MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Name Southwestern Montana Fishery Study

Project No. F-24-D-27

Title Statewide Lake and Stream Rehabilitation - Hebgen Lake

Period Covered: April 1, 1960 - April 30, 1961

Abstract:

Hebgen Reservoir (15,000 acres) in southern Gallatin County, Montana on the Madison River was drawn down slowly for inspection and repair following the August 1959 earthquake in the area. A reservoir pool of approximately 5000 acre feet remained on completion of the drawdown in May 1960; inflow to the reservoir was 900 cfs. To reduce Utah chub (Gila atraria) numbers, the reservoir was treated with toxaphene at the rate of 0.025 ppm. The toxaphene was applied by spray plane to the lower portion of the reservoir pool and to the upper portion through drip stations located on the tributaries. Treated water that seeped through the closed control gates was toxic to fish for a distance of one-half mile below the dam. Very few fish were killed in the upper portion of the reservoir. It is possible that high turbidity in the upper portion of the reservoir pool was responsible for the rather poor results obtained.

Objectives:

To reduce the numbers of Utah chubs (Gila atraria) in Hebgen Reservoir through the use of toxicant. To take advantage of low water in the lake resulting from a drawdown for inspection and repairs at Hebgen Dam to carry out the rehabilitation. To achieve a fish kill in Hebgen Reservoir without killing fish for any appreciable distance in the Madison River below Hebgen Dam.

Findings:

Hebgen Reservoir, located in southern Gallatin County, Montana, R3, 4, and 5E, T11, 12 and 13S, is created by Hebgen Dam on the Madison River. The dam was completed in 1915 by the Montana Power Company for water storage. There has been an excellent sport fishery on the reservoir for brown trout and rainbow trout, but as the numbers of Utah chub increased, following their introduction by bait fishermen, the quality of the sport fishery declined. Richard Graham (1955) studied the Utah chub in Hebgen Reservoir and recommended partial population control through drawdown and rehabilitation.

The earthquake of August 17, 1959, centered near Hebgen Dam. To inspect the dam for any damage that might have been caused by the quake and to install new control gates, the Montana Power Company planned to draw Hebgen Reservoir down as far as possible during the winter of 1959. The planned drawdown presented an opportunity for the Montana Fish and Game Department to carry out the recommended rehabilitation.

The Montana Power Company planned to have their work completed and to start storing water again in April 1960. In view of low water temperatures expected at that date, toxaphene was selected as the fish toxicant to be used. The toxaphene would be applied from drip stations located on tributaries to the reservoir (Figure 1).

The gates at the dam were not closed until May 8, 1960. There remained in the pool above the dam approximately 5000 acre feet of water. Total inflow averaged about 900 cfs. To maintain a concentration of 0.025 ppm of toxaphene in the reservoir for a period of three days, 115 gallons of toxaphene (60%) were used.

Following closure of the gates, drip stations were installed as follows: At 2:00 p.m. on Duck Creek where water temperature was 49°F. At 2:30 p.m. on Grayling Creek, water temperature 44°F. At 3:30 p.m. on the South Fork of the Madison River, water temperature 49°F. At 4:00 p.m. on the main Madison River, water temperature 52°F. Thirty-gallon steel drums, fitted with adjustable taps, were used for the drip stations. Eight drums were used in all - one at Duck Creek, one at Grayling Creek, two on the South Fork of the Madison and four on the main Madison River. Ten gallons of toxaphene were put in each drum and the toxaphene was diluted with 20 gallons of socal No. 2 (Standard Oil Company solvent) so that the drip period could be prolonged for the desired period of time.

After an aerial inspection of the water area above the dam on May 9, 1960, and an outlining of the area to be covered, 25 gallons of toxaphene were applied to the pool area by spray plane.

All drip stations were checked several times on May 9 and were operating satisfactorily. Toxaphene was applied to several small spring seeps flowing into Hebgen Reservoir.

The drastic reduction in flow below Hebgen Dam when the gates were closed resulted in considerable numbers of fish being stranded in isolated pools. Some of the fish were taken by observers of the rehabilitation. Many fish were returned to the stream by the wardens. A flow of 5 or 6 cfs seeping around the gates kept the river alive until Cabin Creek and Beaver Creek entered the channel approximately 3/4 mile and 1 mile below the dam respectively. Together the two streams maintained a flow of approximately 50 cfs.

