MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana PROJECT: Statewide Fisheries Investigations

PROJECT NO: F-46-R-3 STUDY TITLE: Survey and Inventory of Warm Water Streams

JOB NO: III-b JOB TITLE: Southeast Montana Warm Water Streams Investigations

SEGMENT (FISCAL) PERIOD: July 1, 1989 through June 30, 1990

REPORT PERIOD: April 1, 1989 through March 31, 1990

ABSTRACT

Evidence is accumulating that the Cartersville Diversion dam is a partial barrier to sauger movement. Sauger density upstream appears to be only 10% of density downstream. Yellowstone River angler harvest rates of sauger are probably in the range of 6%-12% annually. No methods of modifying diversion dams for fish passage were found. Few female walleye migrated to the Intake area in 1989 and eye-up of eggs collected was low. Richland County modifications of Bennie Peer Creek seem to allow upstream movement of northern pike for spawning.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To collect up to 50 million walleye eggs each year with average survival to hatching of 50%. This goal was not met for reasons listed in RESULTS section.

2. To determine the effect of Yellowstone River low-head diversion dams on game fish distribution and abundance; provide for additional angler days for warm water species at upstream locations. Work was done toward this objective on the Yellowstone River in the Forsyth area.

3. To understand the significance to game fish of Yellowstone River non-game fish species. Sauger guts were examined but no food items were found.

4. To obtain a minimum flow on the Tongue River downstream of the T and Y diversion of 525 cfs for the period April 1 through May 10. A new development related to this goal is discussed under RESULTS.

5. To ensure that legally mandated instream flows are met. These flows were largely met during the report period.

6. To maintain existing water quality and bank-channel conditions. Projects were reviewed under two state laws. These projects were approved as planned, modified, or denied, depending on the kind and degree of effect on river banks and channels.

METHODS

River fish populations were sampled with boat-mounted electrofishing gear. A 17-foot long jet powered boat with a Coffelt VVP unit and boom mounted electrodes was used in the Yellowstone River. Fish in Bennie Peer Creek were sampled with a 1/4 inch mesh bag seine and with a back-pack electrofishing unit.

Walleye eggs were handled by methods previously described (Stewart 1989), with the following change in procedure. Water for fertilization of some egg batches was cooled with ice cubes made with Yellowstone River water. Ice cubes were added to the water for fertilization, left for sufficient time to cool the water to 39 or 40 F and then removed before the cooled water was added to the eggs and milt. This was done experimentally to bring fertilization pan water temperature to approximately 45 F. This temperature is thought to optimize fertilization (Koenst and Smith 1976).

A yellowstone River sauger population estimate was made using the Schabel method (Ricker 1975).

RESULTS

Yellowstone River Fish Population Work

Cartersville Diversion Dam

Recent investigations on fish density and movement have centered on the Cartersville Diversion Dam on the Yellowstone River at Forsyth. I suspect the structure impedes sauger movement upstream because sauger density is much lower upstream of the diversion dam.

In October 1989 sauger numbers were estimated by a Schnabel mark-recapture method in a seven mile Yellowstone River section from the Forsyth bridge to the mouth of Armell's Creek. This section is just upstream of the Cartersville Diversion Dam. The estimated number of sauger present was 130 or 18 sauger per kilometer. This estimate is approximate because conditions of the estimate were not fully met. Specifically, only two sauger recaptures were made instead of the three or four recaptures needed to avoid bias in the estimate (Ricker 1975). Still the estimate is useful in making comparisons with downstream points, because the difference is large. An estimate made in October 1987 just downstream of the diversion dam was 130 sauger per kilometer (Stewart 1988). Identical sauger density was estimated for the Yellowstone River near Miles City in 1985 (Stewart 1986). These population estimates indicate a sauger density 7.2 times greater downstream of the Cartersville Diversion dam than upstream.

Other evidence for a significant density difference comes from electrofishing catch rates. Daily electrofishing catch rates for sauger were summarized for the years 1985 through 1989 for upstream and downstream of the diversion dam. Average catch rate upstream (25 days, 60 sauger) was 2.4 sauger per day. Average catch rate downstream (26 days, 621 sauger) was 23.9 sauger per day. These catch rates suggest a sauger density downstream 10 times greater than upstream. This figure is similar to the difference suggested by population estimates.

