MONTANA DEPARTMENT OF FISH AND GAME

FISHERIES DIVISION

Job Progress Report
Research Project Segment

State: Montana — Title: Reservoir Investigations

Cooperators: Washington Water Power Company — Title: Noxon Rapids - Cabinet Gorge Reservoirs Study

Project No: F-34-R-6

Job No: I-a

Period Covered: July 1, 1971 - June 30, 1972

Summary

Temperature and oxygen profiles were collected from two stations in each reservoir during the summer of 1971. Trapping of Prospect Creek, tributary of Noxon Rapids, in fall 1971 caught no brown trout entering this creek for spawning. Burbot (Lota lota) were planted in Noxon Rapids in 1971 and kokanee (Oncorhynchus nerka) in 1971 and 1972. Sampling to determine success of these plantings were cancelled.

Background

Noxon Rapids and Cabinet Gorge Reservoirs are "run-of-the-river" hydroelectric impoundments owned and operated by Washington Water Power Company. The company and Montana Department of Fish and Game have cooperated in fishery studies since 1956. The reservoirs have followed the "typical" sport fishing pattern; good angling during early years of impoundment tailing off to a mediocre fishery as the reservoirs aged. Cabinet Gorge Reservoir was planted with large numbers of Yellowstone cutthroat (Salmo clarki), kokanee and a few coho salmon (Oncorhynchus kisutch) in the mid-1950's. Both reservoirs were planted with large numbers of various size rainbow trout (Salmo gairdneri) in the late 1950's and early 1960's. Noxon Rapids Reservoir was planted with good numbers of brown trout fry in the mid-1960's. None of these plantings of fish have produced a fishery of importance.

Each reservoir has a rapid rate of water exchange under normal operation. The rate of exchange for Noxon Rapids during the summer is 75 days while the rate for Cabinet Gorge is about 15 days. The annual fluctuation of Noxon Rapids has averaged about 40 feet while fluctuation of Cabinet Gorge has been about 10 feet. Both contain a sizeable population of non-game fish including peamouth (Mylocheilus caurinus), northern

squawfish (Ptychochelius oregonensis), redside shiner (Richardsonius balteatus), largescale sucker (Catostomus macrocheilus) longnose sucker (C. catostomus), yellow perch (Perca flavescens), bullhead (Ictalurus melas) and pumpkinseed (Lepomis gibbosus). Game fish found in each reservoir include rainbow trout, brown trout, westslope cutthroat trout (Salmo clarki subsp.), Dolly Varden (Salvelinus malma), mountain whitefish (Prosopium williamsoni), lake whitefish (Coregonus clupeaformis) and largemouth bass (Micropterus salmoides).

Research and management activities since 1970 have centered around an attempt to establish species of fish that might survive in the fluctuating reservoir environment and compete with the substantial non-game fish population. Burbot and kokanee were selected for possible success. Burbot are pisciverous through much of its life cycle while kokanee are primarily plankton feeders. Burbot and kokanee may be less dependent upon an invertabrate food source than the other Salmonids planted.

Objectives

The objectives of this job were: (1) plant burbot and kokanee if possible; (2) trap and enumerate the spawning run of brown trout moving into the Prospect Creek drainage in fall of 1971; (3) test net either or both reservoirs to determine survival of burbot and kokanee planted in May 1971. An additional objective was added in mid-July 1971 when Washington Water Power Company offered labor needed to collect temperature and oxygen profiles in Noxon Rapids and Cabinet Gorge.

Procedures

Sampling to determine survival of burbot and kokanee was postponed. The small size of the kokanee and the small numbers of burbot would have necessitated a major effort with small chance of success. Montana's hatchery section planted about 400,000 kokanee fry into Clark Fork River near Plains, Montana in May 1972. The planting site is about 28 miles upstream from Noxon Rapids Reservoir and 66 miles above Cabinet Gorge Reservoir. A trap designed to capture brown trout entering the Prospect Creek drainage was installed October 18, 1971 and fished through November 18, 1971. Fish caught were to be identified by species and data on length and sex taken from brown trout. All fish were released upstream.

Temperature and oxygen profiles were taken at 2 stations in each reservoir starting in mid-July and ending in mid-September, 1971. These stations were the same as were used in 1960 and 1962. A resistance thermometer was used to obtain temperatures and the depth was recorded for each 1° F change from surface to bottom. Oxygen determinations were made using the Winkler method and samples taken from the surface and each 50-foot interval or fraction thereof between the surface and bottom and data filed at Regional Fisheries office. Each station was sampled at two-week intervals.

