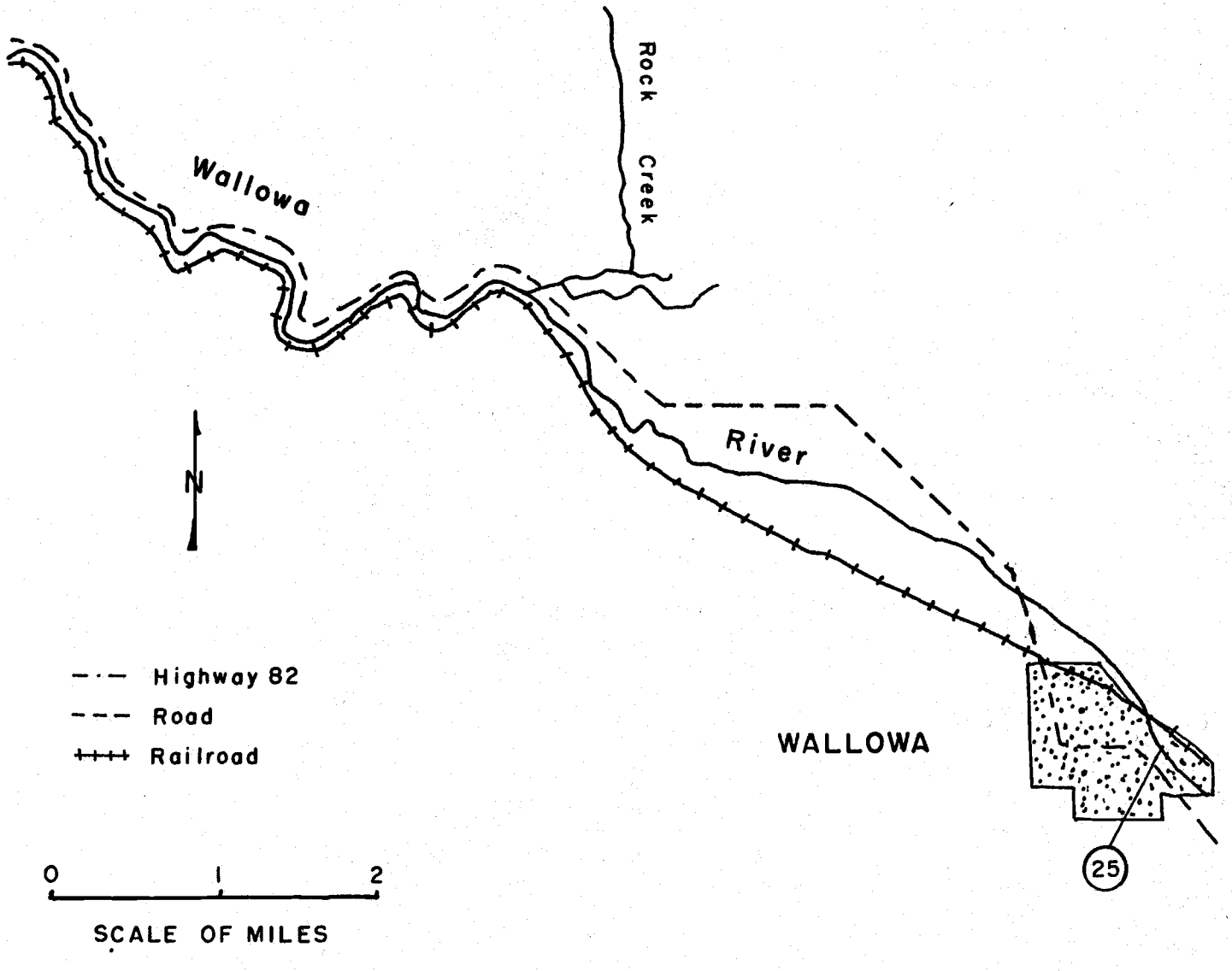


FIGURE 9. MAP OF WALLOWA RIVER 0.25 MILE ABOVE WALLOWA TO 1.5 MILES BELOW WALLOWA

above the lake; (2) in the lake itself at the face of the dam; and (3) in the Wallowa River 1.5 miles above Enterprise.

The maximum water temperature in the Wallowa River above Wallowa Lake (Figure 10) was 56 degrees F. (during late July and early August). The minimum temperature was 39 degrees F. in late September. The mean biweekly temperature ranged between 43 degrees F. and 51.5 degrees F. from June through September. During the period of temperature observations the greatest biweekly fluctuations of 10 degrees or more were not uncommon.

The maximum lake temperature 1.5 feet below the water surface at the dam (Figure 11) was 74 degrees F. in the latter part of July. The minimum temperature of 51 degrees F. occurred in June and late September. The mean biweekly temperature ranged between 55.5 degrees and 69.5 degrees F. from June through September. There is considerable warming of the surface water in the lake as can be seen by comparing the maximum temperatures obtained in the river above the lake and in the lake, 56 degrees and 74 degrees F., respectively. The greatest biweekly fluctuation was 14 degrees F. occurring in the latter part of June and the middle of September. Biweekly fluctuations of 8 degrees F. were common.

The maximum temperature of the Wallowa River 100 yards north of "Market Road" near Enterprise (Figure 12), was 64 degrees F. in late July. The minimum temperatures were 47 degrees F. in early July and in mid-September and 45 degrees F. in late September. The mean biweekly temperature ranged between 50.5 degrees and 60 degrees F. from June through September. The maximum and minimum temperatures at this station ranged from 5 degrees F. to 10 degrees F. lower than the surface water temperature at the lake.

Although biweekly records for this station are shown in Figure 12, diurnal fluctuations for June 22 through September are available from continuous temperature records and generally averaged 9 degrees F., with a maximum of 15 degrees F. in early July and a minimum of 2 degrees F. in the middle of September.

Several spot temperatures were taken in August during a survey of the Wallowa River from the lake to Enterprise. These are presented in Table 1.

Table 1. Spot-Temperature Data for the Wallowa River Between Wallowa Lake and Enterprise for August 1959.

Date	Location	Time	Temp. in Degrees F. Air	Water
8/6/59	Near Cove Ditch	9:00 a.m.	64	65
8/8/59	0.5 mile below Wilson Ditch	12:00 a.m.	78	67
8/15/59	Near Dorrance Road	11:30 a.m.	76	55 1/
8/14/59	Near Market Road	12:30 p.m.	77	59
8/19/59	1 mile below Market Road	12:30 p.m.	72	58

1/ Springs in area reduced water temperatures.

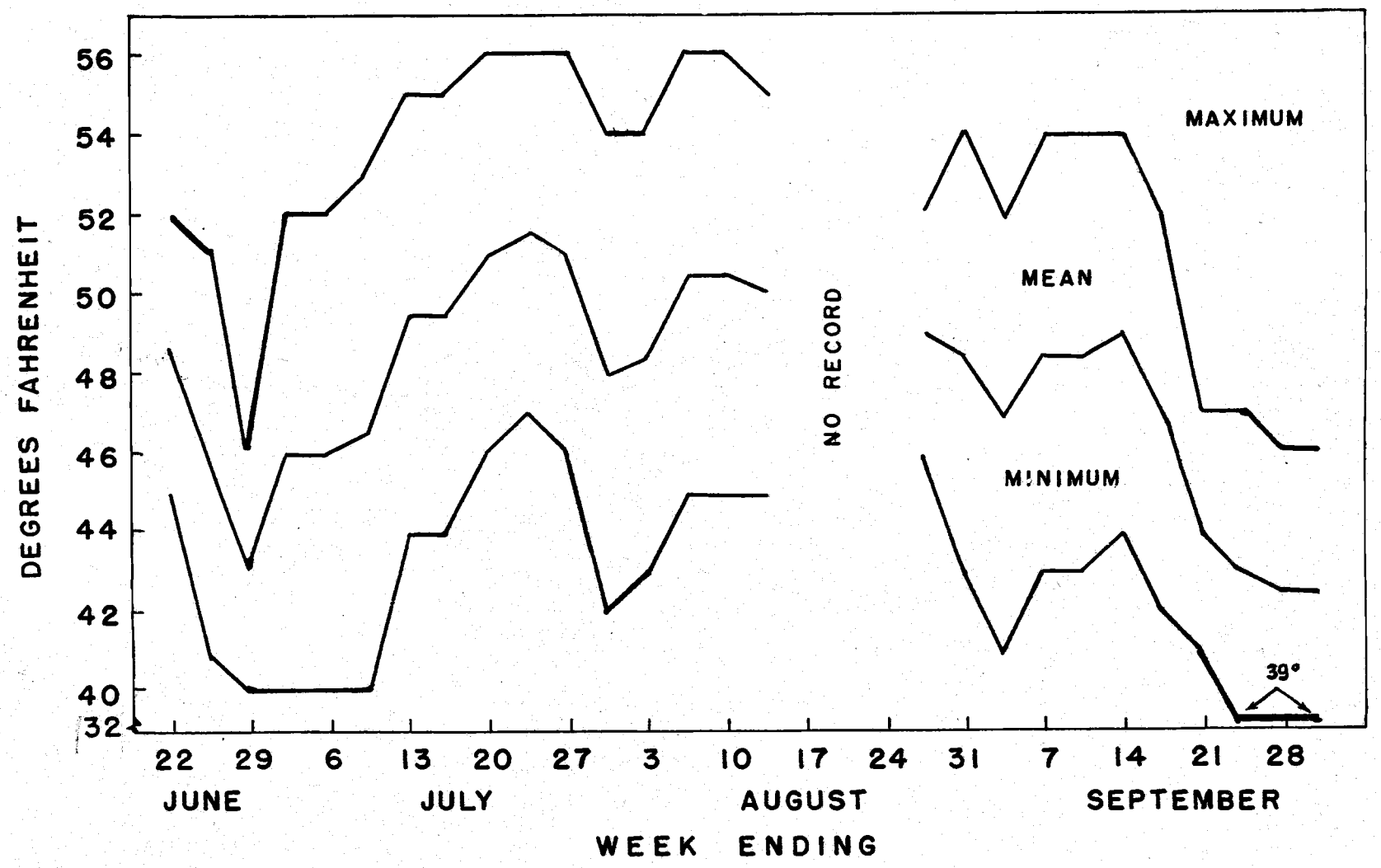


FIGURE 10. BIWEEKLY OBSERVATIONS OF MAXIMUM, MINIMUM, AND MEAN WALLOWA RIVER TEMPERATURES TAKEN 0.75 MILE ABOVE WALLOWA LAKE JUNE THROUGH SEPTEMBER 1959

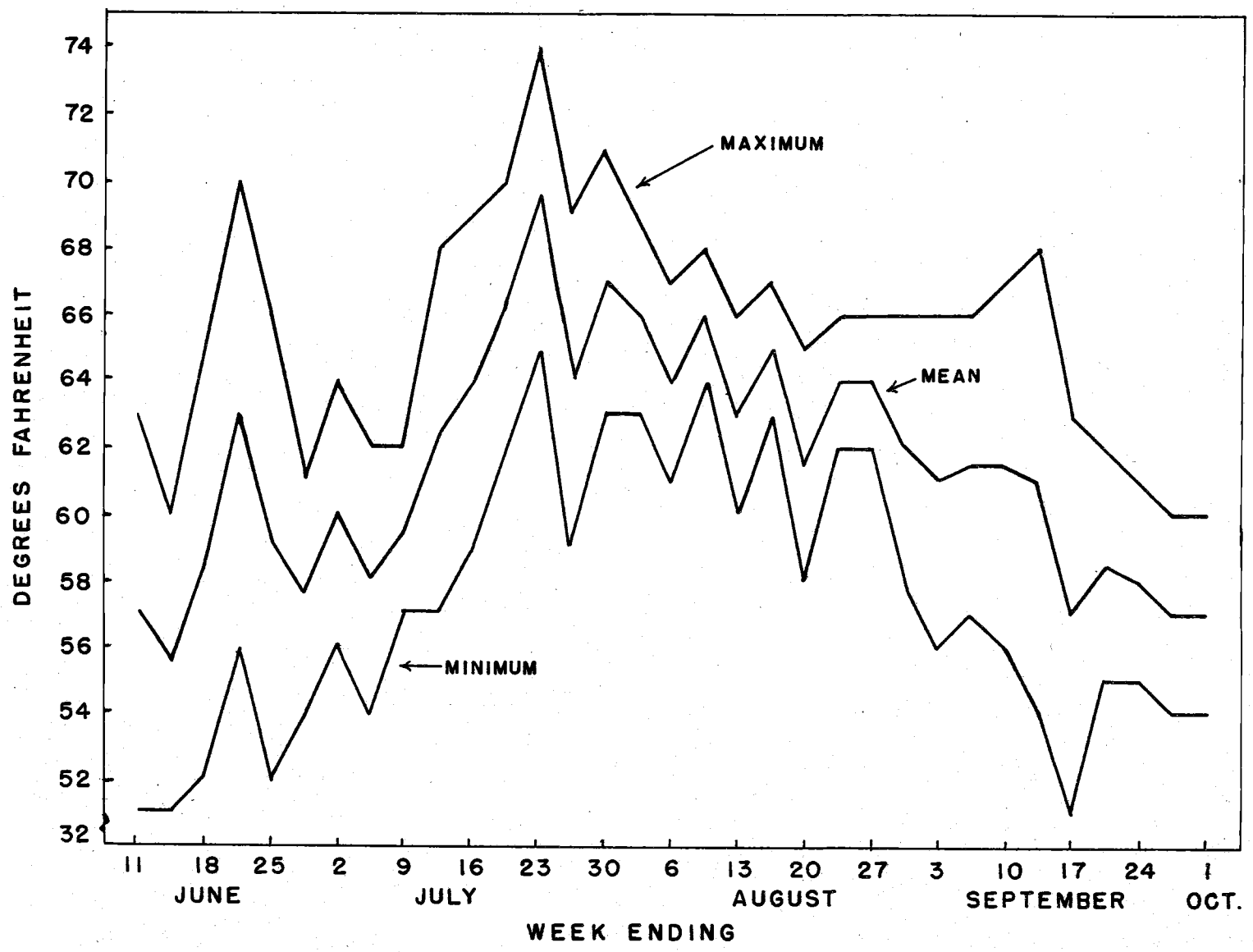


FIGURE 11. BIWEEKLY OBSERVATIONS OF MAXIMUM, MINIMUM, AND MEAN WALLOWA LAKE TEMPERATURES, TAKEN 1.5 FEET BELOW FOREBAY LEVEL AT WALLOWA LAKE DAM, JUNE THROUGH SEPTEMBER, 1959

