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STATE OF ALASKA

William A. Egan, Governor

Alaska Department of Fish and Game

Walter Kirkness, Commissioner

Sport Fish Division

Alex H. McRea, Director

ANNUAL REPORT OF PROGRESS, 1961-1962

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-3

SPORT FISH INVESTIGATIONS OF ALASKA

Richard Haley, Coordinator, Juneau
Robert Baade, Fishery Biologist, Ketchikan
Roger Wadman, Fishery Biologist, Wrangell
Jeremy Sexsmith, Fishery Biologist, Kodiak
Sidney Logan, Fishery Biologist, Seward
Frank Stefanich, Fishery Biologist, Anchorage
Edward J. Cramer, Fishery Biologist, Anchorage
Rupert E. Andrews, Fishery Biologist, Palmer
George Van Wyhe, Fishery Biologist, Glennallen
Henry J. McKirdy, Fishery Biologist, Fairbanks

INTRODUCTION

This report of progress consists of the job completion reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-3, "Sport Fish Investigations of Alaska."

The current project is composed of twenty separate studies and was designed to evaluate the various aspects of the State's recreational fishery resources. The information gathered will provide the necessary background data for better management practices and for the development of future studies. During the current segment, continued emphasis was placed on the overall inventory and cataloging of accessible waters, evaluation of catch data, and investigations on various species of fish.

As a result of several problems of immediate concern, several new studies were instigated during the report year. Data accumulated from these studies has helped solve some problems in projects already in progress.

The population of Alaska is increasing rapidly and this is being reflected in the ever increasing number of "No Trespassing" signs put up by individuals in the vicinity of population centers. Fortunately, much of Alaska's fishery waters are still in the public domain. The division's program of acquiring access to fishing waters continued at a much faster pace since being instigated in 1959. Emphasis is being placed on this job and the successful continuation of this activity will forstall many serious recreational use problems currently facing other states.

The enclosed progress reports are fragmentary in many respects and the interpretations contained therein are subject to re-evaluation as the work progresses.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

State: ALASKA

Project No: F-5-R-3 Name: Sport Fish Investigations of Alaska

Job No: 8-C-3 Title: Evaluation of the Fire Lake Hatchery Water Supply

Period Covered: July 1, 1961 to April 1, 1962

Abstract:

Due to lack of manpower, records were not obtained for the entire year, however, the critical period was covered. It was found that the dissolved gases that were injurious to fish could be dissipated by a simple baffle system at the head of each trough. The aluminum baffles aerated the water sufficiently so that the oxygen content was increased. The volume of water flowing through the pipeline during the winter months was manipulated so that the line did not freeze and also kept the water temperature on the eggs, and the resultant fry, at about 38°F. Records were kept of snow and ice cover, dissolved oxygen, alkalinity and temperature at the various depths during the winter months, of Upper Fire Lake. Approximately 75 gallons of water per minute was sufficient to hatch the silver salmon eggs and hold them until they reached the swim-up stage. During periods of sub-zero temperatures, some water was bypassed to keep the water temperature up; however, sufficient water was maintained in Upper Fire Lake so that some water flowed in the outlet stream.

Recommendations:

It is recommended that this study be continued so that sufficient records are available to devise appropriate charts and graphs to manipulate the water volume and intake depth. The baffle system should be tested for a complete year before any further work is done to alleviate the effects on fish by dissolved gases.

It is further recommended that other measures be taken to alleviate the collection of gases in the 8-inch water line.

Objectives:

To evaluate the Fire Lake Hatchery water supply and to provide recommendations for improvements and procedures designed to fully utilize its potential.

Techniques Used:

Water flow measurements were taken periodically at the outlet of the hatchery and at a station above the hatchery outlet. Dissolved oxygen tests were taken periodically in Upper Fire Lake at the intake tower and in the hatchery. Ice and snow thickness was measured during each sampling period. A seven-day temperature recording device was installed in the hatchery during the latter part of February.

Findings:

Perhaps a brief description of the hatchery and its operation are in order so that the water line system is understood. There is 2,000 feet of 8-inch pipe from the hatchery to the edge of Upper Fire Lake (Figure 1). From the edge of the lake to the intake tower, there is about 400 feet of river crossing pipe. The intake is so constructed that water can be taken from any depth of the lake down to a maximum of 24 feet. There is a difference of elevation between the lake level and the hatchery of about 34 feet. The hatchery has forty troughs set in tandem so that water from the upper 20 troughs spills into the lower twenty troughs. For each set of troughs there is a two-inch valve connected to the main line. Each trough is limited to a maximum of 28 gallons per minute, due to the size of the drain. In the past two years, very little has flowed out of Upper Fire Lake when the hatchery was operating, during the months of March and April. Records kept during the critical low water months give a range of 216 to 360 gallons per minute. These measurements were taken between March 2 to April 1, 1962. Water used in the hatchery was about 75

