The fishery resource of Mystic Lake, Montana
by Michiel Dwayne Poore

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Fish and Wildlife Management
Montana State University

Abstract:
A study of the brook trout, rainbow trout, cutthroat trout, rainbow X cutthroat trout hybrids, and lake trout in Mystic Lake was conducted during 1971 and 1972. Age and growth determinations and population estimates were made on fish captured by fyke nets, experimental gill nets, vertical gill nets, hoop nets, electrofishing and angling. Growth rates of rainbow trout, cutthroat trout, and rainbow X cutthroat trout hybrids were similar and greater than the growth rates of brook trout and lake trout. Brook trout grew faster than lake trout until age IV. A total of 1,805 trout over 8.5 centimeters in total length having a standing crop of 63.9' kilograms/ hectare was estimated to be present by the Schnabel method. By the Petersen method, a total of 1,611 trout over 17 centimeters in total length having a standing crop of 67.4 kilograms/hectare was estimated to be present.

Statement of Permission to Copy

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Montana State University, I agree that the Library shall make it freely available for inspection. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by my major professor, or, in his absence, by the Director of Libraries. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature Michiel Dwayne Poore

Date March 22, 1973

THE FISHERY RESOURCE OF MYSTIC LAKE, MONTANA

By

MICHIEL DWAYNE POORE

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree

of

MASTER OF SCIENCE

in

Fish and Wildlife Management

Approved:

Head, Major Department

Chairman, Examining Committee

Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

June, 1973

ACKNOWLEDGMENT

I wish to express my appreciation to those who gave assistance during the study. Dr. William R. Gould directed the study, assisted in field work and helped in preparation of the manuscript. Drs. Don C. Quimby and Robert L. Eng critically reviewed the manuscript. Dr. Richard J. Graham and fellow graduate students assisted with field work. The Montana Fish and Game Department loaned equipment and vehicles. My wife, Patricia, gave encouragement, assistance with field work, and help in preparing the manuscript. The Montana Cooperative Fishery Unit financed the study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

A study of the brook trout, rainbow trout, cutthroat trout, rainbow X cutthroat trout hybrids, and lake trout in Mystic Lake was conducted during 1971 and 1972. Age and growth determinations and population estimates were made on fish captured by fyke nets, experimental gill nets, vertical gill nets, hoop nets, electrofishing and angling. Growth rates of rainbow trout, cutthroat trout, and rainbow X cutthroat trout hybrids were similar and greater than the growth rates of brook trout and lake trout. Brook trout grew faster than lake trout until age IV. A total of 1,805 trout over 8.5 centimeters in total length having a standing crop of 63.9 kilograms/hectare was estimated to be present by the Schnabel method. By the Petersen method, a total of 1,611 trout over 17 centimeters in total length having a standing crop of 67.4 kilograms/hectare was estimated to be present.

INTRODUCTION

The Bozeman Creek watershed provides a substantial portion of the municipal water supply for the city of Bozeman. In 1917, this drainage was closed to public access by joint order of the City of Bozeman, State Board of Health and U. S. Forest Service "to protect the quality of its water".

Adjacent to the Bozeman Creek watershed on the west is the Hyalite Creek (Middle Creek) drainage which also supplies a portion of Bozeman's water supply. This area has U. S. Forest Service campgrounds, hiking trails and a reservoir, all of which receive substantial recreational use by campers, hunters, hikers, fishermen and picnickers.

During 1969 and 1970, Bissonette (1971) compared the water quality of Bozeman and Hyalite drainages and found higher coliform counts in the Bozeman watershed than in the Hyalite drainage. He concluded wild animals caused a greater bacterial degradation of water quality in the closed watershed than substantial human recreational use did in the open watershed. The findings of Bissonette's study and increasing pressures from recreational interests resulted in opening the Bozeman Creek watershed to foot and horse traffic in March, 1970.

Mystic Lake is the major body of water in the Bozeman Creek drainage. Because the drainage had been closed to public use for over 50 years, little was known about the lake. In 1959, personnel

of the Montana Fish and Game Department surveyed the lake with two gill net sets and found rainbow trout *(Salmo gairdneri)*, brook trout *(Salvelinus fontinalis)*, cutthroat trout *(Salmo clarki)*, and rainbow X cutthroat trout hybrids present. In 1970, further sampling revealed the presence of an additional species, lake trout *(Salvelinus namaycush)*.