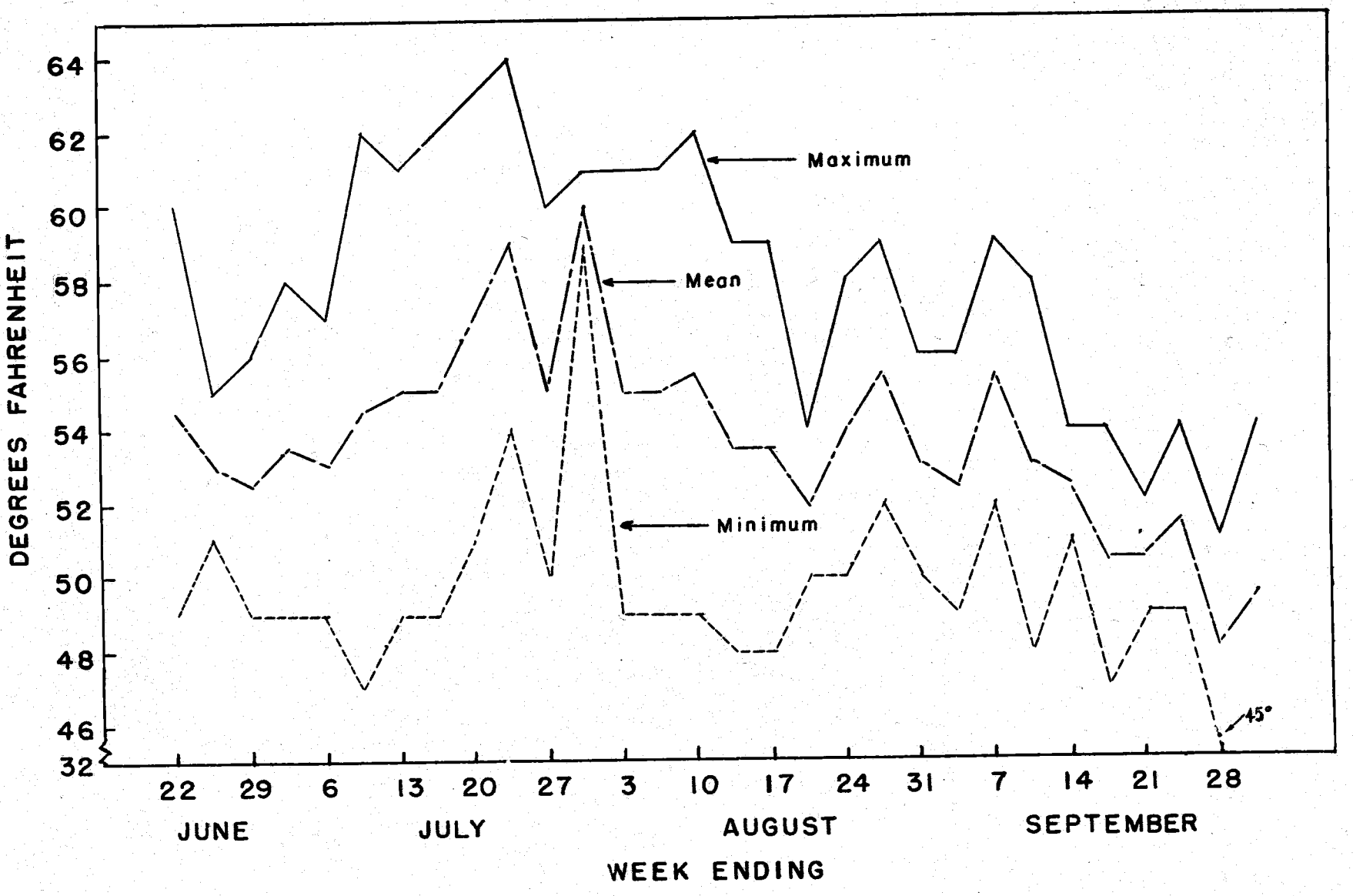


FIGURE 12. BIWEEKLY OBSERVATIONS OF MAXIMUM, MINIMUM AND MEAN WALLOWA RIVER TEMPERATURES TAKEN NEAR ENTERPRISE, JUNE THROUGH SEPTEMBER 1959

Water Flow in Study Area

Water releases from Wallowa Lake and the amounts diverted into the major ditches shortly below the lake govern the flows in the Wallowa River at the upper end of the valley. In parts of this area flows are drastically reduced during the summer months. Shortly below Joseph, ground water returns to bolster the flow and no further serious shortages occur. Provisional data on releases from the lake and volumes diverted into certain large ditches during the study period were obtained from the U.S. Geological Survey and the Wallowa County Watermaster.

The maximum daily flow of water into the river from the lake was 655 c.f.s. on June 24 and 25, 1959 (Figure 13). The minimum flow of 37 c.f.s. occurred in early May and early September. The maximum monthly volume of 27,774 acre-feet occurred in June (Figure 14 a).

The maximum flow of water discharged into the Silver Lake Ditch (Figure 15) from the dam was 119 c.f.s. on July 27, 28, and 29. The minimum occurred in early May and consisted of 2 to 3 c.f.s. The maximum monthly discharge equivalent to 6,892 acre-feet occurred in July (Figure 14 b).

The total monthly equivalent discharge in acre-feet from the dam (the Wallowa River discharge plus the Silver Lake Ditch discharge) was: May 10,686; June 32,094; July 30,622; August 17,356; and September 3,054 (Figure 14 c).

The maximum flow of irrigation water in the Farmers Ditch (Figure 15) was 145 c.f.s. on July 26. The minimum flow was 8.4 c.f.s. on May 1. The maximum volume of 7,628 acre-feet occurred in the month of July (Figure 14 d).

The maximum flow of irrigation water in the Consolidated Ditch (Figure 15) was 414 c.f.s. on June 24. The minimum flow was 17.7 c.f.s. on May 6; the maximum volume of 18,393 acre-feet occurred in the month of June (Figure 14 e).

During the months of July, August, and September any water that remains in the river below the Consolidated Ditch intake may be completely removed or so drastically depleted at the Miller and Wilson Ditches that upstream migrants would be stopped by the reduced flow for approximately 0.5 mile below this point. Mr. Max Wilson, secretary of the Associated Ditch Company, has stated that the ditch company would guarantee a minimum flow of 15 c.f.s. in the critical area below the Consolidated Ditch intake as long as storage water remained in the lake (Mattson, 1957). In the event that storage water was depleted, transportation water for the critical 0.5 mile below the Miller Ditch would very likely be absent for a period during the summer. Storage water in the amount of 3,000 acre-feet would be necessary to furnish 15 c.f.s. per day for 100 days. The possibility of having storage water for use for fish transportation has increased since deactivation of the Pacific Power and Light Company power plant. However, it should be emphasized that the offer for additional water was made verbally and has in no way been definitely committed to fish use.

Springs return some irrigation water approximately 0.5 mile below the Wilson Ditch. On August 11, the flow was estimated to be 33 c.f.s. 1/ at Russel Lane, which is 1 mile below Wilson Ditch (Figure 7). The flow of water on August 11, 2 miles below the Wilson Ditch, was estimated to be 35 c.f.s.

The east branch of the Wallowa River north of "Market Road" had an estimated flow of 18 c.f.s. on August 14. The west branch north of "Market Road" had

1/ All flow estimates made by use of floating-chip method.

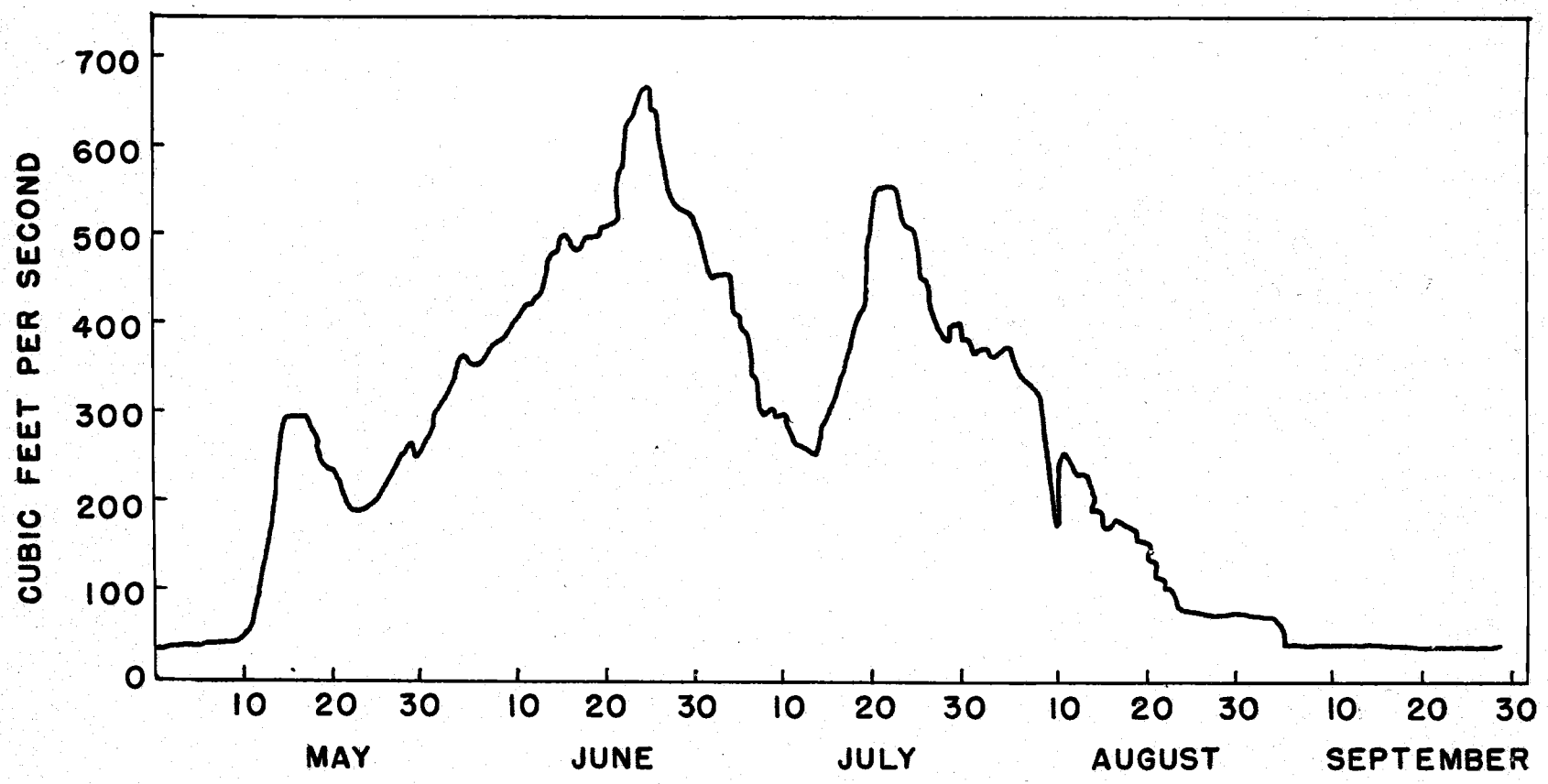
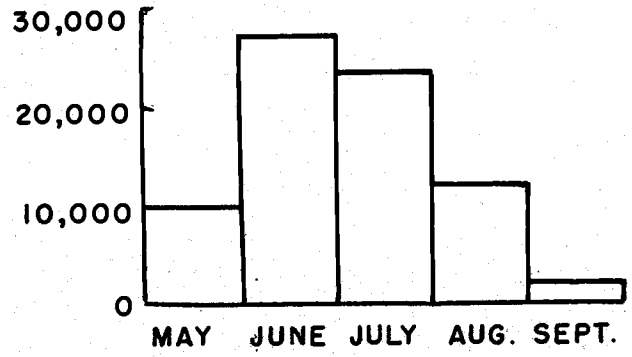
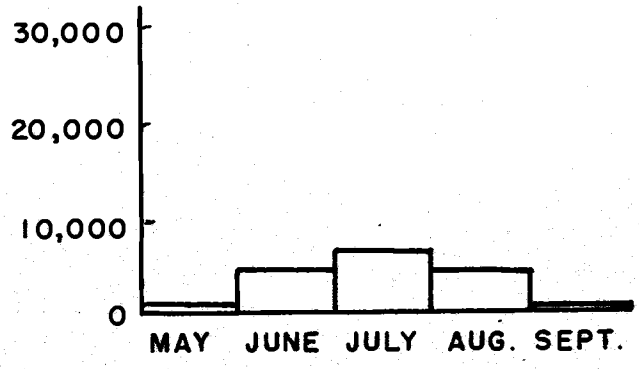


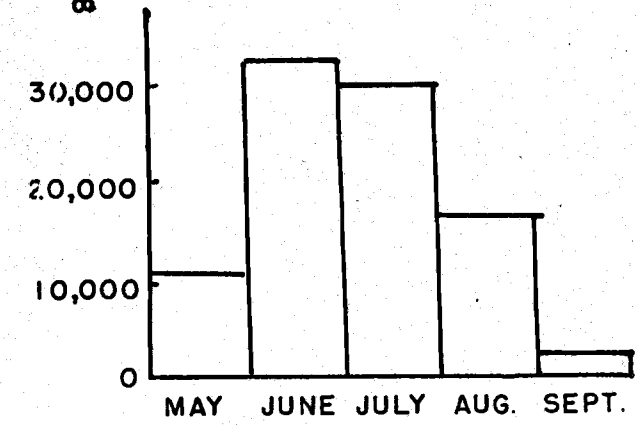
FIGURE 13. DAILY DISCHARGE IN CUBIC FEET PER SECOND FROM WALLOWA LAKE INTO WALLOWA RIVER DURING THE IRRIGATION SEASON MAY THROUGH SEPTEMBER, 1959



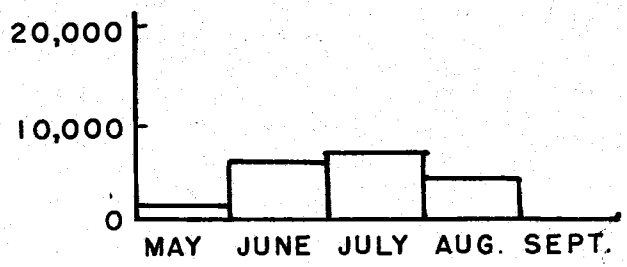
a. Wallowa River 1,000 feet below Wallowa Lake Dam



