

HABITAT IMPROVEMENT PROJECT

Fishery Division



OREGON STATE GAME COMMISSION
1634 S. W. Alder Portland 5, Oregon

NUMBER 1

STATE OF OREGON
OREGON STATE GAME COMMISSION

P. W. Schneider, Director

FEDERAL AID TO FISH RESTORATION
PROGRESS REPORT.

State-Wide Fishery Rehabilitation
Malheur Reservoir and Tributaries Segment
F-20-D-18

By
Lawrence E. Bisbee
Aquatic Biologist

NUMBER 1

State Oregon

Project No.: F-20-D-18

Date: December 13, 1962

PROGRESS REPORT

State-wide Fishery Rehabilitation Malheur Reservoir and Tributaries Segment

Period Covered: June 25, 1962 to December 4, 1962

ABSTRACT

Malheur Reservoir in Malheur County, Oregon, was chemically treated on October 11, 1962, to eliminate an abundant population of black crappie and a smaller population of finescale suckers and reddsided shiners. A total of 1,100 gallons of liquid synergized rotenone (Pro-Noxfish) was used to establish a toxicity of 1.5 p.p.m. in the reservoir. The visible kill consisted of black crappie (99.4 per cent), rainbow trout (0.5 per cent) and finescale suckers and reddsided shiners (0.1 per cent). Carp which reappeared following the 1950 eradication program appeared to have been completely eliminated from the reservoir and tributaries in the 1955 treatment.

Toxicity of the rotenone in the reservoir appeared to be short-lived, possibly because of the high total dissolved solids in the water. Five days after the initial treatment, chemical tests for rotenone in water samples indicated less than 0.5 p.p.m.

Chemical treatment of approximately 20 miles of tributary stream was completed September 10, 1962. A total of 200 gallons of liquid synergized rotenone was used in drip stations to maintain a toxicity of 2.3 p.p.m. in the live stream. Potholes in the lower eight miles were treated with a portable 200-gallon high pressure spray tank. The kill of finescale suckers, reddsided shiners and dace numbered in the thousands. Several thousand trout

were killed in the stream above Ironside.

The stream and the reservoir will be restocked in the spring of 1963.

Location and Past History

Malheur Reservoir is located on Willow Creek, a tributary of the Malheur River in Malheur County, T. 14 S., R. 41 E., Sec. 14. The reservoir is located 13 miles northwest of Brogan and 17 miles northeast of Ironside.

Although the dam was constructed about 1913 or 1914, very little fishery management work was done prior to 1950. During that period, an abundant trash fish population including carp, reidsided shiners, finescale suckers and dace thrived in the reservoir. In September 1950, the reservoir and 15 miles of Willow Creek were chemically treated for the first time. A complete draw-down occurred for the first time in many years leaving only 114 acre-feet of water in the reservoir.

In 1951, public access to Malheur Reservoir was assured when easements were signed with Mr. and Mrs. Carroll Locey and the Orchard Water Company of Malheur County. Since 1951, the reservoir has been managed as a trout fishery and has developed into one of the best in the southeastern part of Oregon. The fishery is maintained by the annual stocking of 100,000 to 150,000 rainbow fingerlings which normally attain a growth rate of one inch per month.

By October 1955, trash fish had again made a tremendous increase in the reservoir and it was chemically treated for the second time. An estimated 3,000 acre-feet of water remained at that time. Carp, reidsided shiners, finescale suckers and dace were removed. After the 1955 treatment, angling pressure on Malheur Reservoir reached an all-time peak in 1960 when an estimated 15,000 anglers visited the reservoir. The fishery declined rapidly after 1960 when black crappie, illegally introduced by anglers in 1958, began to increase

in large numbers. By 1962, total angling pressure on Malheur Reservoir had declined to a low of 7,600 fishermen for the season.

Additional public access to Malheur Reservoir was acquired in 1961 when an agreement between the Malheur County Court and Mr. Francis Dobby was signed opening up a 40-acre tract of land for public use. This additional area provides for camping, parking, bank angling and boat launching.