The purpose of this study was to obtain age and growth, and population information on the essentially unexploited fishery resource of Mystic Lake. This information may be useful in measuring changes in the fishery following the anticipated opening of the area to general public use. Field work was conducted from June, 1971 through October, 1972.

DESCRIPTION OF STUDY AREA

Mystic Lake is located in Gallatin County in southcentral Montana approximately 14.4 air kilometers southeast of Bozeman (Figure 1). It is situated in the Gallatin Range at an elevation of about 1,950 meters above sea level and, according to Bissonette (1971), receives runoff from approximately 1,152 hectares. It lies north of an earthfill regulatory dam built in 1903 and 1904 on the north fork of Bozeman Creek.

The lake lies in an elongate basin surrounded by steep hills bearing conifers. Its banks on the east, west and south sides are steep but the slope on the north is gentle. Nearly all of the shore is composed of silt, sand and sandstone. On the west side of the lake, there is a bar of angular, pebble to cobble-sized rock which at high water extends into the lake about 50 meters (Figure 2). Silt covers the bottom in the northern two-thirds of the lake and sapropel is found in areas over 10 meters deep.

Mystic Lake was subjected to severe fluctuations in water level (Figure 3) because its water was used for irrigation as well as by the city of Bozeman. In 1971 and 1972, the lake was held at minimum pool from October to May. During this time it had about 6.4 hectares, a maximum depth of 9 meters, and held 55,500 cubic meters of water (Fargo 1969). The ice cover melted during the last of April. Filling began in early May with water entering primarily from streams A and B

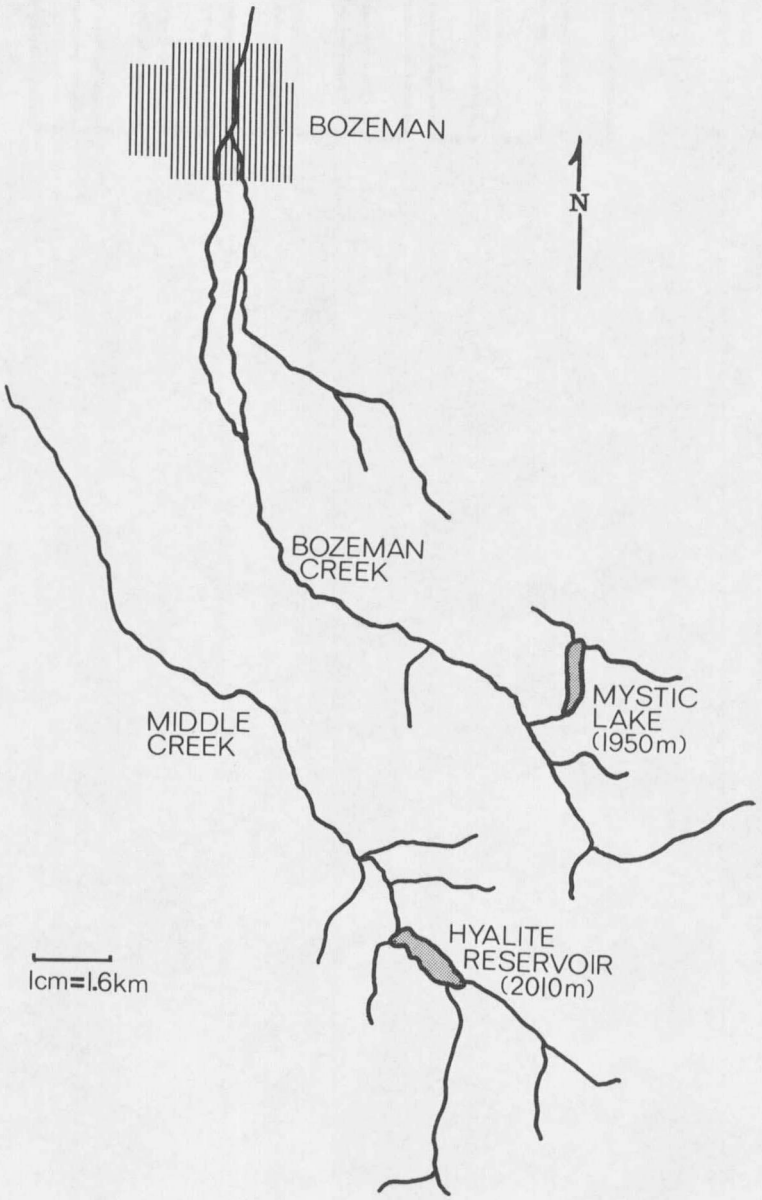

Figure 1. Map of Middle and Bozeman Creek drainages showing locations and elevations of Mystic Lake and Hyalite Reservoir.