Sauger upstream of the Cartersville Diversion dam average larger than downstream. For the years 1985 through 1989, 58 sauger from upstream points averaged 435 mm length and 832 grams weight. The corresponding figures downstream for 597 sauger are 387 mm and 567 grams. Young-of-the-year sauger are common at points downstream, but in the years 1985 through 1989, only one sauger young-of-the-year has been observed upstream of the Cartersville Diversion Dam. Most sauger larvae hatched upstream of the diversion dam would be swept to downstream points soon after hatching.

Some sauger are able to move upstream over the diversion dam, but angler tag returns suggest that few do so. In the years 1985, 1987 and 1988, 590 sauger were tagged between Forsyth diversion dam and Miles City. To date, 49 tags from these fish have been returned by anglers, but only one of these was caught upstream of Cartersville Diversion Dam. Table 1 summarizes angler tag returns

for fish tagged in the Yellowstone River and tributaries from 1974 through 1985 and returned by anglers from 1981 through 1989. This table shows five sauger that moved upstream over the diversion dam.

The diversion dam is an obvious barrier to shovelnose sturgeon movement. Although this species is common downstream of Cartersville Diversion Dam, it has never been observed at upstream points.

Sauger/Walleye Harvest Rates

Some concern has been expressed in recent years by anglers for overharvest of sauger and walleye in the Yellowstone River. This concern has largely been based on anglers observing large catches for brief periods (usually spring and fall) at a few locations of high angler density.

Angler harvest rates were calculated from angler tag returns (Table 2) for the first year following tagging only. Later years were not used because of added bias from non-angling mortality. The average estimated angling mortality was 5.9% for 615 sauger and walleye tagged and 36 first year tag returns. This figure is known to be low by an unknown amount due to natural mortality and tags not returned by anglers. Even if angling mortality is twice as high as calculated, it is still well within acceptable limits of 25-30%.

Sauger Gut Contents

No food items were found in the 31 sauger guts examined in the area upstream of the Cartersville Diversion Dam in October 1989.

Cartersville Diversion Dam - Possible Modifications

This diversion dam seems to be a factor limiting sauger density at upstream points. It is a complete blockage to shovelnose sturgeon movement. Cartersville Diversion Dam differs from other diversion dams on the lower Yellowstone River by its concrete construction and by having a 2-3 foot vertical falls on the downstream side at low river flow. Other diversion dams are loose rock structures with turbulent, but non-vertical water flow on the downstream side.

Many phone calls to fishery workers in several states were made to obtain information on methods that might be used to improve fish passage over the Cartersville Diversion Dam. To date I've identified only one low head dam (Iowa) that is known to be an impediment to fish passage. No attempts have been made to modify that structure for fish passage.

Unless new information is obtained on diversion dams, any attempts to modify the Cartersville Dam for fish passage will be experimental. One possible approach would be piling of large rock against the concrete structure to eliminate the falls. This would make Cartersville Diversion Dam similar to other dams that appear to pass fish reasonably well.

I plan to make application under the River Restoration Act of 1989 to obtain funds for modification of Cartersville Diversion Dam.

Walleye Egg Collection

Walleye were again obtained from the Intake area in April 1989 to collect eggs for cultural purposes. 1989 was exceptional in that very few female walleye were found in the area over the whole spawning period. Only approximately 60 females were collected in 1989. in 1987 and 1988 over 300 female walleye were collected each year. For 1989 females were first found on April 17. The collection of females quickly peaked on April 18 and decreased to April 27 when no females were collected. Surprisingly, male walleye abundance was highest on April 27, when several hundred could have been collected with 2 electrofishing boats, had these males been needed.

Percentage eye-up of walleye eggs collected at Intake was only 10% (Table 3). Reasons for this low egg eye-up are unknown, but eggs broken while inside the females are a suspected reason. In 1990 I will anesthetize females before weighing, measuring and injecting to minimize the possibility of breaking eggs inside females. Dave Erdahl, a fish reproductive physiologist with the U.S. Fish and Wildlife Service at the Bozeman Fish Technology Center, has agreed to observe the egg take procedures in the field in April 1990. Hopefully, he will be able to offer suggestions for improving egg eye-up or design experiments to determine where there are problems.

Average size of walleye spawners at Intake has been recorded since 1984 (Table 4). Average size of both sexes in 1989 was the highest recorded.

Experiments were designed for the 1989 egg take to determine if cooled fertilization water could improve egg eye-up (Table 5). Too few eggs were collected for good experiments and eye-up percentage for all egg batches was low. Experiments with cooled fertilization waters will be repeated in 1990.

