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MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-7-R-11 Name: Northwest Montana Fishery Study

Job No. I Title: Inventory of Waters of the Project Area

Period Covered: May 1, 1961 to June 30, 1962

Abstract: Twenty-eight lakes and three streams in the project area were surveyed for basic physical, chemical and biological characteristics. Fourteen lakes were considered high-mountain lakes, the remainder were lakes on the valley floor.

An aqua-air pumping system was evaluated in respect to the effects on the water temperatures and oxygen concentrations in Lauri Lake during the winter.

Prior to the installation of the air system, oxygen concentrations on the bottom (22 feet maximum depth) dropped from 8.0 ppm to less than 3.0 ppm in one month. One week after installation of air, oxygen concentration on the bottom increased to 7 ppm. During the air operation the same concentrations progressively increased to more than 10 ppm.

Temperature effects recorded during the operation indicated water circulation created by the induced air gradually cooled the entire lake. This cooling effect was maintained throughout the entire operation. After the air was terminated, the lake gradually settled back to the normal temperature graduation. No direct effect on fish was observed.

Objectives: The purpose of this project is to determine the physical, chemical and biological characteristics of the waters of highest importance to the total recreational fisheries picture of the project area, and where practicable, to obtain estimates of existing or potential fisherman use.

Techniques Used: Samples of fish were taken by gill nets (125' graduated experimental nets), 110 - 220 A.C. electro-fishing device, cresol, and angler creel checks. Inlets to lakes and potential gravel areas in streams were observed for spawning facilities. Aerial photographs of lakes surveyed were converted to work maps, from which areas and volumes were determined. Depths were determined with the use of an echo sounder. Age and growth determinations were made at the department's fisheries laboratory, Bozeman.

Findings: The following lakes were sampled for fish population and fish growth information: Basham Lake, Loon Lake, Blue Lake, Cedar Lakes (3), Cabin Lake, Fatty Lakes (3), Lake of the Woods, McCaffery Lake, McGillery Lake, Middle Piper Lake, Fish Lakes (2), Skaggs Lake, Skyuma Lake, Nine Pipe Ponds (3), Palisade Lakes (2), Little Salmon Lakes (2), Meadow Lake, Sunday Lake, and Blanchard Lake. All the above lakes are principally trout lakes with the exception of Blanchard Lake. This lake, near Whitefish, Montana, is being managed for largemouth bass and yellow perch.

The following lakes were surveyed for various physical, biological and chemical characteristics needed to determine the feasibility of fish eradication: Little Beaver Lake, Beaver Lake, Little McGregor Lake, Moran Lake, Carpenter Lake, Bootjack Lake, and Lake Blaine.

Public fishing access areas were procured on Smith (Kila) Lake and Blanchard Lake. It was determined that access was available to all other lakes surveyed for fish eradication.

Three streams were surveyed for physical and biological characteristics, White Clay Creek, Finley Creek and Little Bitterroot River. Work on the Little Bitterroot River was a preliminary survey on the distribution of the northern pike. This river (a tributary to the Flathead River) mouths near Moiese, Montana. Investigations indicated that the northern pike are spread throughout the primary drainage (40 miles) and are throughout the entire irrigation system (42 miles of ditches) of the Niarada-Lonepine-Hot Springs valley.

Some concern of winter kill in Lauri Lake was anticipated after the inlet completely froze early in December. Since this lake (35 surface acres - maximum depth 23 feet) is managed for westslope cutthroat trout brood stock, an aqua-air system was installed. The effects of the system on this body of water were measured by periodic series of temperatures and oxygen concentrations. Temperatures were recorded at two foot intervals with a resistance thermometer and oxygen concentrations were calculated by the standard Winkler method. All series were taken through the ice at one station located in the deepest area of the lake. The sample station was 200 feet from the air supply hose. Ice depths ranged from 9 to 14 inches with 2 to 6 inches of snow ice lying above the lower clear ice.