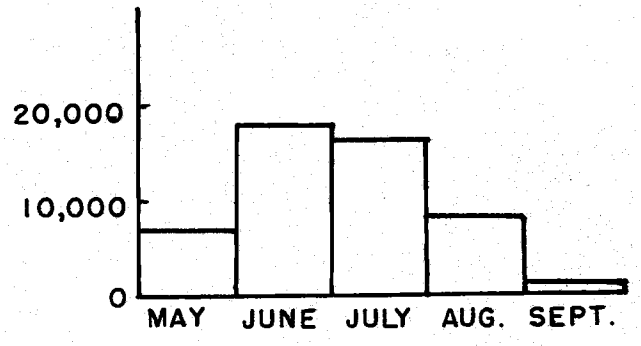
b. Silver Lake Ditch 800 feet below Wallowa Lake Dam



c. Wallowa Lake Dam Releases (includes Silver Lake discharge)



d. Farmers Lake Ditch 600 feet below Wallowa Lake Dam



e. Consolidated Ditch 1.5 miles below Wallowa Lake Dam

FIGURE 14. MONTHLY DISCHARGE IN ACRE-FEET IN THE WALLOWA RIVER AND SILVER LAKE, FARMERS, AND CONSOLIDATED DITCHES DURING THE IRRIGATION SEASON, MAY THROUGH SEPTEMBER 1959

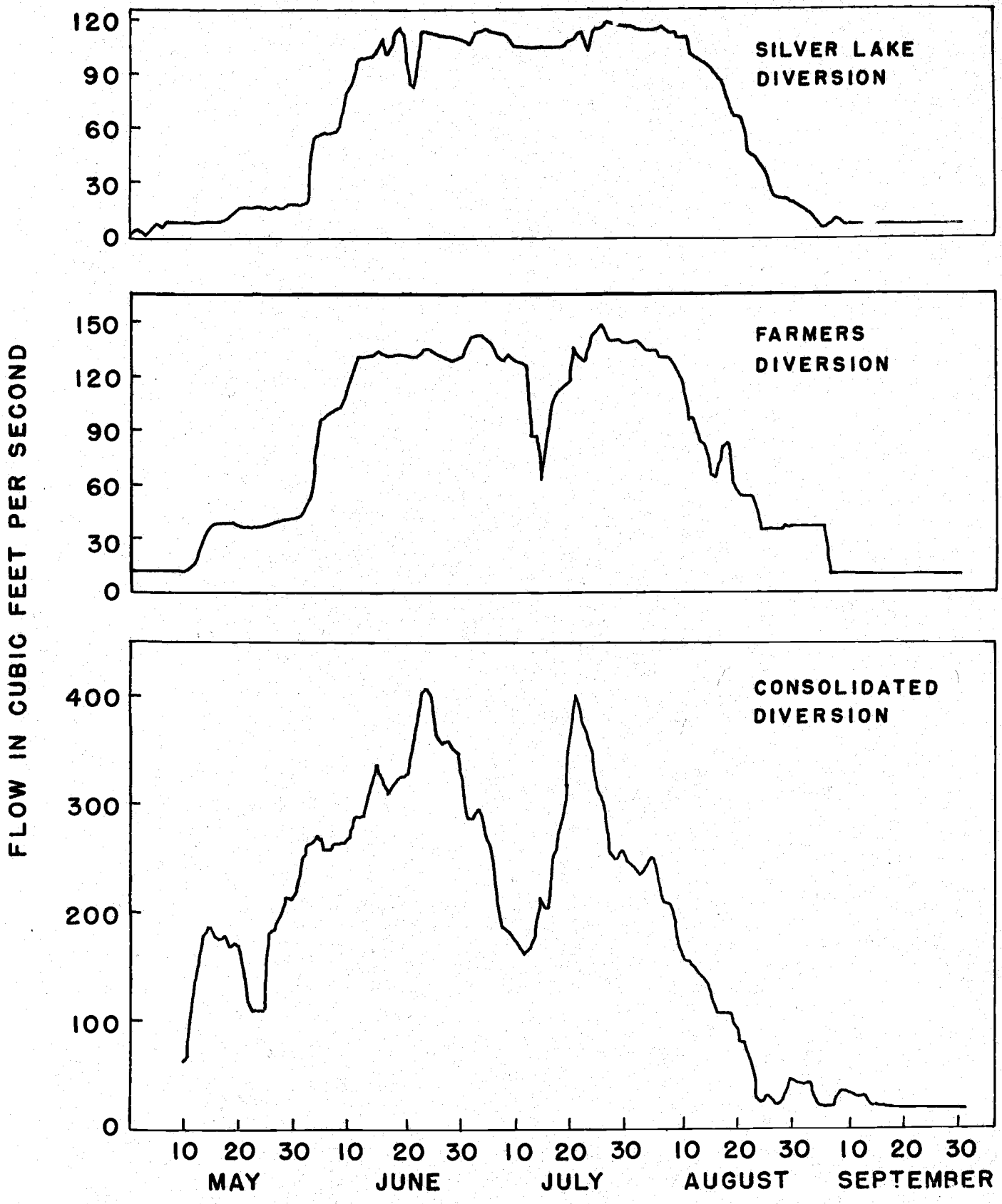


FIGURE 15. DAILY DISCHARGES IN CUBIC FEET PER SECOND FROM WALLOWA LAKE INTO CONSOLIDATED, FARMERS, AND SILVER LAKE DIVERSION DITCHES DURING THE IRRIGATION SEASON, MAY-SEPT. 1959

19 c.f.s. August 14, with other small channels not being estimated. Where the river is within one channel between "Market Road" and Hurricane Creek Road, the volume of water was estimated to be 56 c.f.s. on August 21.

Irrigation Diversions in the Study Area

Although the Oregon Game Commission maintains 45 rotary by-pass screens in the Wallowa Valley, there are 25 unscreened irrigation diversions between the lake outlet and Rock Creek. There are listed in Table 2 in the order in which they would be encountered by downstream migrants; and are also shown in Figures 7, 8, and 9 in the same order. Named diversions, e.g., Silver Lake Ditch, appear on the map so designated.

The Game Commission is interested in screening 21 of the unscreened diversions. Those that cannot be constricted to a width of 8 feet or less and still allow for an adequate volume of water to pass down the ditch will have to be screened by the parties that are responsible. The four largest and most serious ditches, i.e., the Silver Lake Ditch, Farmers Ditch, Consolidated Ditch, and the Cross Valley Canal could not be successfully constricted to an 8 foot width.

The Silver Lake Ditch originates at the dam (Figure 16). The water discharges into a wooden flume 10 feet wide and 42 inches deep.

Water enters the Farmers Ditch 200 yards below the dam (Figure 17). The head of this ditch consists of a wooden flume 12 feet wide and 42 inches deep.

The Consolidated Ditch (Figure 18) originates 1.5 miles below the dam and consists of one large 30-foot channel for a distance of 200 yards below the intake. It then separates into the Big Bend and Granger Ditches. This ditch could either be screened in the main channel or in the 2 branches.

The Cross Valley Canal (Figure 19) originates 1 mile east of Lostine. It is 14.5 feet wide at the intake and is located below many screened ditches. Because of its location, this ditch may nullify the fish-saving function of existing screens.

The Game Commission does not maintain rotary screens above Dorrance Lane in Joseph, as they do not feel this area is frequented by migrants. There are 8 unscreened diversions above Dorrance Lane, 5 of which are less than 8 feet in width. At the present time, the Oregon Game Commission is preparing a work schedule for a survey of the 25 unscreened ditches and a work program for constructing screens will be formulated from the survey results. All ditches found to be containing fish will probably be screened in the next 2 or 3 years.

Barriers in Study Area

Wallowa Lake Dam

The Wallowa Lake Dam (Figures 2 and 16) is approximately 36 feet high. At the base of the dam there are 6 openings for discharge of water from the lake. Three of the openings are not utilized. Of the three that are utilized, one opens to a maximum orifice diameter of 32 inches and empties into the Silver Lake Ditch while the middle two each open to 35 inches and empty into the Wallowa River. The height of the spillway crest is 26.8 feet measured from the sill of the outlet gates.

Table 2. List of Unscreened Diversions in Wallowa River System Between Wallowa Lake and Rock Creek as of the Summer of 1959.

	Name of Ditch	Width	Location
1.	Silver Lake Ditch	10 ft.	NE ¼ NW ¼, Sec. 5, T 3S, R 45E (Fig. 7)
2.	Farmers Ditch	12 ft.	SW ¼ SW ¼, Sec. 32, T 2S, R 45E (Fig. 7)
3.	Cove Ditch	4.5 ft.	SE ¼ SE ¼, Sec. 31, T 2S, R 45E (Fig. 7)
4.	Consolidated Ditch	30 ft.	SE ¼ SE ¼, Sec. 30, T 2S, R 45E (Fig. 7)
5.	Unnamed Ditch	6 ft.	SW ¼ SE ¼, Sec. 30, T 2S, R 45E (Fig. 7)
6.	Wilson Ditch	3.5 ft.	SW ¼ SE ¼, Sec. 30, T 2S, R 45E (Fig. 7)
7.	Miller Pond Ditch	3.5 ft.	SW ¼ SE ¼, Sec. 30, T 2S, R 45E (Fig. 7)
8.	Unnamed Ditch	3 ft.	SW ¼ SW ¼, Sec. 19, T 2S, R 45E (Fig. 7)
9.	Unnamed Ditch	6 ft.	SW ¼ NW ¼, Sec. 18, T 2S, R 45E (Fig. 7)
10.	Unnamed Ditch	3 ft.	SE ¼ SE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
11.	Unnamed Ditch	8 ft.	SE ¼ SE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
12.	Unnamed Ditch	10 ft.	SW ¼ NE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
13.	Unnamed Ditch	6 ft.	SE ¼ SE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
14.	Unnamed Ditch	6 ft.	NW ¼ SE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
15.	Unnamed Ditch	3 ft.	SW ¼ NE ¼, Sec. 12, T 2S, R 44E (Fig. 7)
16.	Unnamed Ditch	3 ft.	SE ¼ SE ¼, Sec. 2, T 2S, R 44E (Fig. 7)
17.	Unnamed Ditch	3.5 ft.	NE ¼ SW ¼, Sec. 33, T 1S, R 44E (Fig. 7)
18.	Cross Valley Canal	14.5 ft.	NE ¼ SW ¼, Sec. 11, T 1S, R 43E (Fig. 8)
19.	Unnamed Ditch	10 ft.	NW ¼ SE ¼, Sec. 3, T 1S, R 43E (Fig. 8)
20.	Unnamed Ditch	3 ft.	NW ¼ SE ¼, Sec. 3, T 1S, R 43E (Fig. 8)
21.	Unnamed Ditch	3 ft.	SE ¼ SE ¼, Sec. 21, T 1N, R 43E (Fig. 8)
22.	Unnamed Ditch	13 ft.	SW ¼ SE ¼, Sec. 21, T 1N, R 43E (Fig. 8)
23.	Unnamed Ditch	3 ft.	SW ¼ NE ¼, Sec. 19, T 1N, R 43E (Fig. 8)
24.	Unnamed Ditch	2 ft.	SE ¼ SW ¼, Sec. 13, T 1N, R 42E (Fig. 8)
25.	Unnamed Conduit	18 in.	SE ¼ NE ¼, Sec. 14, T 1N, R 42E (Fig. 9)

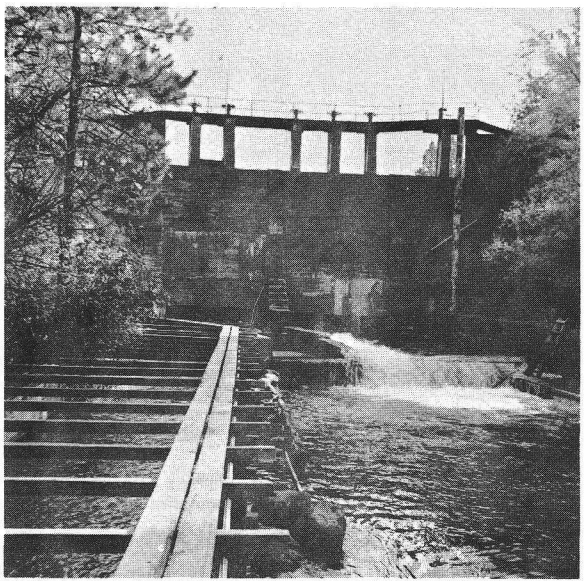


Figure 16. Silver Lake Ditch Flume on Left with Wallowa River on Right and Dam in Background. (Oct. 11, 1959)

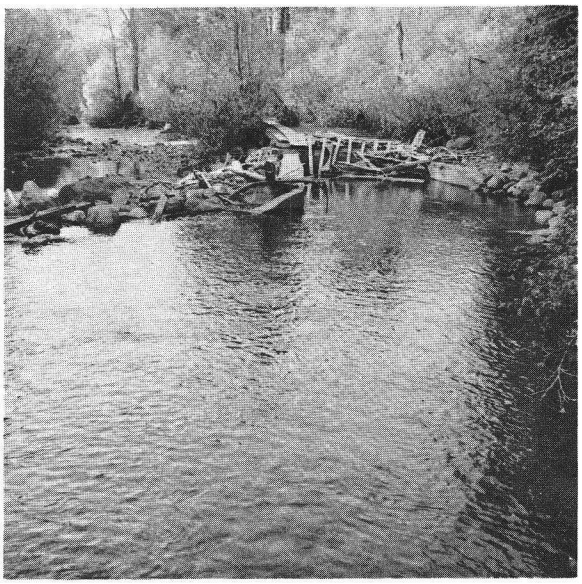


Figure 17. Farmers Ditch Intake on Right and Wallowa River on Left. (Oct. 19, 1959)

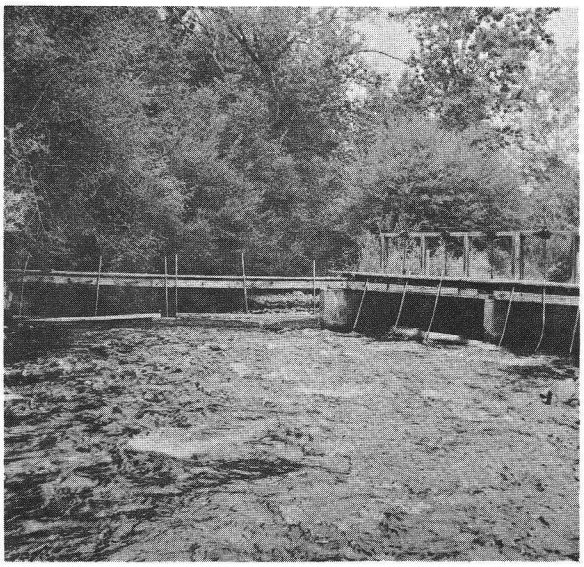


Figure 18. Wallowa River in Foreground Entering Consolidated Ditch on Right Side of Photograph. (Almost the entire stream flow was being diverted into the ditch when this picture was taken on August 17, 1959).