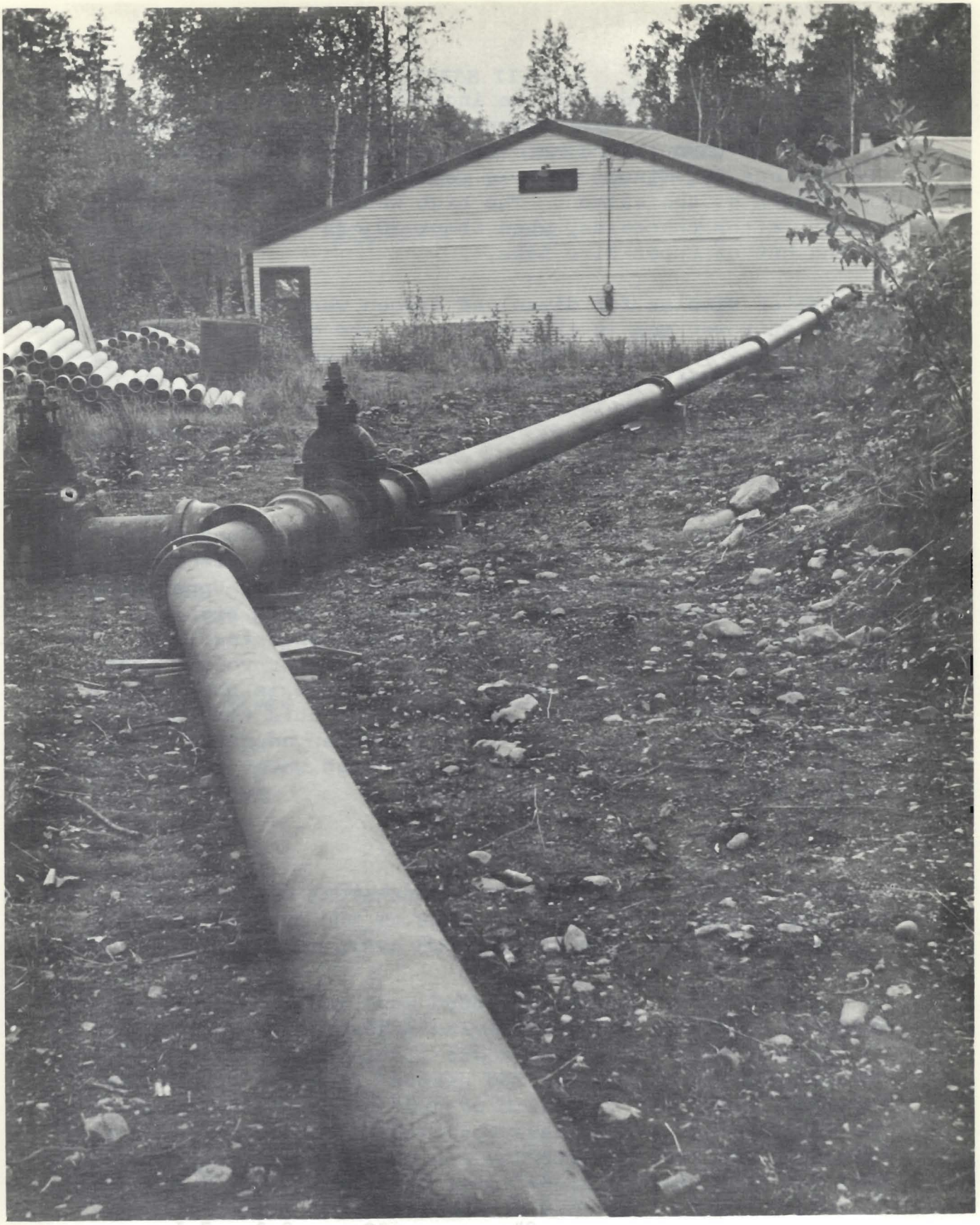

Figure I.

**The Hatchery Water Supply Line
With the Bypass Valve on the Left.**

gallons per minute during the incubation of the silver salmon eggs and the development of the fry. On about March 27 the flow through the hatchery was increased to about 200 gallons per minute and was periodically increased with the growth of the salmon. The high water occurred in September, after the rains, when about 20 cfs was measured coming out of Upper Fire Lake.

Water samples for dissolved oxygen were taken at the inlet tower and in the hatchery. The dissolved oxygen and alkilinity in Upper Fire Lake at the surface, 10-foot and 20-foot depths are presented in Tables I through III. Dissolved oxygen levels are satisfactory for the time covered. The thickness of the ice cover was recorded when the oxygen samples were taken. The ice cover gradually thickened as the winter progressed.