Preparation

Since 1962 was an extremely poor water year as far as runoff into Malheur Reservoir was concerned, it was predicted by the Orchard Water Company that the reservoir would be drawn down to dead storage by the end of the summer. A decision to chemically treat the reservoir and tributaries was reached in view of this possibility and because of the tremendous increase in numbers of illegally introduced crappie.

Treatment of the stream system was necessary because of an increasing population of finescale suckers and shiners. A complete kill of these species was not accomplished in 1955 or 1950.

Chemical treatment of the reservoir and tributaries was scheduled for October in order to take advantage of maximum draw-down of the reservoir after the irrigation season. Many irrigation ditches above the reservoir were dry and much of the grain and hay along the creek was harvested which simplified access to the streams.

Coordination was necessary with local ranchers along Willow Creek above the reservoir and with the Orchard Water Company. All ranchers were contacted prior to the time when preliminary investigations were to be conducted on the creek. All ranchers were very cooperative. Contact with these people was made again just prior to chemical treatment of the streams.

Survey of the tributaries was completed in August and September by a

two-man crew. The stream system from the head of the reservoir to the headwaters was investigated for isolated potholes, springs, upper limits of trash fish and general survey information.

The majority of the Willow Creek watershed lies just outside the timbered boundary of the Malheur and Wallowa-Whitman National Forests. The watershed lies generally in open rolling sagebrush-juniper type country. The main stem of Willow Creek flows through flat, open cultivated valleys connected by a short stretch of narrow canyon. Willow Creek from the mouth of Grouse Creek down to the reservoir contained many potholes in the main channel and very little flowing water. The flow increased from an estimated 50-60 gallons per minute just above the mouth of Grouse Creek to an estimated 1 cubic foot per second at Ironside. A large marshy area at the mouth of Grouse Creek was created by beaver dams. The main flow of water was coming from the South Fork which has live water all year. The Middle Fork was dry in the lower three miles but had live water above the Farley ranch.

The majority of the other tributaries were completely dry or had only a small flow of water in the headwaters. Alder Creek contained live water which originated from two springs (Miller spring) located approximately one mile above the mouth of the creek. The springs had an estimated flow of 60-100 gallons per minute. Much of the stream system is choked with thick streamside cover which made it impossible to make a thorough investigation or check results of the treatment.

Many of the irrigation ditches were completely dry at the time of investigation. Those containing water were being fed from wells.

September 16 an aerial photo of Malheur Reservoir was taken by a private engineering company to aid in determining water volume in the reservoir. September 25 soundings were taken with an electric depth recorder. Water

volume computed by staff engineers indicated the reservoir contained 1,321 acre-feet of water on September 25. The water level was 42½ feet below the high water line. This was the lowest the reservoir has been since 1950.

Sampling of the fish populations was done throughout the tributary streams in order to locate upstream limits of trash fish. Willow Creek below Ironside contained an abundant population of finescale suckers, shiners and dace. An occasional trout was seen. Only trout and dace were observed in the Middle Fork. In the South Fork, a good population of small rainbow was found throughout the stream. Finescale suckers were located up to 5½ miles above Ironside. No suckers were observed above that point. The flows from Miller spring contained shiners and dace.

Fish populations in the reservoir were composed of rainbow (0.6 per cent), black crappie (87.1 per cent), reidsided shiners (0.1 per cent) and finescale suckers (12.3 per cent) as determined by trap net sets.

In preparation for the project the general pattern of activities for chemical treatment was followed. Equipment and rotenone were assembled at a specified location, markers and live boxes were placed in the reservoir and various water analysis and temperature studies were accomplished.

The reservoir was divided into three main sections for equal distribution of the chemical. Eleven live boxes containing crappie and finescale suckers were anchored at various points in the reservoir and at depths ranging from 5 to 28 feet. The live boxes were set out three days in advance of the treatment to check the reaction of the fish to the various depths. Crappie appeared to be a poor test fish while suckers were satisfactory.