Water quality determinations on May 9 showed Hebgen Lake at the dam to have a pH of 7.6, an alkalinity of 87 ppm, and a water temperature of 54°F. Grayling Creek at 10:00 a.m. had a water temperature of 39°F, alkalinity was 46 ppm and the pH was 7.3. Water temperature in Duck Creek was 50°F. at 12:30 p.m., 54°F at 3:15 p.m., Alkalinity in Duck Creek was 46 ppm and the pH was 7.3. The South Fork of the Madison River had an alkalinity of 26 ppm, a pH of 7.3 and at 11:00 a.m. the water temperature was 48°F. Measurements on the main Madison River were very nearly identical to those at Hebgen Dam. At 10:00 a.m. the water temperature was 54°F, alkalinity was 86 ppm and the pH was 7.6.

Because the tributary streams were flowing through silt accumulations in the old lake basin and because of wind action, the upper end of Hebgen Reservoir was very turbid. The lower end of the reservoir near the dam was quite clear.

Very few dead fish were seen on the shoreline of Hebgen Reservoir; however, in the section of river channel from Hebgen Dam to Cabin Creek, large numbers of dead and dying fish were observed. Dying fish, largely trout and whitefish, exhibited typical tocicant reactions. The water in this section of the river was entirely from seepage around control gates at the dam - water that had beem sprayed with toxaphene by plane on May 9.

Two to three hundred dead fish, primarily whitefish and small trout were observed in small backwater pools in the South Fork of the Madison River below the drip station. All drip stations were adjusted so that toxicant application would be completed by the afternoon of May 10.

Observations were made on succeeding days, May 11 and May 12, along the Hebgen Reservoir shoreline and along the tributaries into the reservoir; very few dead fish were seen.

By May 16 flows below Hebgen Reservoir had increased because of greater pressure on the control gates. Fish were still being affected in the section of river between Hebgen Dam and Cabin Creek; an estimated 1500 trout, dead and dying were observed in this stretch. An equal number of dead whitefish and a few dead Utah chubs were seen in the same section.

No dead fish were seen on the shores of Hebgen Reservoir on an inspection by boat on May 25.

On June 2, 1960, four 125-foot experimental gill-nets were set overnight in Hebgen Reservoir (Figure 1). At that time resort operators, John Steffler and Frank Jans reported seeing large numbers of Utah chubs in the upper end of the reservoir.

Net No. 1, Steffler Resort Area, upper end of reservoir near inlet. Net set at 4:00 p.m., June 2, lifted at 8:00 a.m., June 3., a total of 16 hours.

Species	Number	Inches Total Length
Utah chubs	175	6.5 to 14.0
LL Trout	3	17.5 to 28.9
Rb Trout	1	8.3
Whitefish	4	10.5 to 13.5

Net No. 2, Steffler Resort Area, upper end of reservoir. Net set at 4:30 p.m. June 2, lifted 7:30 a.m. June 3, a total of 15 hours.

Species	Number	Inches Total Length
Utah chubs	114	6.7 to 13.5
LL Trout	2	7.5 to 29.3
Rb Trout	1	14.3
Whitefish	3	12.2 to 16.0

Net No. 3, Howard Wells Resort Area, lower section of Hebgen Reservoir. Net set at 6:00 p.m., June 2, net lifted 10:00 a.m. June 3. A total of 16 hours.

Species	Number	Inches Total Length
Utah chubs	32	10.2 to 13.0
LL Trout	6	13.0 to 21.0
Rb Trout	10	10.0 to 15.0
Whitefish	7	10.3 to 14.5

