



Age and growth of walleye and sauger of the Tongue River Reservoir, Montana  
by Victor Leonard Riggs

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE  
in Fish and Wildlife Management  
Montana State University  
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**Abstract:**

Surface coal mining is presently underway adjacent to the Tongue River Reservoir in southeastern Montana. A baseline study of the walleye (*Stizostedion vitreum*) and sauger (*Stizostedion canadense*) populations of the reservoir was conducted as a result of the present mining operation and the plans for expanded mining. The age and growth of 640 walleye and 546 sauger were studied from gillnet, trapnet and electrofishing collections made in 1975, 1976 and 1977. The results indicate excellent growth rates for walleye and sauger for a northern latitude reservoir. The 1973 sauger year class dominated the catch for 1975, 1976 and 1977. The 1972 walleye year class dominated the catch for the same three years. The greatest annual growth increment for walleye and sauger occurred in the first year of life. Young-of-the-year walleye captured during August, 1976 averaged 189.5 mm in length. The Tongue River above the reservoir was used by spawning walleye in late March and early April of 1977. The movement of tagged fish from the reservoir into the river and back to the reservoir was noted. Surface coal mining does not appear to have any detrimental effects on the two species considered at this time.

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by

VICTOR LEONARD RIGGS

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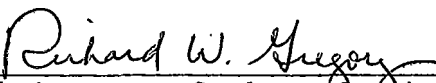
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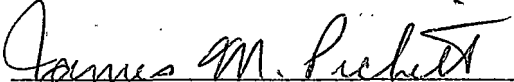
MASTER OF SCIENCE


in

Fish and Wildlife Management

Approved:

  
Chairperson, Graduate Committee

  
Head, Major Department

  
Graduate Dean

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## ABSTRACT

Surface coal mining is presently underway adjacent to the Tongue River Reservoir in southeastern Montana. A baseline study of the walleye (Stizostedion vitreum) and sauger (Stizostedion canadense) populations of the reservoir was conducted as a result of the present mining operation and the plans for expanded mining. The age and growth of 640 walleye and 546 sauger were studied from gillnet, trapnet and electrofishing collections made in 1975, 1976 and 1977. The results indicate excellent growth rates for walleye and sauger for a northern latitude reservoir. The 1973 sauger year class dominated the catch for 1975, 1976 and 1977. The 1972 walleye year class dominated the catch for the same three years. The greatest annual growth increment for walleye and sauger occurred in the first year of life. Young-of-the-year walleye captured during August, 1976 averaged 189.5 mm in length. The Tongue River above the reservoir was used by spawning walleye in late March and early April of 1977. The movement of tagged fish from the reservoir into the river and back to the reservoir was noted. Surface coal mining does not appear to have any detrimental effects on the two species considered at this time.

## INTRODUCTION

Baseline information is needed to detect potential changes in aquatic ecosystems which may occur as a result of expanded mining of western coal. Population, age and growth and life history parameters of the walleye (Stizostedion vitreum) and sauger (Stizostedion canadense) populations of the Tongue River Reservoir were studied for this reason.

Decker Coal Company is presently operating a large surface coal mine near the southwest end of the reservoir and is in the process of expanding to a second location near the southeast shore (Figure 1). A northward extension of the present mine is planned within the next few years.

The field work was conducted during the summer and fall of 1975, 1976 and the spring of 1977. A section of river directly above the reservoir was examined in the spring of 1977 to determine its use as a spawning area for walleye and sauger.

## DESCRIPTION OF STUDY AREA

The Tongue River Reservoir, located 23 kilometers north of Sheridan, Wyoming in Big Horn County, Montana (Figure 1), is the only major impoundment on the Tongue River. The Tongue River originates in the Big Horn Mountains of Wyoming and flows in a northeast direction for 105 river kilometers until reaching the reservoir. The drainage area above the reservoir is 4584 km<sup>2</sup> (U.S.G.S., 1975). The river continues for 271 kilometers beyond the reservoir to its confluence with the Yellowstone River at Miles City, Montana.

The earthfill dam is 27.7 meters high and was completed in 1940 for irrigation and flood control. At spillway level (1043.3 meters) the reservoir floods an area of about 1415 hectares (U.S.G.S. and Mt. Dept. of State Lands, 1977). At storage capacity the reservoir has a maximum length of 12.5 kilometers, a maximum width of 1.4 kilometers and an average depth of 6.1 meters (Garrison, Whalen and Gregory 1975). The surface area, length of shoreline at spillway elevation and the shoreline development index are 1277 hectares, 60 kilometers and 4.74, respectively (Penkal, 1976). The reservoir had an initial storage capacity of about 8939 hectare-meters in May of 1939 (Dendy and Champion, 1973). By 1948, sedimentation had decreased the capacity to about 8557 hectare-meters. With similar rates of sedimentation the 1975 capacity was estimated to be about 7398 hectare-meters (U.S.G.S.