A water sample from the reservoir was sent to a commercial laboratory for analysis. The results of the analysis follow in Table 1.

TABLE 1

Water Analysis, Malheur Reservoir

Date taken - September 26, 1962

Depth taken - 8 feet

P_h value - 8.8Specific conductance,
Micromhos/cm - 610Parts per million

Total solids (residue on evaporation) 475

Volatile solids (loss on ignition) 75

Alkalinity (as Ca CO₃)

Carbonate 50

Bicarbonate 173

Temperatures and dissolved oxygen samples taken on October 8, 1962, are enumerated in Table 2.

TABLE 2

Temperature and Dissolved Oxygen Readings
Malheur Reservoir

Depth	Temperatures	Dissolved Oxygen
Air	53°	.
Surface	52°	8.0 ppm
Fourteen feet	52°	7.7 ppm
Twenty-seven feet	51°	7.7 ppm

Chemical Treatment - Tributaries

1. Equipment used

- a. Three 50-gallon drums with constant flow drippers
- b. Eight 30-gallon drums with constant flow drippers
- c. Four back pack cans
- d. Two 5-gallon rotenone cans
- e. Three 1-gallon rotenone cans
- f. One funnel
- g. One graduate - 25 ml
- h. One pickup truck, 3/4-ton
- i. One pickup truck, 1/2-ton
- j. One portable 200-gallon John Bean spray rig with 200 feet of high pressure hose and gun

2. Personnel needed - Four men

3. Man days required - Twenty-six
4. Chemical - Pro-Noxfish synergized rotenone
 Drippers 100 gallons
 Spray rig 100 gallons
5. Streams treated

<u>Stream</u>	<u>Miles Treated</u>	<u>Water Volume</u>
Willow Creek	15	1 c.f.s. to potholes
Willow Creek, South Fork	6 3/4	1 c.f.s.
Alder Creek (Miller spring)	1	50-60 g.p.m.

6. Drip station data
 (See Table 3)

Chemical treatment of the tributaries above Malheur Reservoir began on September 3 and was completed September 10, 1962. Since the South Fork of Willow Creek above the community of Ironside and the upper end of Willow Creek below Ironside had a suitable flow, drip stations were established 3/4 to 2 1/4 miles apart. Table 3 presents data on individual drip stations. In the South Fork, the drip stations operated for a period of 48 hours. At Stations 2 through 7 dead fish were observed above each drip barrel after 18 hours of operation indicating chemical from the drip above had reached that point. At Stations 8 through 10 it took the chemical up to 36 hours to reach the station below. For that reason, these drips were operated for a period of 72 hours.

Since much of the South Fork and most of the section of Willow Creek from Ironside down to Station 9 was covered by dense brush, no attempt was made to check the stream for isolated pockets of fish while the drips were in operation. In those sections of stream where cover was not too thick, checks were made for isolated pockets of fish. Several were found.

Immediately below Station 11 a series of beaver dams had impounded the water and had created a large marshy area several acres in size. From this

TABLE 3

Data on Drip Stations for Various Streams Treated in the Willow Creek Drainage
September 3 to September 10, 1962