During the summers of 1960 and 1961 the amount of water in the lake was increased by a home owner placing fill in the old beaver dam, thus raising the level of Upper Fire Lake about 10 inches. Fire Creek was extremely high in September and October and gradually diminished in flow until about the first part of April when water volume again increased. The critical time of water usage is the month of March and the first half of April. At this time only that amount of water is used to maintain an adequate supply to the fish and a sufficiently high enough water temperature to keep the pipeline from freezing.

TABLE 1.

DISSOLVED OXYGEN, ALKILINITY AND TEMPERATURE OF WATER AT THE INTAKE TOWER OF UPPER FIRE LAKE AT THE SURFACE OF THE WATER FROM FEBRUARY THROUGH APRIL OF 1962

Date	Depth	Ice Cover	Temp.	DO	pH
Feb. 2	0		32°	8.0	7.8
Feb. 13	0		32°	8.2	
Feb. 20	0		32°	7.6	7.3
Feb. 27	0	15"	32°	11.8	
Mar. 6	0	21"	32°	8.1	7.1
Mar. 12	0	20"	32°	7.1	
Mar. 20	0	20"	32°	8.2	7.1
Mar. 27	0	20"	32°	7.5	7.1

TABLE II.

DISSOLVED, OXYGEN, ALKILINITY AND TEMPERATURE OF WATER AT THE DEPTH OF 10 FEET OF UPPER FIRE LAKE FROM FEBRUARY THROUGH APRIL OF 1962

Date	Depth	Ice Cover	Temp.	DO	pH
Feb. 5	10'		34°	7.1	
Feb. 13	10'		34°	6.5	6.7
Feb. 20	10'		37°	8.0	
Feb. 27	10'	15"	37°	7.0	
Mar. 6	10'	21"	36°	7.1	
Mar. 12	10'	20"	35°	5.9	
Mar. 20	10'	20"	35°	6.9	
Mar. 27	10'	20"	35°	7.0	

TABLE III.

DISSOLVED OXYGEN, ALKILINITY AND TEMPERATURE OF WATER AT THE DEPTH OF 20 FEET OF UPPER FIRE LAKE FROM FEBRUARY THROUGH APRIL OF 1962

Date	Depth	Ice Cover	Temp.	DO	pH
Feb. 5	20'		37°	5.8	7.6
Feb. 13	20'		37°	5.7	
Feb. 20	20'		38°	6.0	7.3
Feb. 27	20'	15"	39°	5.5	7.2
Mar. 6	20'	21"	38°	5.1	7.0
Mar. 12	20'	20"	37°	3.8	7.0
Mar. 20	20'	20"	37°	5.6	6.9
Mar. 27	20'	20"	38°	4.4	7.0

The problem of "gas bubble disease", in the trout and salmon, has occurred only during the months of July and August. In July of 1961, after the fish showed symptoms of "gas bubble disease", wooden baffles were built and placed at the head of each trough to dissipate the gases. Some of the fish died but many recovered, while the greatest majority of the fish had not yet demonstrated any signs of distress. No mortalities from bubble disease occurred after installation of the baffle devices. Permanent aluminum

baffles were constructed during the winter which not only will remove the noxious gases during the summer months, but which also have demonstrated an increase in the oxygen content of the water during the winter months. During the period of ice cover, the intake of the water line was lowered to about 20 feet and remained at this depth the entire winter. During the open water period, the depth of the intake is adjusted so that the hatchery water does not exceed 55°F. During the entire period of ice cover, no noticeable change of water temperatures was observed at the station in the lake. It is anticipated that with the volume of water used during ice cover, the temperature of the water will not be decreased. The past winter was moderately severe, and a large volume of water was bypassed, for two reasons, (1) to keep the water temperature around 38°F for satisfactory incubation, and (2) to diminish the possibility of freezing of the water line. About 2,000 feet of the pipeline is exposed to the atmosphere and there is some loss of heat. No measurements were taken of the volume of water bypassed at the different air temperatures.

No solution was found that would prevent the water line from filling up with gases and thereby decreasing the water pressure. About once a week, personnel at the hatchery would decrease the water supply enough to sustain fish life while gases were released from the water line at the release valve at its highest point. After the gases were released from the water line, the water supply was increased to the fish. This operation would take about 20 minutes and was undertaken only during the latter part of July and the month of August. No problem was encountered with the outside tanks, due, no doubt, to the spray system used.

Information collected to date is insufficient to provide for appropriate charts and graphs for use in manipulating the water supply, especially during the winter months. In the summer months when temperatures of the water went over 55°F, the intake was simply lowered until the desired temperature was obtained. This manipulation was easily undertaken.

Prepared by:

Frank A. Stefanich
Fishery Biologist

Approved by:

Richard Haley
D-J Coordinator

Alex H. McRea, Director
Sport Fish Division