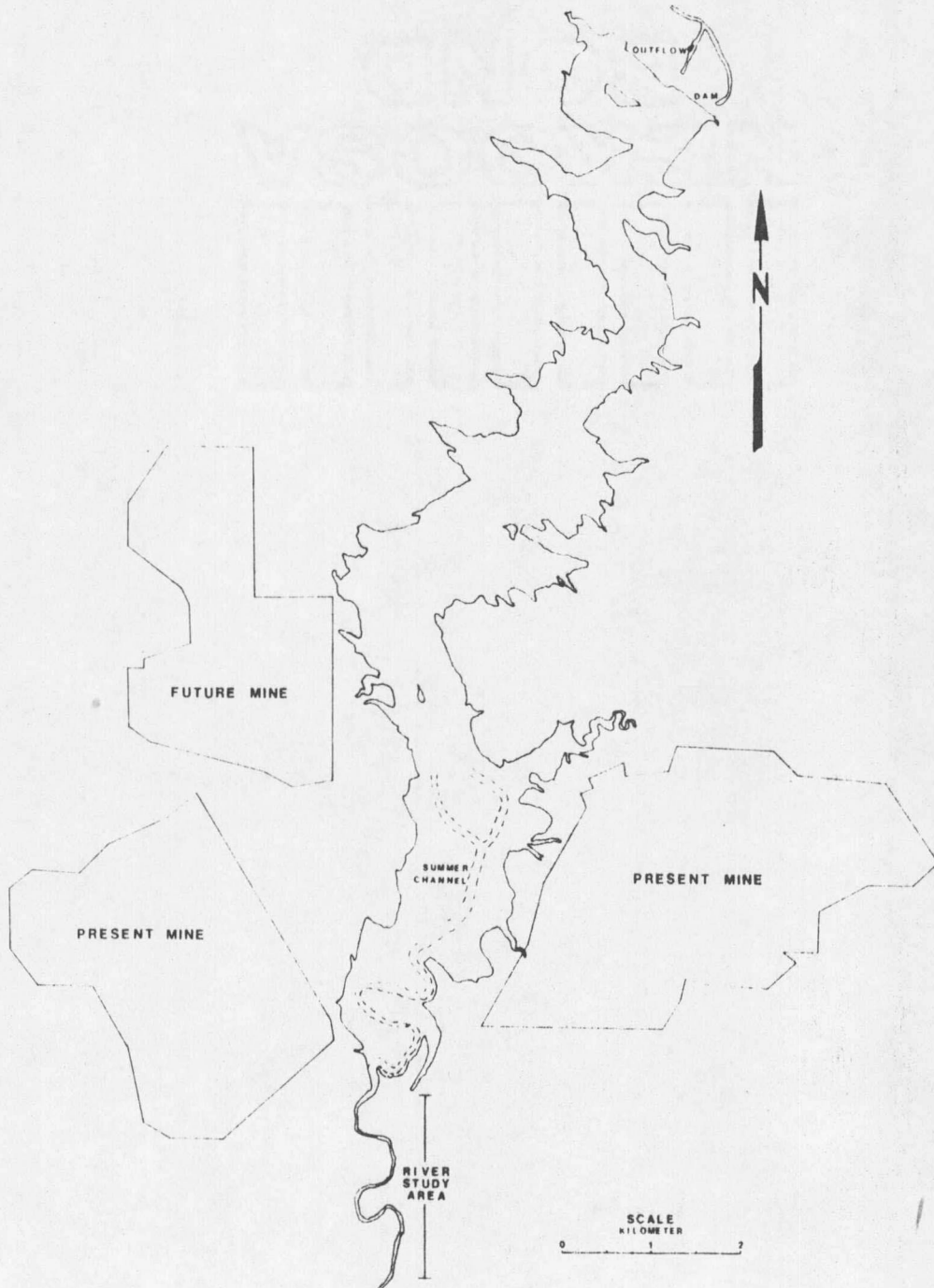


Figure 1. Map of study area.

and Mt. Dept. of State Lands, 1977). Some physical parameters of the Tongue River Reservoir are listed in Table 1.