Stream	Drip No.	Location	Drip Duration (Hours)	Stream flow	Gallons liquid used	Concentration	Distance to next drip
Willow Creek, South Fork	1	6½ miles above Ironside	24	1 c.f.s.	5	2.3 ppm	1 mile
	2	1 mile below Station 1 5½ miles above Ironside next to road	48	1 c.f.s.	10	2.3 ppm	1 3/4 miles
	3	1 3/4 miles below Station 2 at a field road crossing	48	1 c.f.s.	10	2.3 ppm	1 3/4 miles
	4	1 3/4 miles below Station 3 across meadow	48	1 c.f.s.	10	2.3 ppm	2¼ miles
Willow Creek	5	2¼ miles below Station 4 ½ mile below Ironside	48	1 c.f.s.	10	2.3 ppm	1 mile
	6	First bridge crossing 1½ miles below Ironside	60	0.5 c.f.s.	12	2.3 ppm	1 mile
	7	Crossing at Locey ranch	72	.25 c.f.s.	12	2.3 ppm	1 mile
	8	Bridge crossing 1 mile below Locey ranch	72	60 g.p.m.	13	2.3 ppm	1 mile
	9	Crossing at abandoned ranch building 1 mile below Station 8	60	60 g.p.m.	10	2.3 ppm	1 mile
	10	1 mile below Station 9 crossing below old lone barn	18	60 g.p.m.	2	2.3 ppm	3/4 mile
	11	At lower end of drop-off of new by-pass ditch and just above marsh	18	60 g.p.m.	5	2.3 ppm	---

point the portable 200-gallon spray rig with 200 feet of hose played an important part in the treatment of the remainder of Willow Creek. The marsh was flooded with water up to three feet deep in places and was overgrown with cattails up to ten feet in height. In order to insure a complete coverage of all the marsh, parallel trails 15 feet apart were forced through the cattails from one side to the other the full length of the marsh. A man with the high pressure hose followed and covered the area along each trail. The large beaver dam near the marsh was opened up to create a flow through a section of thick brush. A heavy concentration of rotenone was mixed into the flow as the water drained out of the dam.

From the marsh down to the reservoir, Willow Creek contained only potholes and an occasional small flow. The high pressure spray equipment was ideal for treating such sections. From the mouth of the canyon just below the Bronson ranch for a distance of approximately $2\frac{1}{2}$ miles Willow Creek had cut a channel eight to ten feet deep. The banks were lined with thick brush and trees. In order to treat this stretch of stream it was necessary for one man to walk along in the stream bed. At points approximately 400 feet apart the 200-foot hose was pulled into the brush and the stream was sprayed 200 feet above and below each point, making sure each section overlapped the previous one. Many of the potholes in this section were 10 to 40 feet long and up to 5 feet deep.

A number of checks were made along the stream to determine the completeness of the kill. Spot treatment failed to produce live fish.

Chemical Treatment - Malheur Reservoir

1. Equipment used

- a. Fifty gallons regular gas
- b. Five gallons solvent

- c. Gas hand pump
- d. Rotenone hand pump and 50 feet of hose
- e. Three aluminum 14-foot flat bottom scows
- f. One 16-foot aluminum boat with 18 h.p. outboard motor
- g. One 14-foot aluminum boat with 10 h.p. motor
- h. Five 25 h.p. outboard motors with gas cans
- i. Funnel
- j. Portable 200-gallon John Bean spray pump with 200 feet of high pressure hose and gun
- k. Three 16-foot poles for "A" frame construction
- l. Quarter-ton chain hoist
- m. Ten live boxes
- n. Outboard motor lift
- o. Six venturi attachments with hose and barrel fittings
- p. Barrel bung opener
- q. Tarp (large)
- r. One case outboard motor oil
- s. One tent

2. Personnel - Seven men

3. Chemical - Pro-Noxfish synergized liquid rotenone
 Deep water application - 55 gallons
 Shoreline application - 55 gallons
 Surface application - 990 gallons

Malheur Reservoir was treated on October 11, 1962. Approximately nine hours were required to put out 1,100 gallons of chemical. The majority of the rotenone was put out by three boats equipped with venturi devices attached to the outboard motors. One boat distributed chemical in each of three sections. One flat-bottomed scow outfitted with the 200-gallon portable spray equipment covered the entire shore line and shallow water areas. The equipment was also used to apply rotenone to the deep water areas of the reservoir.

Chemical tests for rotenone concentrations were made periodically while the reservoir was being treated and for several days afterward. Water samples were collected at various points in each section and at various depths. Results are presented in Table 4.