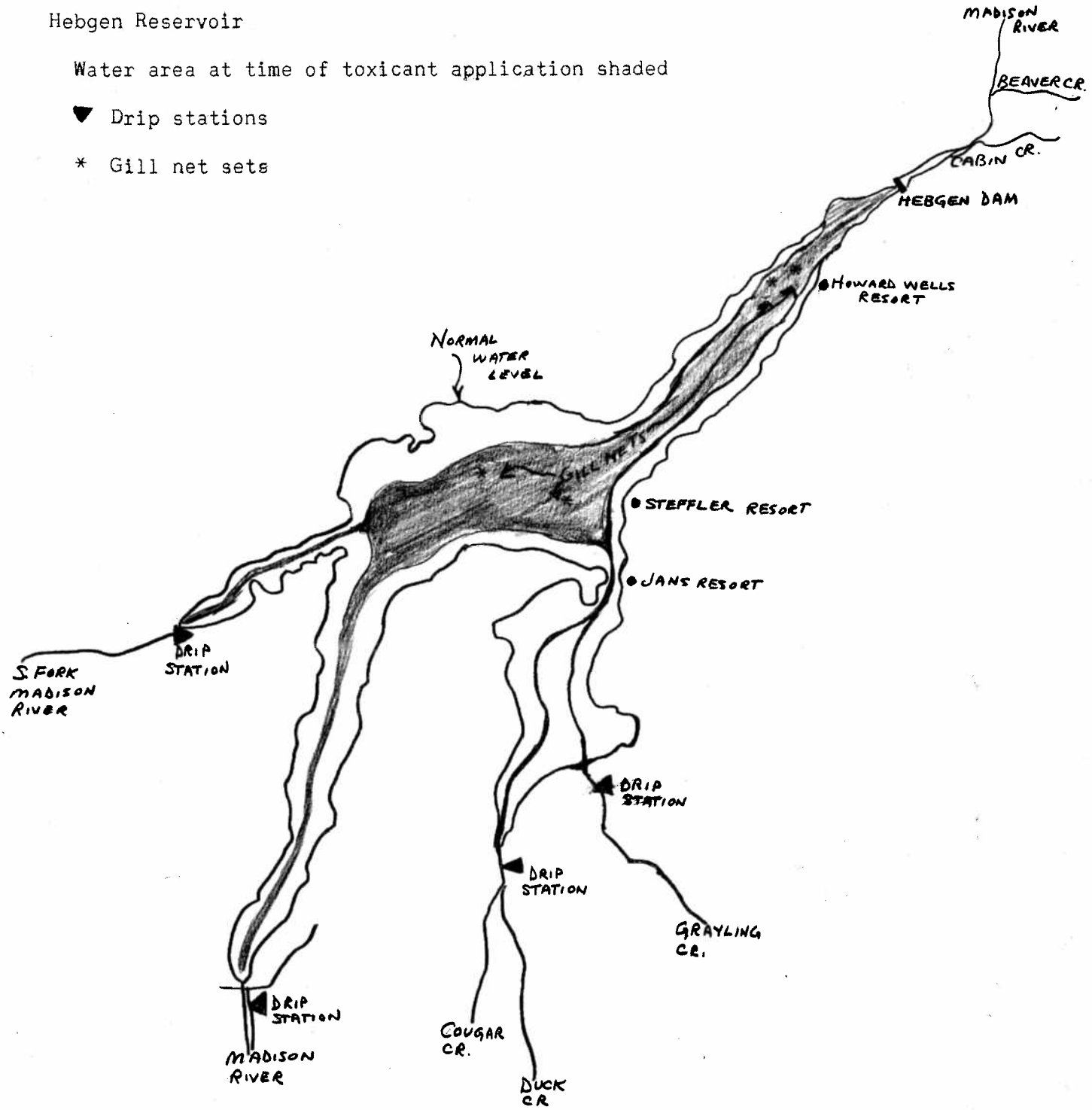
Figure 1

Hebgen Reservoir

Water area at time of toxicant application shaded

▼ Drip stations

* Gill net sets



Net No. 4, Howard Wells Resort Area, lower section of Hebgen Reservoir. Net set 6:30 p.m. June 2, net lifted 9:30 a.m. June 3. A total of 15 hours.

Species	Number	Inches Total Length
Utah chubs	2	11.8 to 12.0
LL Trout	7	11.2 to 15.0
Whitefish	21	9.8 to 17.0

Observations and gill netting showed the rehabilitation had not accomplished the desired result of reducing by any great amount, the numbers of Utah chubs in Hebgen Reservoir. Since considerable numbers of fish were killed below Hebgen Dam by the treated water that seeped around the control gates, it was assumed that the high turbidity in the upper end of the lake had reduced the effectiveness of the toxaphene.

Recommendations:

That tests be carried out to determine the effects of turbidity on the toxicity of varying concentrations of toxaphene.

Prepared by: William Alvord
June 28, 1961

Approved by: Walter J. Everin
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and Game Department