The air system comprises a 3 H.P. electric motor on a C-80 Curtis air compressor and 800 feet of three-quarter inch plastic hose perforated every 10 feet. The equipment was installed on January 19. The following day, the bubbling opened up a channel of water six feet wide along the hose. The maximum open channel of sixteen feet was reached after one week of operation. The air was terminated on March 23rd.

The temperature series were started on January 5, Figure 1. Three series (Figure 2) were taken during the air operation and one series (Figure 3) 10 days after the termination of air. After the installation of air(January 24) the temperatures (top to bottom) varied less than two degrees Fahrenheit compared to nine degrees found on January 5th. A general trend of two degree spread followed throughout the entire operation, although the entire lake generally cooled 3 degrees during the extreme cold weather (air temperature -20°F.) period in early February. After the system was terminated, the temperature variation from top to bottom increased to 3 degrees with most of the change occurring within six feet of the surface.

The oxygen series were started on December 21. A total of four series were taken prior to aeriation, three series during air operation and one series 10 days after termination of aeriation (Figure 4). Water samples for dissolved oxygen determinations were taken at 2-, 12- and 22-foot depths. The dissolved oxygen concentration at the bottom of the lake prior to the

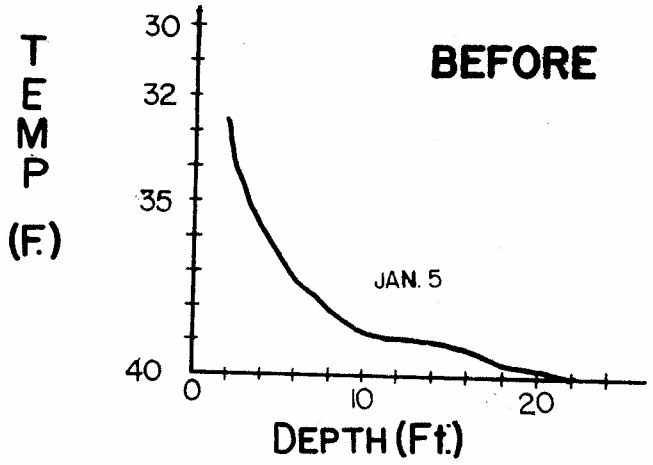

Figure 1. Lauri Lake temp. series before air instillation.

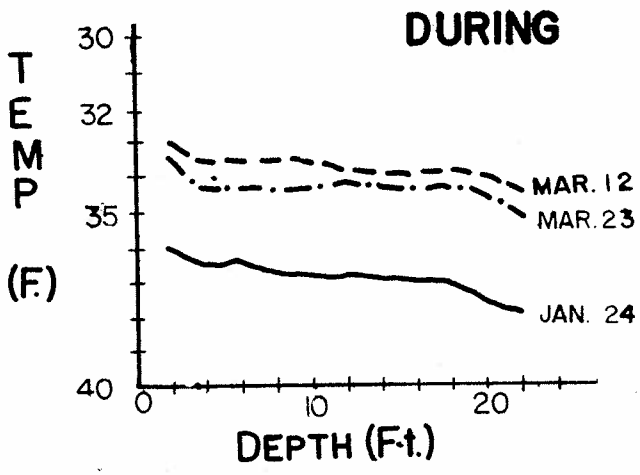

Figure 2. Lauri Lake temp. series during air operation.

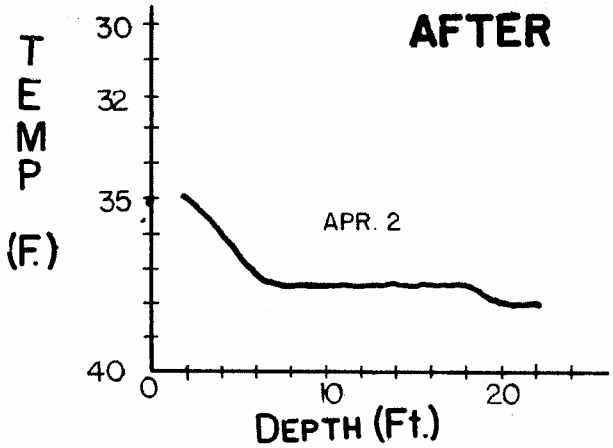

Figure 3. Lauri Lake temp. series after air instillation.