Findings

The upstream trap fished in Prospect Creek from October 18 through November 18, 1971 caught no brown trout and a few mountain whitefish and largescale suckers. It is likely that a spawning run of brown trout into Prospect Creek no longer exists although a few brown trout are still found in Noxon Rapids Reservoir.

It is thought that the unstable environment of the reservoir is the primary reason for the failure of brown trout. Another factor may be downstream movement of these fish into Cabinet Gorge Reservoir and Lake Pend Oreille, Idaho. Idaho Fish and Game personnel have reported that catch of brown trout from Lake Pend Orielle has increased markedly since 1970.[1] Limited gill net sampling in Cabinet Gorge Reservoir in fall 1971 and 1972 indicates brown trout are more numerous than in the lake 1960's.

Temperature and oxygen profiles were taken from two stations in Cabinet Gorge and Noxon Rapids Reservoirs. Cabinet Gorge reservoir is 16 miles long and the stations were three miles and 11 miles above the dam. Noxon Rapids Reservoir is 38 miles long and the stations were six miles and 18 miles above the dam. Surface and bottom temperatures and dissolved oxygen values are given for each reservoir and station in Tables 1 and 2.

Table 1. Surface and bottom oxygen and temperatures, Noxon Rapids Reservoir, 6 mile and 18 mile stations, summer 1971.

Date	Max. Air Temp.	6 Mile Station			18 Mile Station		
		Depth	Temp.	Oxygen	Depth	Temp.	Oxygen
July 23	92	Surface	74°F	8 ppm	Surface	70°F	9 ppm
		150 feet	60	9	112 feet	68	12
Aug. 5	96	Surface	76	8	Surface	72	9
		150 feet	61	7	112 feet	67	8
Aug. 18	86	Surface	72	8	Surface	72	9
		150 feet	68	7	112 feet	69	8
Sept. 2	68	Surface	70	7	Surface	69	8
		150 feet	67	7	112 feet	66	7

[1] Personal communication from Tim Vaughn, Wildlife Biol., Washington Water Power Co.

Table 2. Surface and bottom oxygen and temperatures, Cabinet Gorge Reservoir, 3 mile and 11 mile stations, summer 1971.

Date	Max. Air Temp.	3 Mile Station Depth	Temp.	Oxygen	11 Mile Station Depth	Temp.	Oxygen
July 30	89	Surface	68°F	9 ppm	Surface	68°F	8 ppm
		90 feet	68	10	47 feet	68	9
Aug. 13	90	Surface	70	9	Surface	70	8
		90 feet	70	9	47 feet	70	9
Aug. 25	82	Surface	68	7	Surface	69	7
		90 feet	68	7	47 feet	69	7
Sept. 10	79	Surface	65	8	Surface	65	6
		90 feet	65	7	47 feet	65	7

Neither reservoir formed a thermocline during the period sampled. During the period of July 23 and August 5, the 6 mile station did show a wider range of temperatures from bottom to surface with almost all of the change near the surface, or near the bottom. The greatest change was from 67° F to 62° F at depths of 125 feet to 140 feet.

The homothermous temperatures found in Cabinet Gorge can be expected since almost all of its inflow is through deep (about 150 feet) penstocks in Noxon Rapids Dam. The near homothermous condition of Noxon Rapids may be related to rapid exchange rates and inflows passing through a low-head hydroelectric reservoir immediately upstream.

Oxygen levels at all depths and all stations were above the minimum needed for game fish survival.

Temperature and oxygen levels were well within the lethal tolerance limits of most salmonids during the time sampled, but great masses of water in each reservoir were above the desirable temperature range for most salmonids. The temperature and oxygen data collected in summer 1971 are in close agreement to similar data collected from the same stations in summer 1960 and 1962 (Huston, 1965).

Recommendations

Operation of the upstream trap in Prospect Creek to capture brown trout should be discontinued. Reservoir sampling to determine success of

planting kokanee and burbot should start in 1972 and peak with an intensive effort about 1976. Investigation of the fishery potential of several small ponds connected to the reservoirs by narrow outlets or culverts should be started. Washington Water Power Company should be a cooperator in developing any ponds which lie within reservoir project boundaries, affect Burlington Northern Railroad Company right-or-way, and would require some engineering and construction effort.

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Date: February 15, 1973

Waters referred to:

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Bibliography

Huston, Joe E., 1965. Investigation of two Clark Fork River Hydroelectrical Impoundments. Pro. Mont. Acad. Sci., 25:20-40pp.