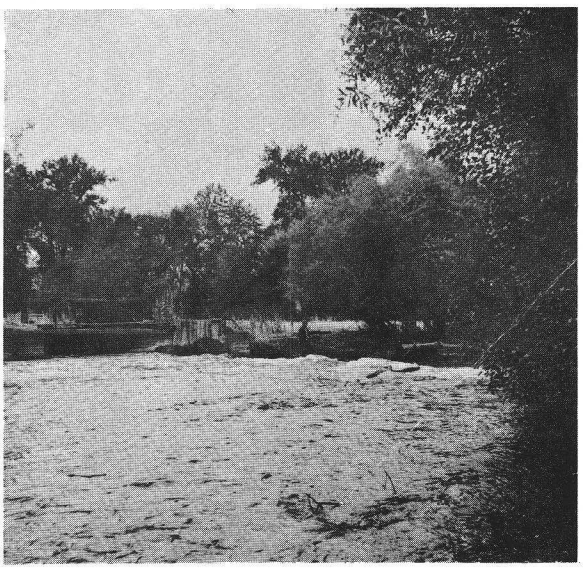


Figure 19. Cross Valley Canal near Lostine, Oregon. Canal Intake Can be Seen on Left. (Oct. 19, 1959).

It is believed downstream migrant bluebacks would move out of the lake in April and May and the adults would attempt to migrate into the lake in July and August. These movements correspond closely with the irrigation season, May through September.

Downstream migrants would have to leave the lake either through the submerged orifices or over the spillway. Fish that were caught in the Silver Lake and Farmers Ditches during May, June, and August of 1959 usually were alive and did not show any obvious indication of external abnormalities due to passage through the submerged orifices. Fish mortality or injury due to passing over the dam spillway is not known.

Consolidated Ditch Dam

The Consolidated Ditch dam consists of removable 2-inch x 12-inch boards and is a barrier during low flow periods especially in August and early September. Water in the river below this dam results from leakage between the 2-inch x 12-inch boards and from seepage from the Consolidated Ditch which parallels the river for 200 yards. The low flow immediately below the dam also represents a barrier to upstream migration.

Low Flow Area and Possible Pollution
Below Miller Pond Ditch Dam

Upstream migrants would be stopped by a dewatered area of approximately 0.25 to 0.5 mile below the Miller Pond Ditch Dam (Figure 20) during low flow periods of the Wallowa River. This is the area where the storage release offer by the Associated Ditch Company would be most beneficial. Some water returns to the river 100 yards downstream from the Miller Pond Ditch intake after flowing into the Mount Emily Lumber Company (Joseph) log pond (Figure 21). The return flow is purplish in color and supports an unidentified aquatic growth of slime on the river bed for a distance of 0.25 mile downriver. It is reported by residents that Eastern brook trout are caught in this area during high water, but a pollution investigation should be made at low water levels.

Log and Debris Jams

A log jam 300 yards below the Miller Pond Ditch dam is a barrier to migrating adults during low flow months. This is the largest log and debris jam found in the Wallowa River from the dam to Rock Creek below the town of Wallowa. Water is backed up a short distance before filtering through the debris of this barrier.

There are two possible log and debris jams that would impede migrating adults at low water flows in the area 0.25 to 0.5 mile south of "Market Road". Trees and logs in and over the river as a result of a logging operation present a possible source for future barriers.

WATER RIGHTS IN STUDY AREA

The first water right was obtained in 1880 by the Mitchell Ditch Company which provided flows for irrigating farm lands. The first major diversion right was that of the Joseph Light and Power Company and Joseph Milling Company obtained in 1882 for a total of 50 c.f.s. Today the water rights are over-appropriated and consequently could completely deplete (even more than at present) the river of its flow if exercised to the full extent during most periods of the irrigation season.

Figure 20. Wallowa River Below the Miller Pond Ditch Dam on August 17, 1959. At Left is Miller Pond Ditch Wooden Flume.

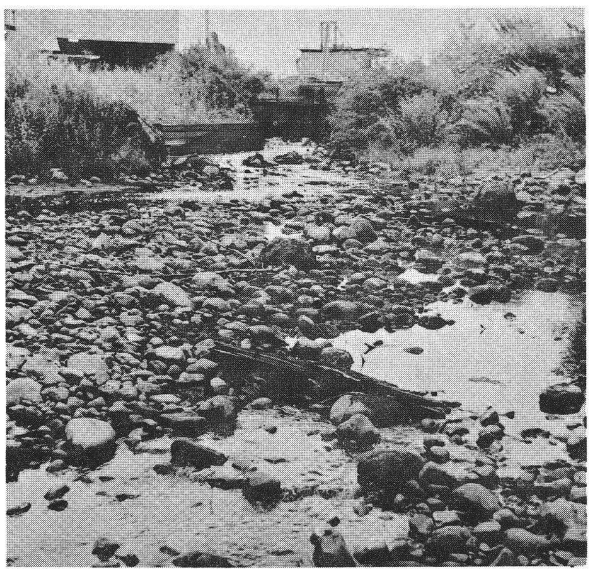


Figure 21. Water Returning to the Wallowa River in Foreground from the Mt. Emily Lumber Company Log Pond in Background. (Picture taken August 17, 1959).

Wallowa River Rights from the dam to Hurricane Creek

The irrigation companies and private individuals are limited to prescribed amounts of water from May 1 to October 1. They are not to exceed 1.5 acre-feet for each acre of land actually irrigated during any period of 30 days 1/ during the irrigation season prior to July 31 of each year; and thereafter not to exceed 1 acre-foot per acre during the entire remainder of the irrigation season (August 1 to October 1).

Table 3 lists the water rights of users from the dam to Hurricane Creek, below the town of Enterprise.

Table 3. The Wallowa River Water Rights of Companies and Individuals from the Wallowa Lake Dam to Hurricane Creek.

Name of Company or or Individual(s)	Amount 2/	Use and Location
Dobbin Ditch Co. and Assignees Silver Lake Ditch Co., Big Bend Water Ditch Co., McCubbin-Craig Ditch Co., Wrenn & Dobbin Ditch Co., Farmers Ditch Co., & Creighton Ditch Co. of Joseph, Oregon.	44,000 (as divided below)	Irrigation, domestic, and supplemental irrigation under Permit 2696, Certificate 9311, Location-T. 3S, R. 45E. Eagle Cap Reservoir, now Wallowa Lake Reservoir.
Priority Date--1/9/15		
Permit No. R-347		
	8,018	Dobbin
	401	McCubbin-Craig
	1,503	Creighton
	6,014	Wrenn & Dobbin
	10,023	Silver Lake
	10,023	Farmers
	8,018	Big Bend
	44,000	
Dobbin Ditch Co. & Assignees (same 6 as above in first item)	118	Eagle Cap Reservoir in Wallowa Lake, to be constructed under Permit #R-347. Water from this reservoir will be used from Wallowa River and will be used by the Dobbin Ditch Co. & other Ditch Companies, being within the NW ¼ NW ¼ of Sec. 9 (?), T 3S, R 45E For irrigation of 14,539 acres.
Priority Date--7/20/15		
Permit No. 2696		

1/ This amount of water could be .023 c.f.s./acre for 30 days or 0.7 c.f.s./acre for 1 day of each month during irrigation season prior to July 31.

Table 3. (continued)

Name of Company or Individual(s)	Amount	Use or Location
Wrenn-Dobbin Ditch Co. & Dobbin Ditch Co. (Joseph, Oregon) November 20, 1919	3.21	Wallowa River and Eagle Cap Reservoir. SE ¼ NE ¼ Sec. 31, T 2S, R 45E. Supplemental irrigation of 137 acres.
H. H. Nottingham	0.06	SW ¼ SW ¼, Sec. 1, T 2S, R 44E, from Wallowa River, diverted through city ditch. Irrigation of 5 acres.
A. E. Clawson	0.06	SW ¼ SW ¼, Sec. 1, T 2S, R 44E, From Wallowa River through city of Enterprise ditch. Supplemental irrigation of 5 acres.
S. D. Cox	0.10	SW ¼ NW ¼, Sec. 1, T 2S, R 44E, From Wallowa River. Irrigation of 8 acres.
B. T. Long	0.25	NE ¼ NE ¼, Sec. 31, T 2S, R 45E. identical with point of diversion of Granger Ditch. From Wallowa River. Irrigation of 21 acres.
T. W. & H. L. Fleming	0.3	NE ¼ NE ¼, Sec. 24, T 2S, R 44E from Wallowa River. Irrigation of 24 acres.
J. P. Mullen	0.14	SW ¼ SE ¼, Sec. 30, T 2S, R 45E From Wallowa River. Irrigation of 5 acres.
Joe Shinn	0.4	SW ¼ NW ¼, Sec. 19, T 2S, R 45E From Wallowa River. Irrigation of 33 acres.
Alder Slope Ditch Co.	16.2	SE ¼ NE ¼, Sec. 24, T 2S, R 44E From Wallowa River, Supplemental irrigation of 1,293.5 acres.
Abijah Fairchild & Ed E. Rogers	0.36	NE ¼ and NW ¼, Sec. 12, T 2S, R 44E, From Wallowa River. Irrigation of 28.5 acres.
A. B. Conway and H. A. Seabrook	0.05	NE ¼ SE ¼, Sec. 2, T 2S, R 44E From Wallowa River, irrigation of 3.5 acres.

Table 3. (continued)

Name of Company or Individual(s)	Amount	Use and Location
John Bookout	0.75	N ½, Sec. 24, T 2S, R 44E. From Scotch Creek, Hurricane Creek, and Wallowa River (the points of diversion are as shown in Permits Nos. 6723-6724 in the name of Alder Slope Ditch Co.). Irrigation and supplemental irrigation of 60 acres.
State Land Board	0.37	SE ¼ NE ¼, Sec. 24, T 2S, R 44E From Wallowa River, irrigation of 30 acres.
J. H. Hartshorn	0.03	NE ¼ & NW ¼, Sec. 2, T 2S, R 44E From Wallowa River. Irrigation of 2 acres.
Sam Litch	0.02	N ½ of Lot 3, Sec. 2, T 2S, R 44E From Wallowa River, irrigation of 1.67 acres.
Pacific Power & Light Co. 10/1/29	60	950 ft. S. and 1,520 ft. E. from the NW Corner of Sec. 5, T 38, R 45E, W.M., Being a point in the dam heretofore constructed at said location at the outlet of Wallowa Lake, being within the NE NW(Lot 4), Sec. 5, T 3S, R 45E. From Wallowa River for power (1247.7 HP) (Power Claim #5)
Henry C. & Susanne Hansen	1.24	NW ¼ NW ¼, Sec. 5, T 3S, R 45E Wallowa River. Domestic and irrigation of 95 acres.
W. H. Andres	0.18	SW ¼ SW ¼, Sec. 1, & SE ¼ SE ¼, Sec. 2, T 2S, R 44E. Wallowa River. Irrigation of 14 acres.
A. A. Goebel	0.01	SE ¼ SE ¼, Sec. 2, T 2S, R 44E, Wallowa River. Irrigation of 3/4 acre.
A. O. Hulse, Chester Sasser, Everatt Stubblefield, Sam Wade, James Hackbarth	0.08	NE ¼ SE ¼, Sec. 2, T 2S, R 44E, Wallowa River. Irrigation of 6.13 acres.
K. S. Francis	0.6	SE ¼ SE ¼, Sec 12, T 2S, R 44E Wallowa River. Irrigation of 30 acres.

Table 3. (continued)

Name of Company or Individual(s)	Amount	Use and Location
J. P. Mullen	0.1	SW ¼ SE ¼, Sec. 30, T 2S, R 45E From Wallowa River, Irrigation of 8.57 acres.
J. A. Eggleson	0.27	NE ¼ NE ¼, Sec. 24, T 2S, R 44E From Wallowa River, Irrigation of 22 acres.
B. W. Hamilton	0.02	NE ¼ NW ¼, Sec. 2, T 2S, R 44E From Wallowa River, irrigation of 1 acre.
L. E. Jordan and H. A. Gritton	0.12	NE ¼ NE ¼, Sec. 2, T 2S, R 44E Wallowa River. Irrigation of 5 acres.
Harold A. Wade	1.375	NE ¼, Sec. 24, T 2S, R 44E, 0.688 c.f.s. from Hurricane Creek, 0.60 c.f.s. from Wallowa River, 0.087 c.f.s. from Springs.
Mrs. Anna McCormack	0.475	NE ¼ NE ¼, Sec. 24, T 2S, R 44E, Wallowa River. Irrigation of 19 acres.
W. C. Eads	0.53	SE ¼ NE ¼, Sec. 24, T 2S, R 44E. Wallowa River. Irrigation of 21 acres.
Ralph Makin	1.00	SE ¼ SE ¼, Sec. 2, T 2S, R 44E., Wallowa River. Irrigation of 40 acres.
Eugene Marr	0.03	SW ¼ NW ¼, Sec. 1, T 2S, R 44E Wallowa River. Irrigation of 1.1 acres.
M. M. Miller	2.0	SW ¼, SE ¼, Sec. 30, T 2S, R 45E Wallowa River, Log Pond.
Adna W. Haggerty and Matilda Haggerty	0.03	NE ¼ NE ¼, Sec. 24, T 2S, R 44E Wallowa River. Irrigation of 2 acres.
East Oregon Lumber Company Enterprise, Oregon. 9/11/15	6.00	Sec. 2, T 2S, R 44E. A branch of Wallowa River. Manufacturing.
R. D. McClallen and Roy E. Williams	.05	NE ¼ SW ¼, Sec. 2 T 2S, R 44E Spring Creek, Tributary of Wallowa River. Irrigation of 3 acres.

Table 3. (continued)

Name of Company or Individual(s)	Amount	Use and Location
W. F. Craig, Asa Craig, and Mrs. L. P. McCubbin	1.00	SE ¼ SE ¼, Sec. 12, T 2S, R 44E 0.5 c.f.s. from a spring branch, Wallowa River, 0.5 c.f.s. from a branch of Wallowa River. Irrigation of 80 acres.
Max Wilson	.1	NE ¼ NW ¼, Sec. 32, T 2S, R 45E Unnamed stream carrying seepage and waste water from Farmers Water Ditch and Silver Lake Ditch, Tributary of Wallowa River. Irrigation of 3 5/12 acres.
Ed E. Thomas and Claude Reavis	0.125	SE ¼ NE ¼, Sec. 2, T 2S, R 44E Small branch of Wallowa River. Irrigation of 5 acres.
Clara M. Burdett	0.475	Sec. 19, T 2S, R 45E, for irrigation of 35 acres.
C. R. Burdett	0.3	25' & 450' E. W ¼ cor. of Sec. 18, T 2S, R 45E. Irrigation of 11.3 acres.
S. W. Shinn	0.55	SE ¼ NW ¼, Sec. 2, T 2S, R 44E

2/ All quantities are in c.f.s. except for the storage quantity of 44,000 acre-feet.