Table 1. Morphometric data of the Tongue River Reservoir at spillway elevation (1043.3 m)

Maximum depth <sup>1</sup>	18.0 m
Mean depth <sup>1</sup>	6.1 m
Depth of outlet <sup>3</sup>	15.2 m
Maximum length <sup>2</sup>	12.5 km
Maximum breadth <sup>1</sup>	1.4 km
Mean breadth <sup>1</sup>	1.1 km
Surface area <sup>2</sup>	1277 ha
Volume <sup>3</sup>	7398 ha·m
Length of shoreline <sup>2</sup>	60 km
Index for shoreline development <sup>2</sup>	4.74

<sup>1</sup>(Garrison, et al. 1975)

<sup>2</sup>(Penkal, 1976).

<sup>3</sup>(U.S.G.S. and Mt. Dept. of State Lands, 1977).

Peak runoff usually occurs during late May and early June, but 1975 was an exceptional year with runoff persisting from early May to mid-July (Figure 2). An extensive late summer draw-down coupled with the high runoff in 1975 resulted in a reservoir fluctuation of about 8 meters (Figure 3). The years of 1976 and 1977 were closer to normal

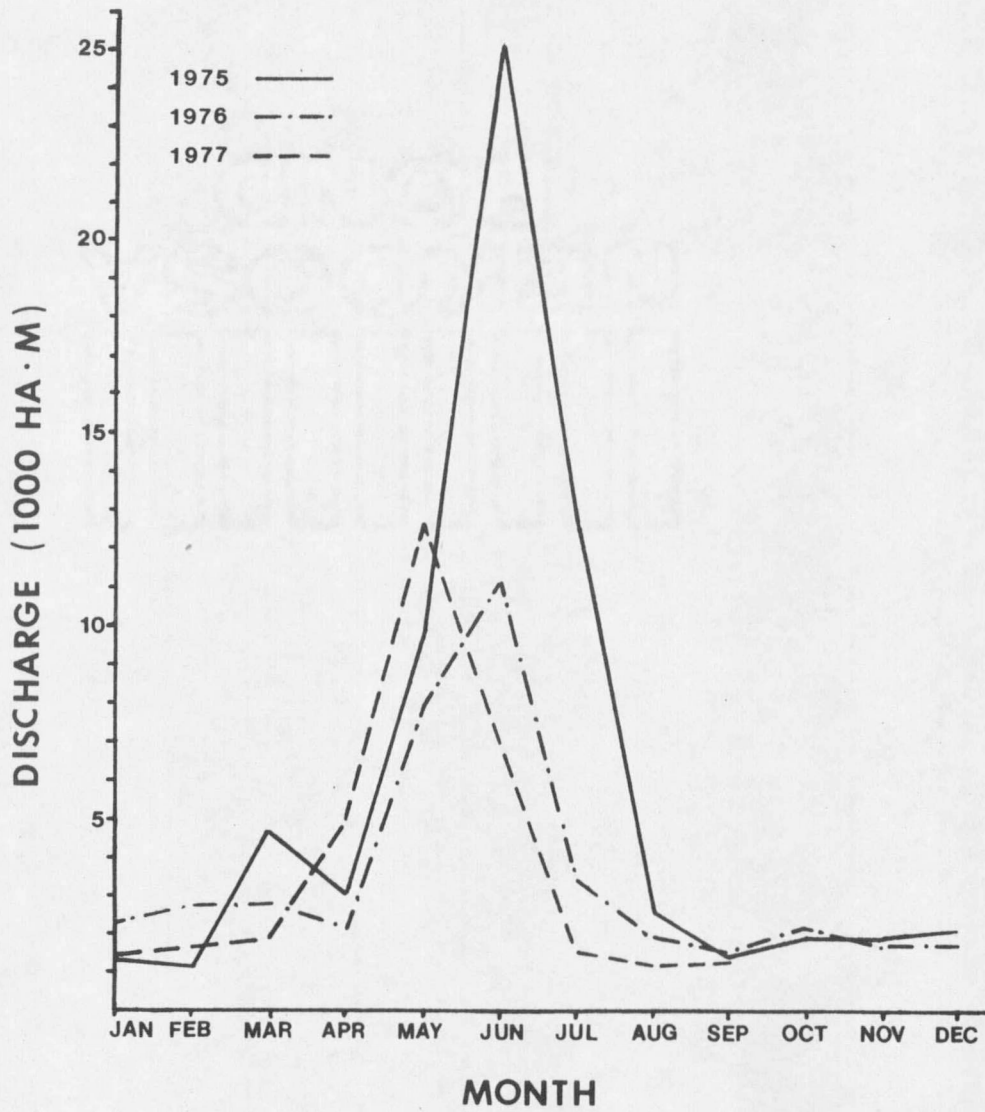


Figure 2. Discharge rates of the Tongue River, near Decker, Montana (U.S.G.S. 1975, U.S.G.S. 1976, and U.S.G.S. unpublished data).













































































