Bennie Peer Creek

Potential problems for migrant northern pike on Bennie Peer Creek were previously described (Stewart 1989). This stream received at least moderately high runoff in March and early April 1989. This gave a test of the ability of Richland County modifications to pass northern pike upstream for spawning.

Electrofishing on March 31, 1989 collected 5 northern pike in the 1/4 mile of stream between the mouth and the culvert on the county road. These fish ranged in weight from 1440 grams to 4400 grams. Electrofishing upstream of the culvert on this date collected no northern pike.

Seine hauls were made on August 23, 1989 in the area just upstream

of the culvert. This seining caught three northern pike ranging from 298 mm to 312 mm length and 170 grams to 190 grams weight. Northern pike of this size in August are almost certainly young-of-the-year and could have gotten upstream from the culvert only by being spawned upstream from the culvert. An adjacent landowner also reported seeing adult northern pike in the same area in early spring. This also supports the conclusion that adults were able to move upstream through the culvert for spawning in early spring 1989.

Tongue River Reservoir Water Releases

The Northern Cheyenne tribe in 1989 made an initial proposal to the State of Montana to settle Tongue River water allocation issues on the Tongue River. The State of Montana is presently analyzing tribal claims to water. In a related matter the State is also pursuing repair and upgrading of Tongue River Dam in the U.S. Congress. Repair of the dam would allow operation of the reservoir at a higher level and result in an increase in the amount of water that could be supplied downstream during critical seasons.

The Department is supplying information to appropriate state agencies so that the need for 525 cfs in the lower Tongue River during spring will receive consideration, along with other fisheries issues.

LITERATURE CITED

Koenst, W.M. and L.L. Smith. 1976. Thermal requirements of the early life history stages of walleye and sauger. J. Fish. Res. Bd. Can. 33:1130-1138.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191. Department of the Environment. Fisheries and Marine Service. Ottawa, Can. 382 pp.

Stewart, P.A. 1989. Southeast Montana warm water streams investigations. Job Prog. Rept. F-46-R-2, Job III-b. MT Dept. Fish, Wildl. & Parks. 9 pp.

Stewart, P.A. 1988. Southeast Montana warm water streams investigations. Job Prog. Rept. F-46-R-1, Job III-b. MT Dept. Fish, Wildl. & Parks. 10 pp.

Stewart, P.A. 1986. Southeastern Montana Fisheries Investigations. Job. Prog. Rept. F-30-R-22, Job I-b, MT Dept. Fish, Wildl. & Parks. 9 pp.

Waters Referred to:

Bennie Peer Creek	7-21-0083
Yellowstone River Sec. 01	7-21-1350
Yellowstone River Sec. 02	7-21-1400

Key Words:

Sauger-passage, population estimate, harvest rate
Diversion dams - modification for fish passage
Walleye egg collection
Northern pike - passage

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Table 1. Location and number of angler tag returns, 1981 through 1989, of fish tagged from 1974 through 1985 in the Yellowstone River and tributaries.

Location of Return	Sauger & walleye	Channel catfish	Shovelnose sturgeon
Tagged upstream of Forsyth Diversion Dam			
Above Forsyth Diversion 1/			
Powder River near Wyoming		1	
Tagged from Forsyth Diversion to Kinsey, including lower Tongue River			
Above Forsyth Diversion	5	3	
Lower Tongue River or at Miles City 2/	6	10	11
Rosebud Creek to Forsyth Diversion	2		1
Garrison Res. - North Dakota	1		
Near mouth Powder River			2
Intake or downstream	2	1	1
Tagged vicinity Powder River mouth			
Yellowstone River - Intake or below	2	1	
Miles City area or lower Tongue River	1		1
Forsyth Diversion to Rosebud	1		
Powder River in Wyoming		1	
Vicinity Powder River Mouth	1		1
Powder River near Broadus		1	
Above Forsyth Diversion		1	
Tagged Glendive vicinity			
Near Powder River mouth			1
At Intake			1
Garrison Res. - North Dakota	1		
Tagged below Intake			
Intake or Yellowstone River downstream	3		
Garrison Res - North Dakota	8		
Near Glendive	1	1	
Miles City vicinity or lower Tongue R	2		
Forsyth Diversion to Rosebud	2		
Missouri River	1		1
Near Powder River mouth			1

1/ One burbot returned
2/ One smallmouth bass also returned