Size, abundance, and seasonal habitat utilization of an unfished trout population and their response to catch and release fishing
by Denise Wilson Vore

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Fish and Wildlife Management
Montana State University

Abstract:
Few studies have assessed the effects of catch and release fishing on a previously unfished trout population or provided information on seasonal habitat use. Four sections of Rattlesnake Creek were studied from March 1985 through February 1987. I examined the effects of catch and release fishing on a population of trout that had not been fished for 45 years. Seasonal and diel habitat use were also evaluated. Cutthroat, bull, and brook trout were present in Rattlesnake Creek. Size and abundance of cutthroat and bull trout were large compared to other similar streams. Two years of catch and release fishing had no measurable effect on size or abundance of trout. Among all cutthroat trout tagged, 22% were recaptured and 68% of. those over 400 mm total length were caught and released. These and other data collected on Rattlesnake Creek indicate the extreme vulnerability of cutthroat trout to angling. Cutthroat trout behavior during late spring days was related to spawning. Feeding was the dominant activity during summer days and cover seeking dominated during winter days.

Diel shifts were most noticeable during winter. Twice as many trout were counted at night during the winter. Winter night . counts were similar to summer day counts.

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of

Master of Science

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Fish and Wildlife Management

MONTANA STATE UNIVERSITY
Bozeman, Montana
April 1993

APPROVAL

of a thesis submitted by

Denise Wilson Vore

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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Signature Denise Wilson Vore

Date 4/22/93

ACKNOWLEDGMENTS

My sincere thanks to those who were involved in all phases of this study. I am grateful to the following groups for their interest and assistance with funding: the Trout and Salmon Foundation, Sport Fishery Research Foundation, Foundation for Montana Trout, National and local Trout Unlimited, Western Montana Fish and Game Association and the Inland Empire Fly Fishing Club.

I would like to extend a special thanks to the following individuals for their assistance. Don Peters and Dennis Workman of the Montana Department of Fish, Wildlife and Parks contributed invaluable assistance during all phases of the study. Gary Blount worked in partnership to develop the project and collect all portions of the data. Marshall Bloom and Pete Test of Trout Unlimited were instrumental in getting the project initiated. Dr. Bob White supported the project and assisted in preparation of the manuscript. Drs. Calvin Kaya and Lynn Irby critically reviewed the manuscript. Ginger Thomas, Ken Gutowski, and Ron Snyder provided advice, encouragement, and expertise in statistical analysis, insect analysis (not included) and field work techniques.

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ABSTRACT

Few studies have assessed the effects of catch and release fishing on a previously unfished trout population or provided information on seasonal habitat use. Four sections of Rattlesnake Creek were studied from March 1985 through February 1987. I examined the effects of catch and release fishing on a population of trout that had not been fished for 45 years. Seasonal and diel habitat use were also evaluated. Cutthroat, bull, and brook trout were present in Rattlesnake Creek. Size and abundance of cutthroat and bull trout were large compared to other similar streams. Two years of catch and release fishing had no measurable effect on size or abundance of trout. Among all cutthroat trout tagged, 22% were recaptured and 68% of those over 400 mm total length were caught and released. These and other data collected on Rattlesnake Creek indicate the extreme vulnerability of cutthroat trout to angling. Cutthroat trout behavior during late spring days was related to spawning. Feeding was the dominant activity during summer days and cover seeking dominated during winter days. Diel shifts were most noticeable during winter. Twice as many trout were counted at night during the winter. Winter night counts were similar to summer day counts.

INTRODUCTION

Catch and release fishing was first instituted in the Great Smokey Mountains National Park in 1954 (Barnhart 1989). It is currently used to establish and maintain high quality fisheries by decreasing angling mortality. Several studies have shown the effects of catch and release fishing (Anderson and Nehring 1984, Thurow and Bjornn 1978, Varley and Gresswell 1988). However, there have been few opportunities to study the effects of catch and release fishing on a previously unfished trout population.

Rattlesnake Creek was closed to fishing for 45 years. It was protected as Missoula, Montana's municipal water supply. In 1985, a 25 km section of Rattlesnake Creek, above the confluence of Beeskove Creek, was opened to catch and release fishing. Approximately 12 km immediately below Beeskove Creek remains closed to fishing.

This study was designed to determine the characteristics of an unfished trout population and evaluate its response to catch and release angling. With the recent decline in many interior cutthroat trout populations (Behnke 1972) and their known vulnerability to angling (MacPhee 1966), it is becoming increasingly important that we understand the dynamics of unfished populations and the effects of angling on remaining populations. Results from this study will provide a point of reference for comparing trout populations in relatively pristine systems with those in heavily impacted and

managed streams. Until we understand the structure of undisturbed fisheries and their habitats, protection and enhancement efforts will lack both a rational context and effective direction. Population abundance, size, habitat use, and species composition of trout in Rattlesnake Creek were the elements examined in the study. Abundance and size of trout were expected to exceed that of other similar-sized, but fished, streams.

Seasonal changes in abundance and habitat use were also investigated. Limited information is available about seasonal fluctuations in trout populations or their habitat requirement during the late fall and winter periods in temperate latitudes. Collection of information during late fall and winter can be difficult due to icing, subzero temperatures, and snow. Studies which have evaluated seasonal population fluctuations and habitat use have concentrated on juvenile anadromous fishes (Taylor 1988, Bustard and Narver 1975, Hillman and Griffith 1987, and Everest et al. 1985). Seasonality has been investigated to a lesser extent in brook and brown trout populations (Cunjak and Power 1986 & 1987, Hartman 1963, Maciolek and Needham 1952, Chisholm and Hubert 1987). Seasonal and diel fluctuations in cutthroat trout (*Oncorhynchus clarki lewisi*) abundance, habitat use, and behavior were evaluated in this study. Specific objectives of my study were to:

1. Determine population abundance, size, and species composition in two unfished sections and two fished sections of Rattlesnake Creek.

2. Conduct a creel census to determine angler distribution, angler use, catch, catch composition, and catch per unit effort.

3. Identify seasonal movement patterns of trout in Rattlesnake Creek.

4. Describe seasonal and diel cutthroat trout habitat use and behavior.

STUDY AREA

The Rattlesnake Creek drainage is located in west central Montana, 8.3 km north of Missoula (Figure 1). The drainage includes approximately 21,053 ha and is within the Lolo National Forest.

The general topography of the drainage is mountainous with glacially formed valleys. Geologic parent material in the area includes argillite, quartzite, and limestone of the Precambrian Belt series as well as Cambrian shales and limestones (Nelson & Dobell 1961). Climate of the region is semi-arid with an average annual precipitation of 32 cm (Knoche 1968).

Vegetation varies from a spruce-fir forest in the upper drainage to an open pine-larch forest below Franklin Bridge (Figure 1). Trees and shrubs of the riparian area include: cottonwood (*Populus trichocarpa*), alder (*Alnus rubra*), willow (*Salix* spp.), and rose (*Rosa* spp.). Occasionally the valley bottom opens up in to small grassy meadows. Fescues (*Festuca* spp.), wheatgrasses (*Agropyron* spp.), pinegrasses (*Calamagrostis* spp.), and bluejoint (*Calamagrostis* spp.) are the most common graminoids (Adelman 1979).

Rattlesnake Creek originates on the flanks of McLeod and Triangle peaks, and flows south-southwest to its confluence with the Clark Fork of the Columbia River at Missoula (Figure 1). It is a third order stream with a gravel, rubble substrate. The watershed is characterized by relatively high peak discharge per unit area (Van der Poel 1979). Average annual discharge during the study period