The water rights for the major diversions (Silver Lake, Farmers, Cove, Consolidated, Wilson, and Miller Pond Ditches) in the vicinity of Joseph, exceed 465 c.f.s. The 60 c.f.s. water right of the Pacific Power and Light Company, now not used, would increase the total to 525 c.f.s. It is thought that the Pacific Power and Light Company water rights will not be sold immediately.

The water rights for all the diversions between the dam and Hurricane Creek exceed 535 c.f.s. The water rights for the diversions north of Joseph to Hurricane Creek amount to approximately 35 c.f.s. while the remaining 500 c.f.s. is diverted from the stream in the short distance between the dam and Joseph.

TRAPPING DOWNSTREAM MIGRANTS

Two fish traps were placed in irrigation ditches. The flumes of Silver Lake and Farmers Ditches were chosen for sampling locations. Trapping was done primarily to determine the species of fish migrating from the lake and being diverted into the ditches. The study was of such short duration that only a

small part of the potential downstream migration period was sampled.

Description and Function of Fish Traps

The fish trap consisted of 3 components. These were trap box, apron, and wing (Figures 22, 23, and 24). The trap box was 4-sided and had a 6-inch "throat" for fish entrance (Figure 24). Three sides were made of plywood and the end of hardware cloth. One side of the trap was fastened to the flume side and had an overall length of 2 feet and height of 42 inches. The downchannel end of the trap box was 1 foot wide and was made of 1/4-inch hardware cloth for water passage. The two remaining sides of the trap box were angled to form a 6-inch entrance. Guillotine boards could be placed in the "throat" to adjust for fluctuating water levels and prevent fish from swimming under the apron.

The apron was 3 feet wide at the entrance and 6 inches wide at the throat and by-passed water through 1/4-inch hardware cloth. The apron could be raised or lowered at the throat of the trap box as the water level increased or decreased. The apron directed the fish up from the bottom of the flume and into the trap box.

The wing was 42 inches high and over 6 feet long. The hardware cloth by-passed water through 1/2-inch and 1/4-inch mesh and directed fish into the trap box. The wing attached to the "throat" of the trap box and extended 3 feet out into the channel at the trap entrance. The ditches were approximately 11 feet wide in the areas where the traps were installed.

Fish entered the 3-foot-wide opening, swam with the current through the "throat", and dropped into the trap box. A small piece of hardware cloth extended from the apron into the trap box and prevented fish from jumping up on the apron then out of the trap.

One hundred fingerling rainbow trout (Salmo gairdnerii) were released June 15 into each of the Silver Lake and Farmers Ditches above the traps to test trapping efficiency. Fourteen fish were caught in the Silver Lake Ditch trap and none in the Farmers Ditch trap. 1/ It was found necessary to move the Silver Lake ditch trap on June 17 to a new location in another section of the flume due to the increased water velocity.

Fish Catch

The traps were placed in the flumes May 25 and removed August 31. A total of 244 fish were captured during this period. The combined catches for both traps are listed in Table 4.

Eighty-four per cent of the game fish were caught in May and June. Data in Figure 25 show that the 115 mm. (4.5 inches) length was the mode for the mackinaw trout. The length-frequency distribution of 22 rainbow trout is presented in Figure 25.

The mackinaw trout undoubtedly were a result of Game Commission plantings in the lake to control the populations of whitefish, suckers and dace. Some mackinaw trout have been trapped at screened diversions near Enterprise, 6 miles below the dam.

1/ Subsequent modification of the apron height at the throat of the trap improved flow conditions and is believed to have increased the efficiency.

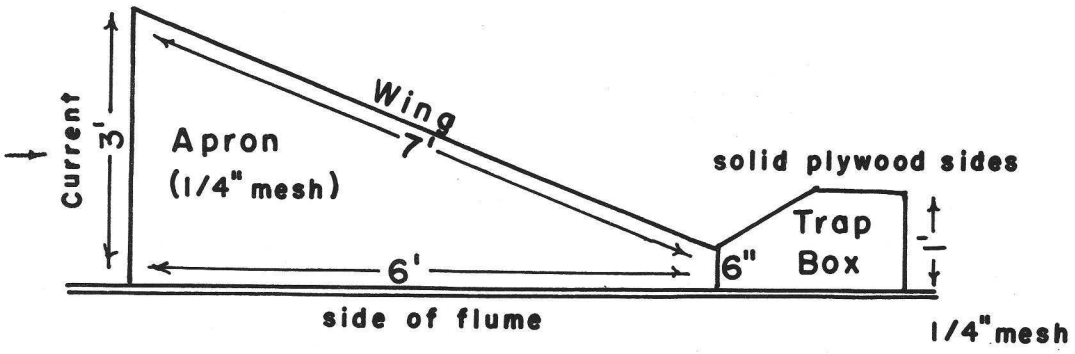
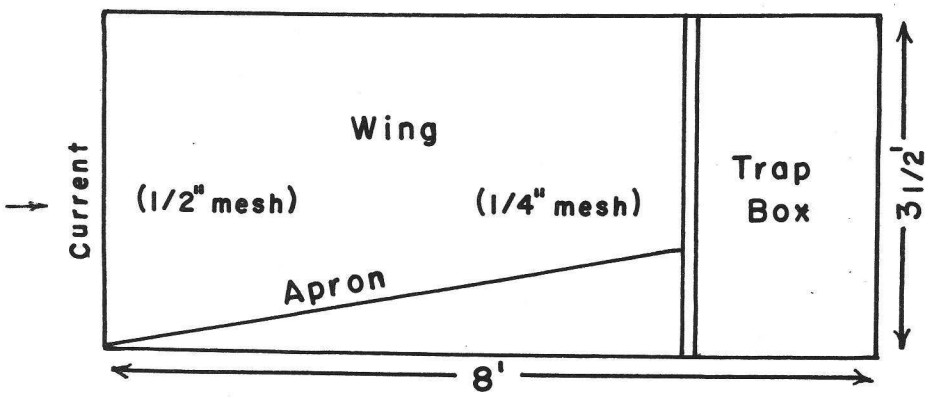


FIGURE 22. TOP VIEW OF TRAP SHOWING TRAP BOX, APRON AND WING

0 1 2
FEET



0 1 2
FEET

FIGURE 23. SIDE VIEW OF TRAP SHOWING WING, TRAP BOX, AND APRON

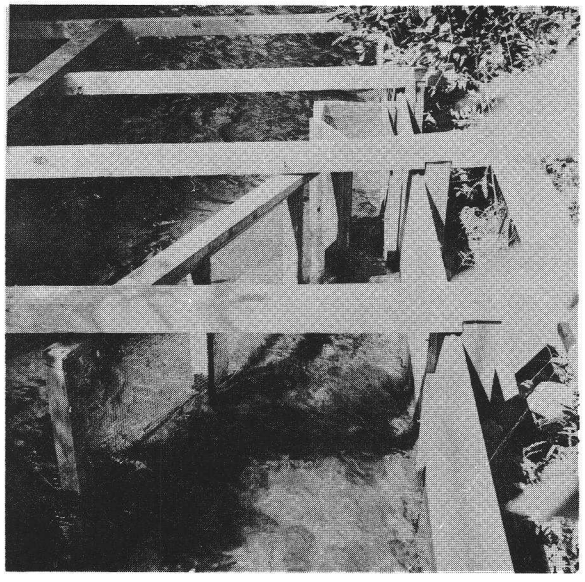


FIGURE 24. TRAP IN FARMERS DITCH FLUME

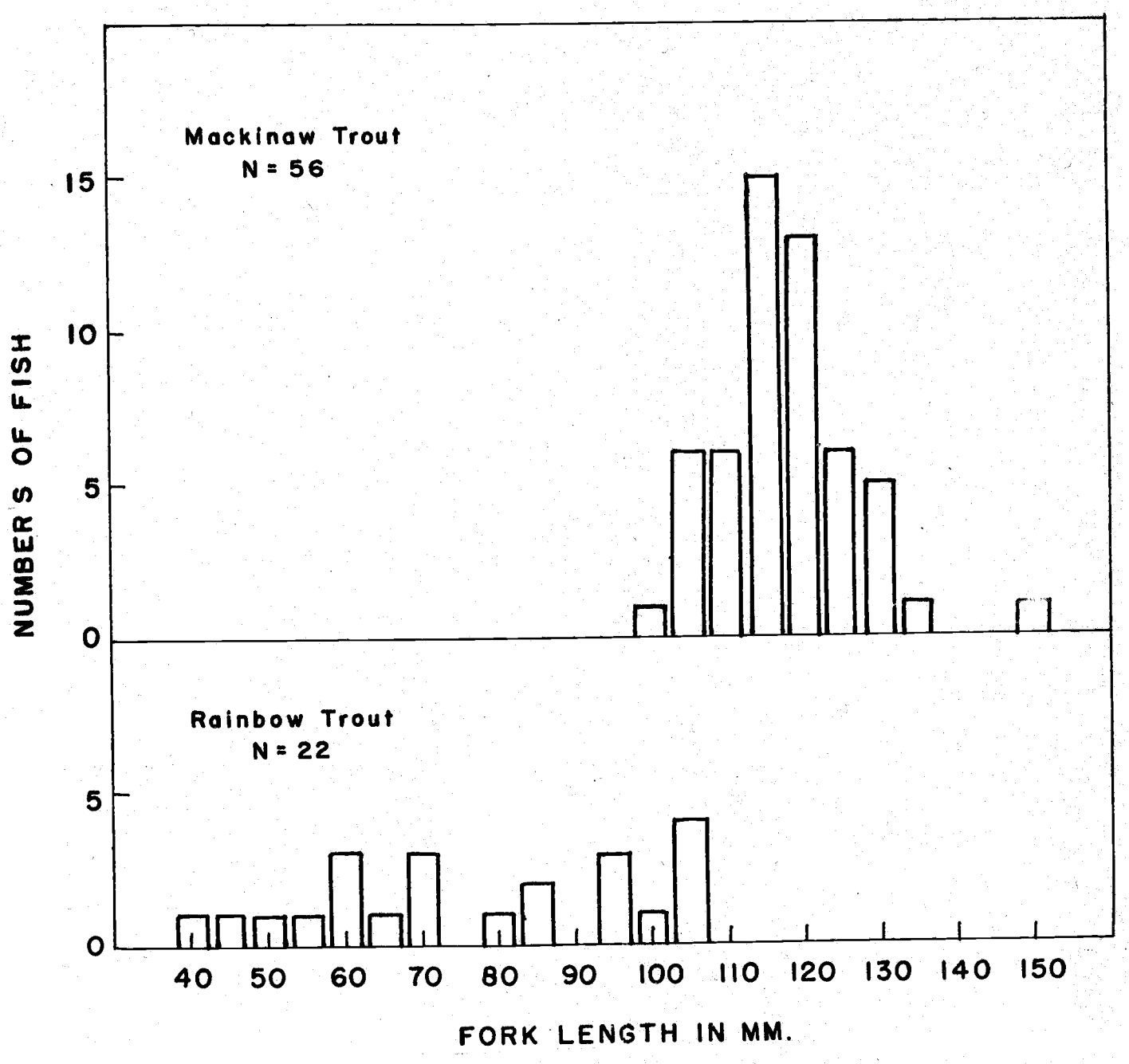


FIGURE 25. LENGTH-FREQUENCY DISTRIBUTION OF MACKINAW AND RAINBOW TROUT TRAPPED IN FARMERS AND SILVER LAKE DITCHES, MAY - AUGUST 1959

Table 4. The Combined Catches for the Silver Lake and Farmers Ditch Traps from May 25 to August 31, 1959.

Name of Fish	Numbers of Fish	Mean Fork Length (mm.)	Size Range (mm.)
Mackinaw Trout (Cristivomer namaycush)	56	117.5	99-149
Rainbow Trout (Salmo gairdneri)	23	83.2	41-172
Kokanee (Oncorhynchus nerka kennerlyi)	1	211.0	
Speckled Dace (Apocope oscula carringtoni)	67	75.5	41-128
Columbia River Coarse-scaled Sucker (Catostomus macrocheilus)	55	128.5	48-179
Rocky Mountain Bullhead (Cottus punctulatus)	27	80.3	49-126
Black-Sided Dace (Apocope oscula nubila)	13	65.1	38-87
Oregon Whitefish (Prosopium oregonium)	1	178.0	
Smooth Bullhead (Cottus beldingii)	1	52.0	

There are rainbow trout in the Silver Lake and Farmers ditches. The catch of this species, therefore, is a reflection of both lake, ditch, and Wallowa River populations.

One dead kokanee was caught on July 10 and was the only fish of this species caught during the trapping period. Information on kokanee migration from the lake is believed best obtained by operating the traps in April and May.

FEASIBILITY OF REESTABLISHING BLUEBACK SALMON IN WALLOWA LAKE

The feasibility of reestablishing blueback salmon in Wallowa Lake has been considered with respect to the data collected. It appears that such a project is feasible, providing the following conditions can be met:

1. A suitable donor stock.
2. Screen all irrigation diversions not now screened.
3. Provide additional summer flow in the Wallowa River from the Consolidated ditch downstream to a point about 2 miles below the city of Joseph.
4. Ladder diversion dams where necessary.
5. Maintain an egg-taking station in the river below the lake. Maintain an egg-incubation station at some suitable site in the watershed.

Each of the conditions will be discussed separately.

Successful Donor Stock

The original stock of Wallowa Lake blueback salmon was completely destroyed many years ago. Hence an outside source of blueback salmon must be obtained. The only important source at this time is from the Leavenworth Hatchery (Bureau of Sport Fisheries and Wildlife) in Central Washington. It is not known at this time, of course, whether their fish would adapt to Wallowa Lake. This information can only be obtained empirically. However, this same stock has been successfully used at Suttle Lake (Metolius River) in Central Oregon. In four years of lake-rearing studies at Suttle Lake, the survival of marked fingerlings for 7 months of residence varied between 7 and 39 per cent.