The treatment of Malheur Reservoir appeared to be quite effective. Approximately 20 minutes after the chemical was first introduced crappie and

rainbow began to show signs of distress in shallow water areas. By mid-afternoon, very few distressed fish were observed. The kill consisted of black crappie, rainbow, finescale suckers and shiners. It is estimated that sportsmen picked up less than 700 trout, most of which were around 12 inches in length. A check of the entire shoreline the day after the treatment revealed no live fish. Very few suckers and shiners were observed. Crappie composed the largest percentage of the kill. From strip counts made along various sections of the shoreline, it is estimated that the crappie kill was 175,000 to 200,000 fish. Better than 95 per cent of the crappie were four inches or less in length.

The day after the treatment the live boxes were checked. Fish in live boxes at all depths were dead.

On October 15, six overnight gill net sets were made at depths ranging from 5 feet to 30 feet throughout the reservoir to check completeness of kill. No fish were taken or observed. Additional gill net sets will be made in the future.

Tests for toxicity were made on November 29, 1962. Six live boxes containing 2½- to 6-inch rainbow were placed at various depths in the lower end of the reservoir. The live boxes were checked December 4, 1962. Results are given in Table 5.

TABLE 4

Results of chemical tests for rotenone concentrations
in water samples taken at various depths in Malheur
Reservoir during and following chemical treatment

Date	Sample No.	Section A		Section B		Section C	
		Depth	ppm	Depth	ppm	Depth	ppm
10/11/62	1*	5'	0.0				
	2*	25'	0.5				
	3			5'	1+		
	4			20'	1+		
	5	3'	0.5				
	6	25'	0.5				
	7					5'	1.0
10-12-62	1	3'	1+				
	2	19'	1+				
	3			5'	1+		
	4			15'	1+		
	5					2.5'	1+
	6					7'	1+
	7	5'	1+				
	8	28'	1+				
10-15-62	1	5'	-0.5				
	2	30'	-0.5				
	3			5'	-0.5		
	4			18'	-0.5		
	5					4'	-0.5
	6					8'	-0.5
10-16-62	1	5'	-0.5				
	2	28'	-0.5				
				5'	-0.5		
				19'	-0.5		
						3'	-0.5
					9'	-0.5	

* Taken 10:20 A.M.

TABLE 5

Tests for toxicity in Malheur Reservoir using
live boxes containing rainbow fingerlings