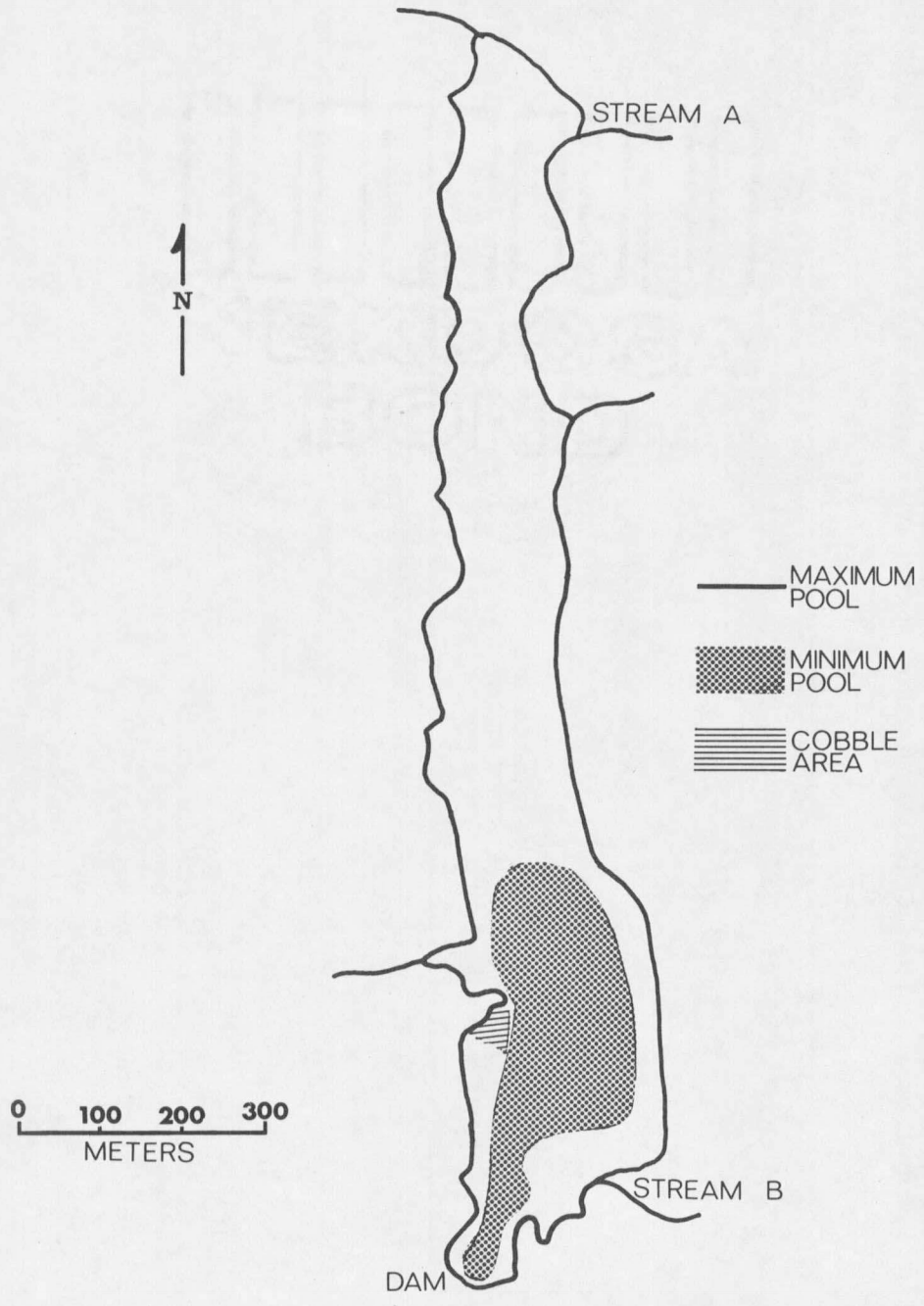

Figure 2. Map of Mystic Lake showing surface area at maximum and minimum pool.