Screen Diversion Ditches

The historical evidence collected clearly indicates that irrigation diversions were one of the primary causes for the decline in abundance of blueback salmon in the Wallowa River. There are, at present, 25 unscreened diversions ranging from 2 to 30 feet in width on the Wallowa River between the lake outlet and Rock Creek. Twenty-one of these are apparently eligible for screening under the Columbia River Fisheries Development Program. The remaining four (Silver Lake, Farmers, Consolidated, and Cross Valley ditches) are too large. These range from 10 to 30 feet in width and are formidable obstacles to the juvenile blueback salmon moving downstream to the sea. It is mechanically feasible to successfully screen these ditches. The problem lies in determining who will finance the projects.

Augment Summer Stream Flows

The Wallowa River is nearly dry in certain critical areas during the summer when adult blueback salmon must ascend the stream. A source of additional flow must be found to provide upstream passage for adults enroute to the lake outlet. One potential source of such flow would be the 15 c.f.s. allocated to the Pacific Power and Light Company for their now-inoperative Joseph generating plant. However, safeguards would have to be established to ensure that this flow would not be usurped by present diversions. Reliable flow records have been compiled by the USGS (1958) and annual reports have been published for each water year.

Ladder Diversion Dams

Certain diversion dams would be partial or complete barriers to upstream-migrating adult blueback salmon. Ladders would have to be installed to facilitate passage.

Egg-Taking and Incubation

The original spawning grounds for Wallowa Lake blueback salmon have been drastically reduced from their original size. Furthermore, the little area remaining is utilized by kokanee which support a sport fishery in Wallowa Lake. It does not seem reasonable to believe that the angler will view with kindness the introduction of a competing species on the limited spawning grounds available to kokanee. Hence, the reproduction of returning blueback salmon will probably have to be conducted below the Wallowa Lake Dam. That is, the eggs will be taken there, fertilized, and incubated either at the lake outlet or at some suitable site farther downstream. The lake would be utilized for rearing the juvenile blueback prior to emigration.

Summary

In summary, there are, indeed, some serious problems to be solved if blueback salmon are to be successfully reestablished in Wallowa Lake. However, none of the problems appear to be insurmountable and the project appears to be feasible. A careful, well-planned study program is essential, though, to the success of the project.

RECOMMENDED PROGRAM

The recommended program would consist of three phases. First, a study to determine whether juvenile blueback salmon transplanted as fry or fingerlings from Leavenworth Hatchery will rear successfully in Wallowa Lake and emigrate satisfactorily therefrom. Second, determine whether sufficient numbers of the migrants return as adults to the Wallowa River (not necessarily as far upstream as the lake outlet). Third, if phases 1 and 2 prove successful, then a program of watershed rehabilitation should be launched to maximize the production of blueback salmon in the Wallowa River system with due regard for competing water-use by agriculture and the kokanee sport fishery.

The preliminary studies (phase 1 and 2) would take 4 to 6 years to complete. The details for procedure would be developed at a later date.

LITERATURE CITED

Hodges, John I.

1955. Wallowa Lake survey. Fish Comm. Oreg., Dittoed report, 4 pp.

Mattson, C. R.

1957. Preliminary report, Wallowa Lake blueback salmon rehabilitation project. Fish Comm. Oreg., Dittoed report, 9 pp.

McGuire, H. D.

1896. Third and fourth annual reports of the State Fish and Game Protector of the State of Oregon. 130 pp.

Pulford, Earl F.

1955. Wallowa River survey. Fish Comm. Oreg. Typed report, 8 pp.

Reed, F. C., E. P. Thompson, and R. C. Campbell

1890. Fourth annual report of the State Board of Fish Commissioners for 1890. 57 pp.

Thompson, R. N.

1958. Preliminary report No. 2, Wallowa Lake blueback salmon rehabilitation project. Fish Comm. Oreg., Dittoed report, 14 pp.

Van Dusen, H. G.

1905. Annual reports of the Department of Fisheries of the State of Oregon for the years 1903 and 1904. 197 pp.

U. S. Geological Survey

1958. Compilation of records of surface waters of the United States through September 1950, Part 13, Snake River Basin. U. S. Geol. Surv. Water Supply Paper 1317, 566 pp.

U. S. Geological Survey

1956. Surface water supply of the United States 1956, Part 13, Snake River Basin. U. S. Geol. Surv. Water Supply Paper 1447, 261 pp.

APPENDIX B

SUMMARY LISTS OF OBSTRUCTIONS AND DIVERSIONS

Summary lists of obstructions and diversions have been prepared for each river system in the Eastern Oregon area and are contained in Tables I-X.

LIST OF APPENDIX B TABLES

Table I. A Summary List of Obstructions and Unscreened Diversions on the Umatilla River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Umatilla R.	6-3-59	Area of low flow (U-12) in irrigation season	-	Lower river--below Echo	None
" "	3-21-58	Brownell Dam (U-1) low flow obstruction	-	1.5 mi. above mouth	None
" "	7-29-59	Brownell Diversion (U-14) unscreened 20 c.f.s.	-	1.5 mi. above mouth	Investigate for screening.
" "	3-21-59	Three-Mile Dam (U-2) poor access to fishway	10-20 ft. high, 450 ft. wide	3 mi. above mouth	Improve access to fishway.
" "	7-29-59	West Extension Diversion (U-15) unscreened 150 c.f.s.	-	3 mi. above mouth	Investigate for screening.
" "	3-21-58	P. P. & L. Co. Dam (U-3) poor access to fishway	10 ft. high, 300 ft. wide	Near Hermiston	Improve fish passage or remove dam.
" "	3-21-58	Maxwell Dam (U-4) low flow obstruction	Height variable 200 ft. wide	Just above Butter Cr.	None
" "	3-21-58	Maxwell Diversion (U-16) unscreened--can take over 100 c.f.s.	-	Just above Butter Cr.	Investigate for screening.
" "	7-29-59	Dillon Dam (U-5) low flow obstruction	Height variable	2 mi. below Echo	None
" "	3-21-58	Westland Canal Dam (U-6) low flow obstruction	Height variable 450 ft. wide	0.5 mi. above Echo	None

Table I. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Umatilla R.	3-21-58	Cold Springs Dam (U-7) intermediate and low flow obstruction	4-5 ft. high in 2 steps, 450 ft. wide	2 mi. above Echo	Provide fish passage.
" "	7-28-59	Wilson Diversion (U-17) unscreened--50 c.f.s.	-	0.25 mi. above Cold Springs Dam	Investigate for screening.
" "	3-21-58	Stanfield Dam (U-8) low flow obstruction	Height variable	1 mi. below Nolin	None
" "	7-28-59	Cunningham Pump (U-18) unscreened -- 8 c.f.s.	-	0.5 mi. above Nolin	Investigate for screening
" "	7-28-59	Brown Dairy Diversion (U-19) unscreened 5 c.f.s.	-	2 mi. below Reith	Investigate for screening.
" "	7-28-59	State Hospital Dam (U-9) low flow obstruction	Height variable	0.5 mi. above Birch Creek	None
" "	7-28-59	State Hospital #2 Diversion (U-20) unscreened 5 c.f.s.	-	0.5 mi. above Birch Creek	Investigate for screening.
" "	7-28-59	Ukiah Lumber Co. Diversion (U-21) unscreened 5 c.f.s.	-	1 mi. above Reith	Investigate for screening.
" "	7-28-59	Wide, level channel and possible low flow obstruction (U-13)	-	Pendleton	None
" "	7-28-59	State Hospital #1 Diversion (U-22) unscreened 5 c.f.s.	-	Pendleton	Investigate for screening.

Table I. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Umatilla R.	8-12-59	Unnamed check dam (U-10) low flow obstruction	3 ft. high, 60 ft. wide	Pendleton	None
" "	8-12-59	Crispin Diversion (U-23) unscreened--8 c.f.s.	-	2 mi. above Pendleton	Investigate for screening.
" "	8-12-59	Crispin Dam (U-11) low flow obstruction	4 ft. high	2 mi. above Pendleton	None
" "	8-12-59	Canyon Ranch Diversion (U-24) unscreened 2 c.f.s.	-	1 mi. below Bingham Springs	Investigate for screening.
" "	8-12-59	Unnamed diversion (U-25) unscreened 5 c.f.s.	-	0.5 mi. above Bingham Springs	Investigate for screening.
Pearson Cr.	10-24-58	2 small and 1 medium sized debris jams (U-P-1)	-	4 to 5 mi. above mouth	Remove

Table II. A Summary List of Obstructions and Unscreened Diversions on the Main Stem and North and South Forks of the Walla Walla River.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Walla Walla R.	-	2 unscreened ditches (WW-1), reports indicate 2 unscreened and 6 screened diversions in Washington	3 c.f.s. and 14 c.f.s.	Buckley ditch SW ¼ of Sec. 28, T 7 N, R 34 E. Garden City ditch W ½ of NW ¼ of Sec. 35, T 7 N, R 34 E.	Investigate for diversion of fish, screen if necessary.
" "	7-30-59	9 unscreened ditches in Oregon (WW-2)	On 7-30-59, 7 of ditches had following flows 40, 25, 6, 5, 5, and 0.5 c.f.s.	Hudson Bay Dam at Milton-Freewater Confluence of North and South Forks	Investigate for diversion of fish, screen if necessary.
" "	1958 1/	Burlingame Diversion Dam (WW-3), adequate fishway present	-	1 mi. below mouth of Yellowhawk Cr.	None
" "	1957 1958 1959	Area of intermittent flow (WW-4)	2.5 mi. in length	Immediately 2.5 mi. below city of Milton-Freewater	Construction of impervious low flow channel with possible supplementing of water supply by tapping underground reserves or development of upstream storage.
" "	1957 1958 1959	Hudson Bay Dam (WW-5) low water block to steelhead	Height, 4 ft.	Downstream city limits of Milton area of Milton-Freewater	Construct fishway.

Table II. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Walla Walla R.	1957 1958 1959	Little Walla Walla Irrigation Co. Dam (WW-6) low water block to steelhead	Height, 4.5 ft. (varies with water stage and stop-board use)	0.25 mi. above Hudson Bay Dam	Construct fishway or otherwise assure passage.
Little Walla Walla R.	1957 1958 1959	Centennial Mill Dam (WW-7), low water block to steelhead	Height, 4 ft. (varies with water stage)	Downstream city limits of Milton-Freewater	Construct fishway or otherwise assure passage.
South Fork Walla Walla R.	7-30-59	17 unscreened diversion ditches (WWSf-1)	Most do not exceed 4-5 ft. in width	Lower 8 mi.	Investigate for diversion of fish, screen if necessary.
" "	1957 1959	City of Milton Intake Dam (WWSf-2), fishway present	-	1 mi. above mouth of South Fork	Improvement of ladder may be desirable.
" "	7-30-59	Temporary diversion dams (WWSf-3), some form low water blocks	-	Lower 8 mi.	Enforcement of fish passage laws.
" "	3-20-59	Log jam (WWSf-4)	Large jam	0.25 mi. above Skip-Horton Cr.	Recommend removal on basis of some spawning area above for steelhead.
North Fork Walla Walla R.	8-11-59	8 unscreened diversion ditches (WWNf-1)	Small	Lower 5 mi.	Investigate for diversion of fish, screen if necessary.
" "	9-4-59	Temporary diversion dams (WWNf-2), some form low water blocks	-	Lower 5 mi.	Enforcement of fish passage laws.

1/ Multiple observations have been made where just the year is listed.

Table III. A Summary List of Obstructions and Unscreened Diversions on the Lower Grande Ronde River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Wildcat Cr.	7-22-59	3 small log jams (LGR-Wc-1)	-	0.5 to 2.5 mi. above Wallupa Cr.	Remove
N. F. Wenaha	7-24-58	1 beaver dam-small (LGR-WNf-1)	-	5 to 6 mi. above mouth	Remove
" " "	6-3-59	Falls (LGR-WNf-2)	20 ft. high (reported)	8 mi. above mouth	None
Milk Cr.	7-24-58	1 beaver dam (LGR-WM-1)	-	0.5 mi. above mouth	None
" "	7-24-58	Numerous brush and log jams (LGR-WM-2)	-	Upper reaches	None
" "	7-24-58	Falls (LGR-WM-3)	6 ft. high	5 to 5.5 mi. above mouth	None
Butte Cr.	6-3-59	Falls (LGR-WB-1)	Unknown	0.8 mi. above Rainbow Cr.	None
Crooked Cr.	7-22-58	Many small log and debris jams (LGR-WC-1)	-	Above First Cr.	None
" "	7-22-58	Small falls (LGR-WC-2)	5 ft. high	3 mi. above mouth	None
Cougar Cr.	7-22-58	Beaver dam (LGR-WCc-1)	-	0.3 mi. above mouth	None
Joseph Cr.	8-25-59	3 diversion dams (LGR-J-1)	-	3 to 4 mi. above mouth	Provide fish passage for salmon if they are introduced.

Table III. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Joseph Cr.	8-25-59	3 unscreened diversions 2-3 c.f.s. (LGR-J-2)	-	3 to 4 mi. above mouth	Investigate for screening.
Swamp Cr.	8-28-59	12 debris jams and beaver dams (LGR-JS-1)	-	2 to 14 mi. above mouth	Remove
Chesnimnus Cr.	8-29-58	1 small debris jam (LGR-JC-1)	-	1.2 mi. above Pine Cr.	None

Table IV. A Summary List of Obstructions and Unscreened Diversions on the Wallowa River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Wallowa R.	1959	Unscreened ditches (Wa-1)	18 ditches range in width from 1.5 to 15 ft.	Mouth of Dry Cr. to Joseph	Investigate to determine fish loss, screen if necessary.
"	8-26-58	2 irrigation diversion dams (Wa-2), concrete abutments and stop boards, form low water block.	-	2.5 and 2.6 mi. below Joseph	Action should be taken to assure passage to spawning area above for chinook and silvers. Depending on numbers of stop boards used, dams may be passable at one time and not another.
"	9-24-58	Log jam (Wa-3)	30 ft. long, 60 ft. wide, 4 ft. high	0.25 mi. below Joseph	Removal not recommended unless blueback introduced into Wallowa L.
"	9-24-58	Area of low flow (Wa-4), due to irrigation withdrawals	0.3 mi. in length	Immediately below Joseph	Correction not necessary unless blueback run restored--in this case, irrigationists may guarantee transportation flow.
"	10-7-57	2 irrigation diversion dams (Wa-5), low flow barriers	-	At Joseph	Correction not recommended unless blueback run restored.
"	1959	Unscreened ditches (Wa-6)	7 ditches from 3.5 to 30 ft. in width	Joseph to Wallowa L.	Screening not recommended unless blueback run restored.