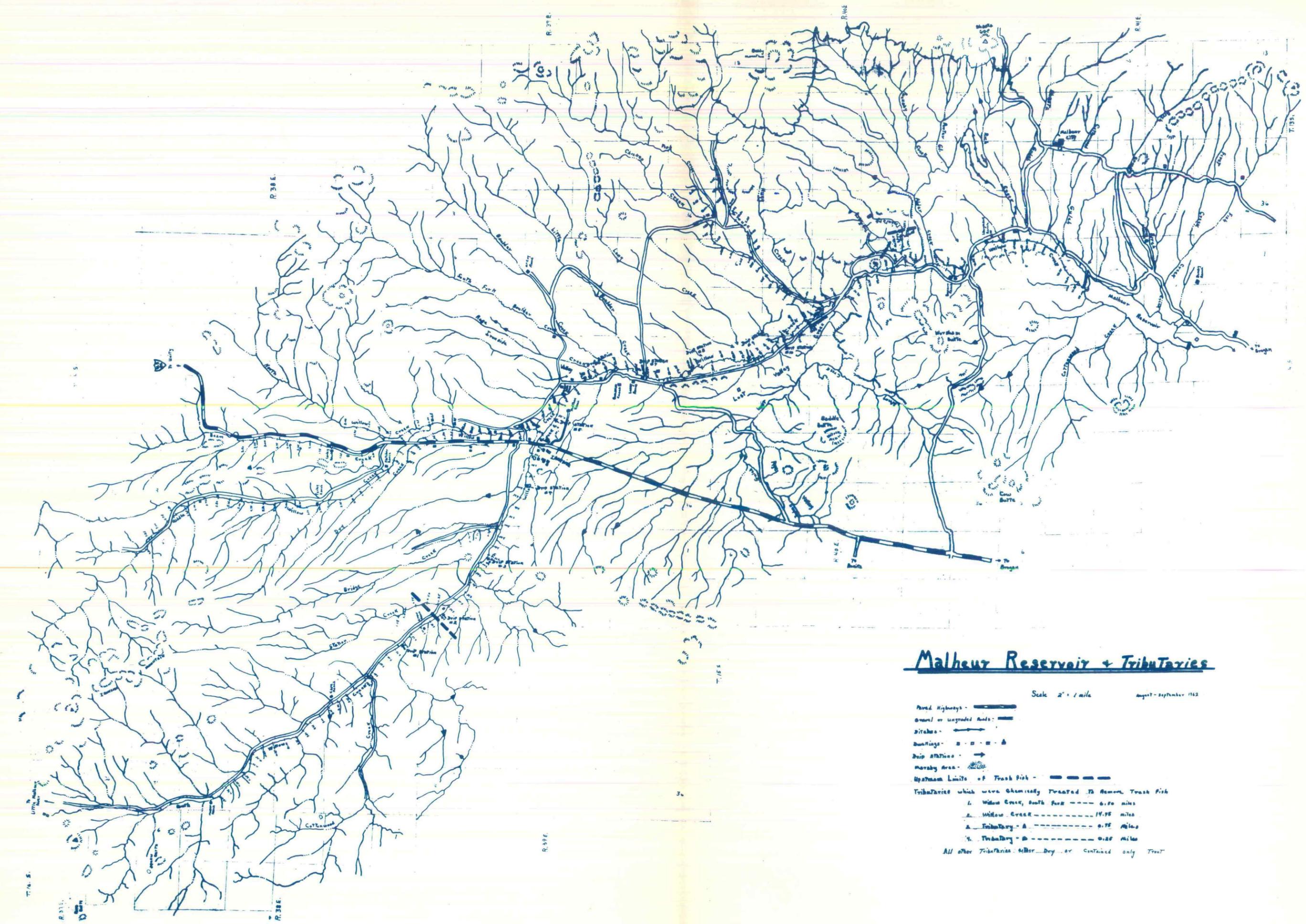
Live box No.	Depth	Time and Date set	Time and Date checked	Condition of Fish	
				No. dead	No. alive
1	9'	4:00 PM, 11-29-62	2:00 PM, 12-4-62	9	5
2/	31'	" "	" "	7	7
3	6'	" "	" "	4	6
4	30'	" "	" "	5	9
5	9'	" "	" "	7	2
6	26'	" "	" "	6	3

Approved by:

Submitted by:

Robert L. Borovicka
Coordinating Biologist

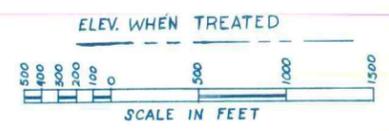
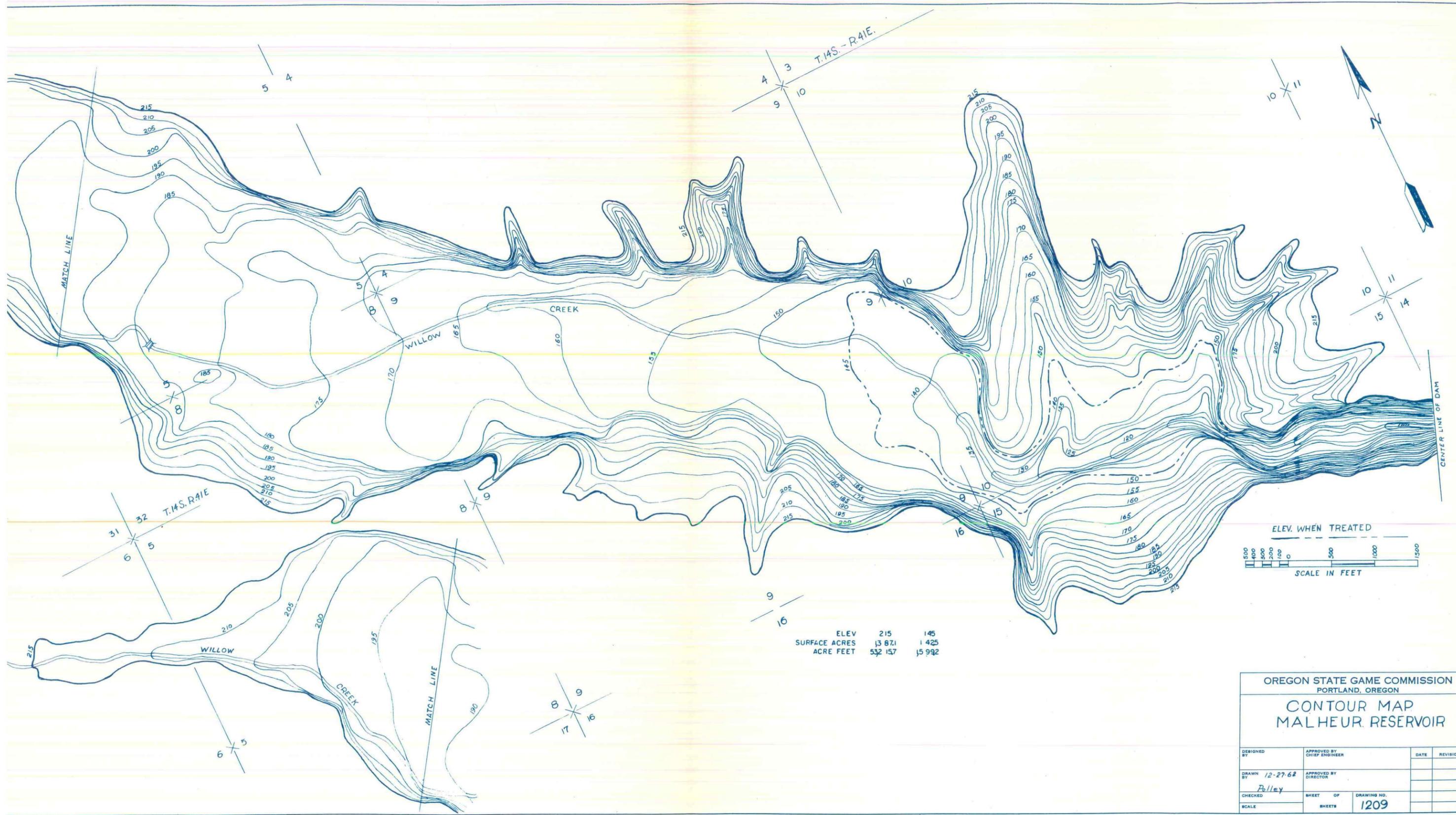
Larry Bisbee
Project Biologist



Malheur Reservoir + Tributaries

Scale 2" = 1 mile August-September 1962

- Paved Highways -
 - Gravel or ungraded Roads -
 - Ditches -
 - Damplings -
 - Deep Stations -
 - Marshy Area -
 - Upstream Limits of Trash Pick -
- Tributaries which were chemically treated to remove Trash Pick
1. Willow Creek, South Fork - 6.20 miles
 2. Willow Creek - 14.95 miles
 3. Tributary - A - 0.75 Miles
 4. Tributary - B - 0.25 Miles
- All other Tributaries either dry or contained only Trout



OREGON STATE GAME COMMISSION PORTLAND, OREGON			
CONTOUR MAP MALHEUR RESERVOIR			
DESIGNED BY	APPROVED BY CHIEF ENGINEER	DATE	REVISION BY
DRAWN BY Polley	APPROVED BY DIRECTOR		
CHECKED	SHEET OF SHEETS	DRAWING NO. 1209	
SCALE			