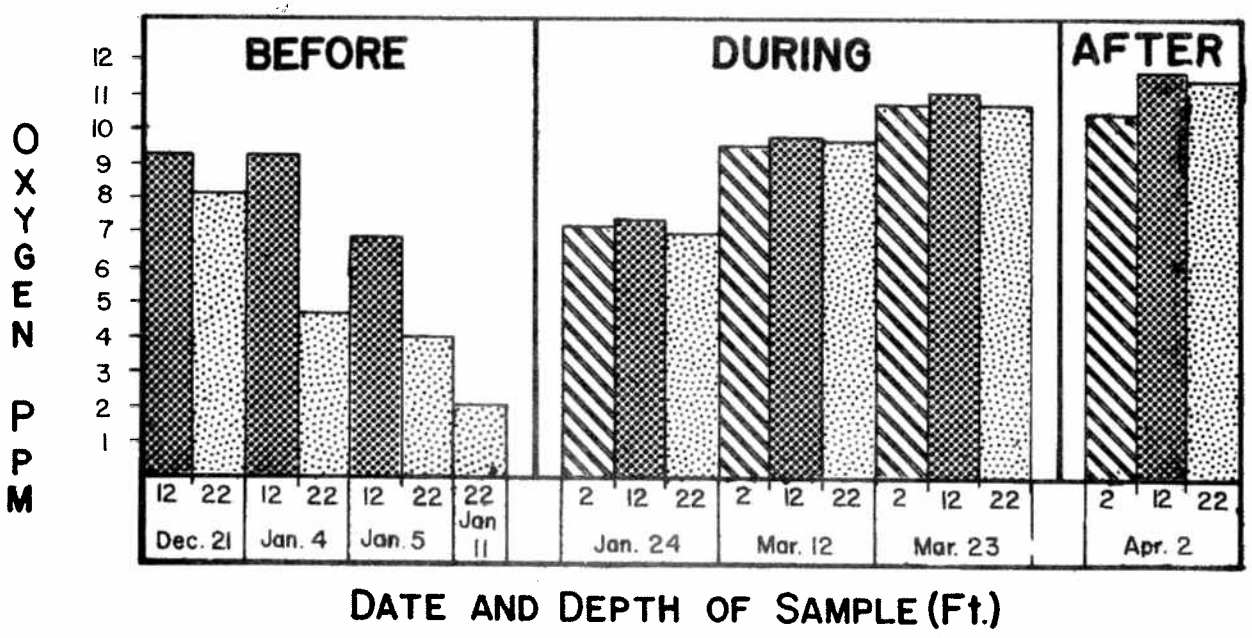

Figure 4. Lauri Lake oxygen concentrations before, during and after the aqua-air system.

installation progressively dropped from 8 ppm to less than 3 ppm on January 11. During the period air was introduced, the dissolved oxygen progressively increased. Ten days after the air was terminated both the mid and bottom samples increased to 11+ ppm; however, the top sample had decreased to 10.5 ppm. At the time of air termination, the lake was still covered with ice, except the portion kept open by the air system. The lake remained under this same ice cover until break-up time about two weeks later.

Fish sampling during the air operation indicated no particular fish concentrations near the open water or air supply hose.

Observations were made on the fish during the spawning operation at the lake in late April. Five hundred fish ascended the inlet stream to the trap. Both the numbers of fish and egg production were comparable to production figures over the last two years.

Information collected during the report period was placed on two sets of 6 x 9 inch survey cards, one set retained at district headquarters and the other forwarded to the Helena office.

Recommendations: It is recommended that this project be continued as a means of furnishing needed data for sound recommendations on fish management.

The use of the aqua-air system apparently was the averting factor in the prevention of winter kill in Lauri Lake. No apparent detrimental effects were observed; however, it is recommended that the experimental work be continued to develop the benefits aqua-air systems may provide for fisheries management.

Prepared by D. A. Hanzel

Approved by George D. Holton

Date