Table IV. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approximate Dimensions	Approximate Location	Recommendations
Wallowa R.	1957 1958 1959	Wallowa Lake Dam (Wa-7) (no ladder)	Height, 40 ft.	Lower end Wallowa Lake	Fishway not recommended unless blueback run restored.
West Fork Wallowa R.	10-24-58	Falls (WaW-1)	2 falls of 25 to 30 ft. each	Just above mouth	Fishway believed economically infeasible.
East Fork Wallowa R.	-	Falls and torrential area (WaE-1)	-	-	Passage not recommended due to extensive amount of precipitous gradient and lack of spawning potential.
Minam R.	7-9-58	Minam Falls (WaM-1)	Height, 7 ft.	4.5 mi. above Horse Ranch	Fishway recommended on basis of 14 mi. of suitable habitat for spring chinook above.
"	7-9-58	Splash Dam (WaM-2)	Height, 10 ft.	4.6 mi. above Horse Ranch	Removal recommended on basis of 14 mi. of habitat for spring chinook above.
"	4-29-59	Cataracts and falls (WaM-3), impassable	-	First 2 or 3 mi. below Minam Lake	No action recommended due to lack of spawning area above.
Little Minam River	8-28-59	Multiple falls (WaMLM-1)	12 falls range in height from 2.5 to 12 ft.	5 to 8 mi. above mouth	No action recommended due to lack of spawning area above.
Big Canyon Creek	7-31-59	2 unscreened diversion ditches (WaBi-1)	2 ft. wide	1 mi. and 0.5 mi. above mouth	Investigate for diversion of fish, screen if necessary.

Table IV. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Bear Cr.	-	Area of intermittent flow (WaB-1), mid-July through September	-	First 2-3 mi. above mouth	Restricts access of stream to anadromous fish, consider upstream storage.
" "	7-31-59	4 unscreened ditches (WaB-2)	Range from 2.5 to 4 ft. wide	1.8 to 5 mi. above mouth	Investigate for diversion of fish, screen if necessary.
" "	7-31-59	Diversion dam (WaB-3), low water barrier	45 ft. wide, 1 ft. high, 15 ft. long	4.5 mi. above mouth	Passage should be assured in event of introduction of silver salmon.
" "	9-12-58	Area of low flow (WaB-4) in late summer	-	13 mi. above mouth	Restricts spawning area of spring chinook, consider upstream storage.
" "	6-6-58	2 cataract areas	-	16 to 16.5 mi. above mouth	Passage at lower area questionable, no action recommended due to lack of spawning area above.
" "	6-6-58 and 6-1-59	2 falls (WaB-6)	Specific height unknown, impassable	16.5 to 19 mi. above mouth	No action recommended due to lack of spawning area above.
Lostine R.	8-27-57 9-9-57	Temporary diversion dams (WaL-1)	-	Lower 4.5 mi.	Recommend enforcement of fish passage laws.
" "	1957 1958 1959	City of Lostine water supply dam (WaL-2), has ineffective ladder	12 ft. long, 3 ft. high, 40 ft. wide	1 mi. above Lostine	Recommend construction of functional ladder.

Table IV. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Lostine R.	1959	Sheep Ridge irrigation dam (WaL-3), no ladder	Height, 4 ft.	1 mi. above city of Lostine Dam	Recommend construction of ladder.
"	7-28-59	2 unscreened diversion ditches (WaL-4)	Flow volume 10 c.f.s. and 2 c.f.s.	3.5 and 8.8 mi. above mouth	Investigate for diversion of fish, screen if necessary.
"	Sept. 1956	Falls (WaL-5)	Consist of several low falls and a falls 6-7 ft. in height	1 to 1.5 mi. below confluence of E. and W. Fks.	No action recommended due to lack of spawning potential above.
East Fork Lostine R.	10-3-57	Falls (WaLE-1)	2 falls, 6 and 12 ft. in height	Immediately above mouth	No action recommended due to lack of potential above.
West Fork Lostine R.	10-3-57	Falls (WaLW-1)	2 falls, 6 and 12 ft. in height	Immediately above mouth	No action recommended due to lack of potential above.
Hurricane Cr.	10-24-57 4-16-59 9-24-59	4 unscreened ditches (WaH-1)	-	Mouth upstream 6.5 mi.	Investigate for diversion of fish, screen if necessary.
"	-	1 ditch (WaH-2) screened in the past but presently without screen	-	4 mi. above mouth	None--OGC indicates no diversion of fish at this ditch.

Table IV. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Hurricane Cr.	9-24-59	Area of intermittent flow (WaH-3), flow may be depleted from mid-summer to fall by irrigation withdrawals.	2.5 mi. long	3.5 to 6 mi. above mouth	Contact water users to determine if unnecessary diversion of stream flow is made following irrigation season--introduction of silver salmon will depend on restoration of flow to low flow area by Oct. of each year.
"	4-16-59	2 diversion dams (WaH-4), low water barriers	1.5 and 4 ft. in height	6.5 to 7 mi. above mouth	Passage should be assured if silver salmon introduced.
"	4-16-59	Uppermost diversion dam (WaH-5)	Height 10 ft.	7.5 mi. above mouth	Passage not recommended due to lack of spawning potential above.
"	4-16-59	2 unscreened diversion ditches (WaH-6)	-	7.5 mi. above mouth	Screening not recommended due to inaccessibility of ditches to anadromous fish.
"	4-16-59 7-24-59	Falls (WaH-7), several falls	Range 5 to 30 ft. in height	8 to 12.5 mi. above mouth	Passage not recommended at any of the various falls due to extent of precipitous gradient and lack of sufficient potential above.
Prairie Cr.	10-18-59	1 unscreened ditch (WaP-1)	-	2-3 mi. above mouth	Investigate for diversion of fish, screen if necessary.

Table IV. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Prairie Cr.	8-8-59 9-21-59	20 unscreened ditches (WaP-2)	-	5 to 15 mi. above mouth	Stream in this area should be investigated to determine if steelhead are present or if a potential for steelhead exists—recommendations for screening would depend on findings.
"	8-8-59 9-21-59	10 debris jams (WaP-3), low flow barriers	Small jams	6 to 15 mi. above mouth	None—if steelhead use this area, jams can be passed during high water.
"	8-8-59 9-21-59	2 diversion dams (WaP-5)	Height, 1 ft.	7 and 13 mi. above mouth	None—if steelhead are present, passage is possible during high water.
"	8-8-59	1 diversion dam (WaP-6) with culvert sluiceway	Height, 4.5 ft.	10 to 11 mi. above mouth	Possible velocity block in highwater—correction dependent on proof of steelhead use of stream above.
"	8-8-59	Culvert (WaP-7)	2 — 18 in. culverts	10 to 11 mi. above mouth	Possible high water velocity block—correction dependent on proof of steelhead use of stream above.

Table V. A Summary List of Obstructions and Unscreened Diversions on the Upper Grande Ronde River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx Location	Recommendations
Grande Ronde	1958	Low falls (UGR-1)	3-4 ft. high	3.3 mi. below Sheep Cr.	None
" "	1959	Gravel dam (UGR-2)	4 ft. high	La Grande	Insure early summer fish passage.
" "	1959	Gravel dam (UGR-3)	2 ft. high	La Grande	Insure early summer fish passage.
" "	1959	Low flow area (UGR-4)	-	La Grande	None
" "	1959	5 diversions unscreened (UGR-5)	-	La Grande	Investigate for screening.
Fly Cr.	12-8-59	1 medium sized debris jam (UGR-F-1)	-	4 mi. above mouth	Remove
" "	12-8-59	9 small debris jams (UGR-F-2)	-	Lower 5.5 mi.	Remove
Beaver Cr.	6-17-59	La Grande reservoir dam (UGR-B-1)	30 ft. high	13 mi. above mouth	None
Willow Cr.	7-7-59	Diversion dam (UGR-W-1)	7 ft. high	1 mi. below Spring Cr.	Provide fish passage.
Spring Cr.	7-7-59	6 diversion dams (UGR-W-S-1)	-	Lower 3.5 mi.	Provide fish passage.
" "	7-7-59	1 beaver dam (UGR-W-S-2)	-	4 mi. above mouth	Remove if passage is provided at dams below.

Table V. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Spring Cr.	7-7-59	7 unscreened diversions (UGR-W-S-3)	-	Lower 3.5 mi.	None at present—screen if run is established.
Indian Cr.	1958 1959	12 medium and small debris jams (UGR-I-1)	-	5 to 10 mi. above mouth	Remove
" "	7-15-59	Low concrete diversion dam, has fish passage facility (UGR-I-2)	-	3 mi. above mouth	None
" "	7-15-59	4 unscreened diversions (UGR-I-3), 1 c.f.s. or under	-	2.5 to 4.5 mi. above mouth	Investigate for screening.
Clark Cr.	July 1959	Steep gradient (UGR-C-1)	0.2 mi. long	4 mi. above Middle Fk.	None
" "	July 1959	2 falls, 3 beaver dams, several debris jams (UGR-C-2)	-	4 to 6 mi. above Middle Fk.	None
Middle Fork Clark Cr.	6-25-58	Several impassable falls (UGR-C-MF-1)	-	1.5 mi. above mouth	None
" "	6-25-58	Numerous log jams (UGR-C-MF-2)	-	1.5 to 3.5 mi. above mouth	None
Phillips Cr.	7-10-59	3 debris jams--medium to small (UGR-P-1)	-	1.5 to 3 mi. above Little Phillips Cr.	Remove
" "	1958 1959	Diversion dam (UGR-P-2)	5 ft. high	1 mi. above Elgin	Provide fish passage.
" "	1958 1959	2 small unscreened diversions (UGR-P-3)	-	1 mi. above Elgin	Investigate for screening.

Table V. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Gordon Cr.	6-30-59	3 beaver dams (UGR-G-1)	1.5 to 4 ft. high	2.6 to 4.2 mi. above mouth	Remove
" "	6-30-59	3 unscreened diversions (UGR-G-2) 1-4 c.f.s.	-	Lower 4 mi.	Investigate for screening.
Cabin Cr.	7-1-59	2 small debris jams (UGR-Cb-1)	2-3 ft. high	0.2 to 1.3 mi. above mouth of North Fk.	Remove
" "	7-1-59	3 small beaver dams (UGR-Cb-2)	-	0.9 to 1.5 mi. above mouth of South Fk.	Remove
" "	7-1-59	Low falls (UGR-Cb-3)	4 ft. high	1.5 mi. above mouth	None
" "	7-1-59	1 unscreened diversion (UGR-Cb-4)-less than 1 c.f.s.	-	1 mi. above mouth South Fk.	Investigate for screening.
Catherine Cr.	1957-59	Union water supply dam (UGR-Ca-1)--has fishway	6 ft. high, 40 ft. wide	1.5 mi. above Union	None
" "	1958-59	Lower Davis Dam (UGR-Ca-2)--has fishway	6 ft. high	6 mi. below Union	None
" "	1958-59	Upper Davis Dam (UGR-Ca-3)--has poor fishway	-	0.2 mi. above Lower Davis Dam	None
" "	1959	Dobbin ditch diversion dam (UGR-Ca-4)	-	In Union	None

Table V. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Catherine Cr.	7-14-59	3 unscreened diversions, (UGR-Ca-5) 2-6 c.f.s.	-	3 mi. above to 6 mi. below Union	Investigate for screening.
" "	7-14-59	2 unscreened diversions, dry at time of observation (UGR-Ca-6)	-	4 mi. above and 6 mi. below Union	Investigate for screening.
Lookingglass Cr.	1957-59	Lookingglass Falls (UGR-L-1)--has by-pass channel	6 ft. high	2.5 mi. above mouth	None
" "	1958	Small debris jam (UGR-L-2)	-	0.2 mi. above Summer Cr.	Remove
" "	6-4-58	Small debris jam (UGR-L-3)	-	2 to 3 mi. above Summer Cr.	Remove
" "	6-4-58	Beaver dam (UGR-L-4)	-	2.5 mi. below source	None
" "	6-4-58	High falls (UGR-L-5)	15-20 ft. high	1 mi. below source	None
Mottet Cr.	1959	3 debris jams (UGR-L-M-1)	-	0.5 to 1.2 mi. above mouth	None
" "	1959	2 small debris jams (UGR-L-M-2)	-	1.5 to 2 mi. above mouth	None

Table VI. A Summary List of Obstructions and Unscreened Diversions on the Imnaha River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Imnaha R.	1957 1958 1959	Rock slide (I-1)--no present problem, has been corrected in past	-	15 mi. above Imnaha, Oregon	None
"	7-16-59	Log jam (I-2)	Large	2.3 mi. above Mahogany Cr.	No action required at present--warrants future watching.
"	6-25-59	Log jam (I-3), may be high flow obstruction	Large	Immediately above "Blue Hole"	None--jam of no importance as long as other impassable barriers exist above, need of removal would depend on development of S. Fk. Imnaha R.
"	6-25-59	Impassable cataracts during high flow period (I-4)	-	"Blue Hole" to 1 mi. below confluence N. and S. Fks.	None at the present, need of correction would depend on development of S. Fk.
"	6-12-58 9-5-58	Lower Imnaha Falls (I-5)--may be high flow barrier	5 ft. high, 5 ft. wide	1 mi. below confluence N. and S. Fks.	None--correction depends on development of S. Fk.
"	6-12-58 9-5-58	Upper Imnaha Falls	7 ft. high	0.2 mi. above lower falls	None--correction depends on development of S. Fk.
Summit Cr.	-	Unscreened diversion (I-S-1)	Small	0.5 mi. above mouth	Investigate to determine diversion of fish, and screen if necessary.

Table VI. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Lightning Cr.	10-19-59	5 debris jams (I-L-1), low flow barriers	3 small, 2 medium	1.5 to 8 mi. above mouth	None--jams passable to steelhead--would require removal only if silver salmon introduced.
"	6-1-59	3 log jams (I-L-2), degree of obstruction unknown, aerial observation	Small or medium	12 to 16 mi. above mouth	None--removal not believed practicable.
Horse Cr.	5-7-59 6-10-59	8 log and debris jams (I-H-1), low flow barriers	Small and medium	1.5 to 8 mi. above mouth (to Rheumatiz Gulch)	None--jams passable to steelhead, removal would depend on introduction of silver salmon.
"	6-1-59	2 log jams (I-H-2), degree of passage unknown, aerial observation	Small or medium	5 mi. above Rheumatiz Gulch	None--removal not believed practicable.
Cow Cr.	August 1959	1 unscreened ditch (I-C-1)	1-2 c.f.s. 2-3 ft. wide	1 mi. above mouth	Investigate to determine diversion of fish, screen if necessary.
Big Sheep Cr.	8-6-59	5 unscreened ditches (I-BS-1)	Small	3 ditches near Carrol Cr. and 2 below mouth of Little Sheep Cr.	Investigate to determine diversion of fish, screen if necessary.
" "	1957 1958 1959	2 temporary diversion dams (I-BS-2)	18 in. high	3 mi. above mouth Little Sheep Cr.	Enforcement of fish passage laws.

Table VI. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendation
Big Sheep Cr.	10-2-57 6-25-59	Torrential flow area	-	4 mi. below confluence of S. and Middle Fks.	None--spawning area above does not warrant consideration of obtaining easier passage in this section.
" "	8-7-58	Critical flow area (I-BS-3) due to diversion of water from Big Sheep Cr. immediately below confluence of S. and Middle Fks.	-	Immediately below confluence of S. and Middle Fks.	None
" "	8-7-58 6-25-59	Diversion dam (I-BS-5), Wallowa Valley Improvement canal diversion	-	Confluence of Middle and S. Fks.	None--spawning area above dam negligible.
Camp Cr.	4-28-58	4 log jams, partial barriers (I-BS-C-1)	2 medium, 1 small	0.3 to 2.1 mi. above mouth	Jams should be removed.
Little Sheep Cr.	7-16-59	5 unscreened diversion ditches (I-BS-LS-1)	Small	From 0.8 mi. below McCully Cr. to 0.8 mi. below Threebuck Cr.	Investigate to determine diversion of fish, screen if necessary.
" "	4-17-59 5-8-59	24 log and debris jams (I-BS-LS-2)	-	From Wallowa Valley improvement canal diversion dam to 2.5 mi. above Coverdale Forest Camp-Imnaha roads junction	16 of jams should be removed with fisheries funds, 8 jams are result of recent logging operation and should be removed by contractor.

Table VI. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Little Sheep Cr.	6-25-59	Diversion dam (I-BS-LS-3) Wallowa Valley improvement canal diversion from Little Sheep Cr., believed to be a barrier except possibly at peak flows.	-	2-3 mi. below source of stream	None--area above of poor quality for production of anadromous fish.
Middle Fk. of Big Sheep Cr.	8-7-58	2 falls (I-BS-M-1)	7 and 10 ft. high	1 mi. above mouth	None--negligible amount of production area above.
" "	8-7-58	Log jam (I-BS-M-2)	-	1.3 mi. above mouth	None
" "	8-7-58	3 impassable falls (I-BS-M-3)	15, 20, and 35 ft. high	0.2 mi. above mouth N. Fk. Big Sheep Cr.	None

Table VII. A Summary List of Obstructions and Unscreened Diversions on the Pine Creek System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Pine Cr.	4-2-59	Low diversion dam (P-1)	1 ft. high, 60 ft. wide	1 mi. above Halfway	None
" "	6-1-59	Low dam (P-2)	-	Below Cornucopia	None
" "	8-59	Many diversion dams and dry stream bed (P-3)	-	Pine Valley	None
" "	8-17-59	6 unscreened diversions (P-4)	-	Pine Valley	Investigate for screening
Clear Cr.	8-17-59	7 diversion dams (P-C-1)	-	Pine Valley	None
" "	8-17-59	8 unscreened diversions (P-C-2)--0.5 to 4 c.f.s.	-	Pine Valley	Investigate for screening.
East Pine Cr.	8-18-59	12 diversion dams (P-EP-2)	-	Pine Valley	None
" " "	8-18-59	3 small debris jams (P-EP-1)	-	5.5 to 6.7 mi. above mouth	Remove
" " "	8-18-59	Low flow area (P-EP-3)	-	1.5 and 2.5 mi. above mouth	None
" " "	8-18-59	8 unscreened diversions (P-EP-4) 1-3 c.f.s.	-	Pine Valley	Investigate for screening.
North Pine Cr.	8-18-59	1 diversion dam (P-NP-1)	-	0.5 mi. above mouth	None

Table VIII. A Summary List of Obstructions and Unscreened Diversions on the Powder River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Powder R.	1959	5 small unscreened diversions (Po-1)	-	Below lower Powder Valley	Investigate for screening.
"	1959	6 large unscreened diversions (Po-2)	-	2 mi. above lower Powder Valley downstream to Keating	Investigate for screening.
"	1959	Diversion dam (Po-3)	Low dam	1 mi. below Goose Cr.	None
"	-	4 flood dams (Po-4)	Height variable	Lower Powder Valley	None
"	1959	Diversion dam (Po-5)	Height variable	0.2 mi. above Keating	None
"	1958-59	Diversion dam (Po-6)	6 ft. high	Upper end of lower Powder Valley	None
"	6-19-59 7-14-59	2 diversion dams (Po-7)	2-3 ft. high	Mouth of Big Cr. to 1.5 mi. below	None
"	1958-59	Thief Valley Reservoir Dam (Po-8)	40-45 ft. high 390 ft. long	60 mi. above mouth	None
"	Fall-58	15 diversion dams (Po-9)	Heights variable	Between Baker and N. Powder	None
"	-	37 diversions (Po-10)	-	Above N. Powder	None
"	10-58	2 small debris jams (Po-11)	-	2 mi. above Haines	None
"	10-58	Beaver dam (Po-12)	-	Just above Lake Cr.	None
"	9-58	Subterranean flow (Po-13)	-	2 mi. below Sumpter Valley	None
"	9-58	Log and debris jam (Po-14)	-	2 mi. below Sumpter Valley	None

Table VIII. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
McCully Fk.	6-59	2 log and debris jams (Po-M-1)--aerial observation only	-	Lower McCully Fk.	None
Cracker Cr.	9-58	Diversion dam (Po-C-1)	4 ft. high	1.5 mi. below Wind Cr.	None
N. Powder R.	10-58	9 diversion dams (Po-NP-1)	Heights variable	N. Powder Valley	None
"	10-58	17 unscreened diversions (Po-NP-2)	-	N. Powder Valley	None
"	12-58	Many debris jams (Po-NP-3)	-	Above N. Powder Valley	None
"	12-58	6 unscreened diversions (Po-NP-4)	-	Above N. Powder Valley	None
Anthony Fk.	12-9-58	5 unscreened diversions (Po-NP-AF-1)	-	2 to 5 mi. above mouth	None
"	12-9-58	2 low diversion dams (Po-NP-AF-2)	-	2.5 and 4 mi. above mouth	None
"	12-9-58	2 log and debris jams (Po-NP-AF-3)	-	2 and 4.5 mi. above mouth	None
Eagle Cr.	1959	Log jam (Po-E-1)	Large jam	1 mi. above mouth Little Eagle Cr.	Remove
"	8-59	Sloping falls (Po-E-2)	12 ft. high (in 3 steps)	1.2 mi. above Little Eagle Cr.	Investigate to determine if obstruction.

Table VIII. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Eagle Cr.	1958-59	Log jam (Po-E-3)	-	0.4 mi. below Dixie Cr.	Remove
"	1958	2 log jams (Po-E-4)	-	0.2 to 0.8 mi. above Two Color Guard Station	Remove
"	1958	Several falls (Po-E-5)	All impassable	Above Boulder Park	None
Kirby Cr.	7-30-59	Unscreened diversion (Po-E-K-1)	-	1 mi. below head of Kirby Cr.	Investigate for screening.
E. Eagle Cr.	8-26-59	Unscreened diversion (Po-E-EE-1)	-	0.2 mi. above East Eagle Mine	Investigate for screening.
" "	6-59	Falls (Po-E-EE-2)-- aerial observation only	-	13 mi. above mouth	None
W. Eagle Cr.	9-58	Log jam (Po-E-WE-2)	Moderate sized	0.5 mi. above W. Eagle Cr. Bridge	Remove
" "	9-58	Phillips ditch dam (Po-E-WE-1)	Height variable 3 to 5 ft. high	3 mi. above mouth	Assure fish passage during migration period.
" "	9-58	Phillips diversion ditch, unscreened--(Po-E-WE-5)	-	3 mi. above mouth	Investigate for screening.
" "	9-58	Log jam, large (Po-E-WE-3)	15 ft. high, 100 ft. long	Shortly below Grove Cr.	Remove
" "	9-58	Log jam (Po-E-WE-4)	Large	Shortly above Trout Cr.	Remove

Table IX. A Summary List of Obstructions and Unscreened Diversions in the Burnt River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approx. Dimensions	Approx. Location	Recommendations
Burnt R.	-	Diversion dams and ditches (B-1)--37 ditches observed by USFWS in 1941	-	Mouth to Unity Dam	None
" "	12-12-58	Unity Dam (B-2), unladdered	76 ft. high	80 mi. above mouth	None
South Fk.	6-13-59	Diversion dam (B-SF-1), degree of obstruction undetermined (aerial survey)	-	1-2 mi. above mouth	None
" "	6-13-59	Falls (B-SF-2)--appear impassable from air	-	Just below Whited Reservoir Dam	None
" "	6-13-59	Whited Reservoir Dam (B-SF-3), unladdered	40 ft. high	6 mi. above mouth	None
" "	-	Diversion ditches (B-SF-4)--14 ditches observed by USFWS in 1941	-	-	None
North Fk.	6-13-59	Diversion ditches and dams (B-NF-1), number unknown, 3 ditches and dams observed on aerial survey of 6-13-59	-	-	None

Table X. A Summary List of Obstructions and Diversions on the Malheur River System.

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approximate Dimensions	Approximate Location	Recommendations
Malheur R.	-	Low flow area (M-1) due to irrigation withdrawals, August and September	-	Mouth to Vale	Needs more investigation if anadromous fish introduced--may not be compatible with fall outmigration.
"	-	Unscreened diversion ditches below Juntura (M-2), number unknown	8 large and 2 small present in 1942, largest over 600 c.f.s.	Mouth to Juntura (about 75 mi.)	Would require screens only if anadromous fish introduced into system.
"	-	Nevada diversion dam (M-3)	2 ft. high by 300 ft. long at time of construction in 1930's	1 mi. below Vale	Forms low water barrier--of no importance unless fish introduced.
"	12-3-57	Harper diversion dam (M-4)	17 ft. high by 700 ft. long	11 mi. above Harper	Has fishway which does not function during low water--of no importance unless fish introduced.
	-	Unscreened diversion ditches above Juntura (M-5), number unknown, diversion for 13,000 acres in area	-	Stream section above Juntura (about 75 mi.)	Would require screens only if anadromous fish introduced.
"	-	Low flow area (M-6) due to water storage present in some years from mid-Oct. to mid-April	-	Below Riverside Dam (Warm Springs Reservoir)	Needs further investigation if fish introduction considered--may not be compatible with fall outmigration.

Table X. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approximate Dimensions	Approximate Location	Recommendations
Malheur R.	12-4-57	Riverside storage dam (M-7), unladdered, forms 191,000 acre-foot Warm Springs Reservoir	90 ft. high by 550 ft. long	100 mi. above stream mouth	Would require fishway if anadromous fish runs restored to upper main stem.
"	-	Low flow area (M-8) in Drewsey Valley due to irrigation exists in Aug. and Sept.--diversion for 13,000 acres in area	-	Vicinity of Drewsey Valley	Needs more investigation if fish introduced--may not be compatible with fall outmigration.
Willow Cr.	-	Unscreened diversion ditches (M-W-1), number unknown, diversion of flow for irrigation of 5,000 acres as of 1939	-	-	None
"	-	Low flow areas (M-W-2)--critical flow area below Willow Creek Dam during winter storage season--low flows in various areas during irrigation season	-	Above and below Willow Creek Dam and Reservoir	None
"	-	Willow Creek Dam (M-W-3) forms 49,000 acre-foot Willow Creek Reservoir	Impassable	40 mi. above mouth	None
Bully Cr.	-	Probable low flow areas (MB-1) during irrigation season--recent flow data (to 1950) not in suitable detail to confirm	-	-	None

Table X. (continued)

Stream	Date of Observation	Obstruction or Diversion (and Code No.)	Approximate Dimensions	Approximate Location	Recommendations
Bully Cr.	-	Unscreened diversion ditches (MB-2) number unknown, diversion for 7,000 irrigated acres above stream-mile 7	-	-	None
North Fk.	-	Unscreened diversion ditches below Beulah Dam (MNF-1), number unknown	2 ditches of 10 and 15 c.f.s. noted in 1942	Mouth to Beulah Dam	Would require screens if anadromous fish introduced.
"	-	Low flow area (MNF-2), critical flows below Beulah Dam during storage season, mid-Oct. to mid-April in some years	-	Mouth to Beulah Dam (16 mi.)	Alleviation of low flows desirable for salmonid rearing.
"	12-4-57	Beulah Storage Dam (MNF-3) forms 60,000 acre-foot Agency Valley Reservoir	90 ft. high by 1,867 ft. long	16 miles above mouth	Would require fishway if anadromous fish runs restored to North Fork.
"	-	Unscreened diversion ditches above Beulah Dam (MNF-4)—diversion for about 900 irrigated acres above dam	-	Agency Valley Reservoir to mouth Little Malheur River	Would require screens if anadromous fish introduced.
South Fk.	-	Low flow area (MSF-1) due to irrigation and natural small runoff volume	-	At mouth, likely present in various other sections	None
"	-	Unscreened diversions (MSF-2)—number unknown, diversion for about 5,000 acres as of 1939	-	Mouth to headwaters	None

APPENDIX C

COST ESTIMATES

Engineering cost estimates for certain recommended stream improvement projects that qualify for federal funds have been listed by river system in Table I.

Estimates for the cost of screening some of the diversions in the river systems of Eastern Oregon are listed in Table II.

These estimates have been prepared by the OFC Engineering Division.

LIST OF APPENDIX C TABLES

Table I. Stream Clearance Costs by River System With Equipment Purchases, Rentals and Engineering Prorated and Added Thereto.

Umatilla River	$ 2,939.
Walla Walla River	2,173.
Grande Ronde River (Lower)	21,302.
Wallowa River	14,893.
Grande Ronde River (Upper)	20,944.
Pine Creek	3,532.
Imnaha River	27,415.
Powder River	14,522.
	$107,720.

Table II. Screening Estimates for Certain Projects in Eight Eastern Oregon River Systems.

Walla Walla River	$ 29,000.
Umatilla River	99,000.
Lower Grande Ronde	600.
Wallowa River	133,000.
Upper Grande Ronde	15,000.
Imnaha River	1,000.
Pine Creek	9,000.
Powder River	70,000.
Total	$356,600.