MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

State: Montana Title: Northcentral Montana Fisheries Study

Project No.: F-46-R-6 Title: Missouri River Pallid Sturgeon

Study No.: III Inventory

Job No.: D Title: Planning Inventory, Fisheries

Period Covered: July 1, 1992 through June 30, 1993

ABSTRACT

A study to evaluate the status of the pallid sturgeon in the middle Missouri River was continued. A total of 15 pallid sturgeon were captured during 1992. Eleven of the pallids were "new " fish and the 4 others were recaptures from previous years. Six pallids were radio tagged and monitored throughout the year. The Tiber Dam tailwater trout fishery was evaluated for population improvements that have been anticipated since the Bureau of Reclamation began providing recommended instream flows in 1985. The trout standing crop was estimated at 65 fish/mile. Numbers of trout have declined since 1987, mainly because of decreases in rainbow trout numbers. Fall stocking of fingerling rainbows from Madison River stock has been largely unsuccessful.

INTRODUCTION

Pallid sturgeon are found in the Wild and Scenic portions of the Missouri River in Montana. They exist in low numbers throughout their geographic range (Pflieger 1975) as is probably the case in this section of the Missouri River. In 1990 the U.S. Fish and Wildlife Service listed the pallid as "endangered" under the Endangered Species Act 1973. Reasons for listing are habitat modification and apparent lack of reproduction. Reports of pallid sturgeon sightings have also declined dramatically in the last 20 years (U.S. Fish and Wildlife Service, 1989). The pallid sturgeon has been listed as a class A "species of special concern" in Montana since 1973 (Holton, 1980).

The Montana Department of Fish Wildlife and Parks (MDFWP) initiated a fisheries study during 1989 to determine the past and present status of the pallid sturgeon in the 175 mile reach of river between Fort Benton and Fort Peck Reservoir. Results from the study will be used to develop a status report. This report will aid in devising management and recovery plans to maintain and enhance the pallid population in the river.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. **To determine current status (abundance and distribution) of pallid sturgeon in Missouri River upstream of Fort Peck Dam.** Sampling for pallid sturgeon was continued and carried out throughout the study area.

2. **To enhance trout populations and trout fishing opportunity in Marias River immediately downstream from Tiber Dam.** Trout populations in the Marias were monitored and wild rainbow trout fingerlings of Madison River origin were stocked in the Marias.

3. **To maintain streambanks and beds in a stable and near-natural condition in Choteau and Liberty counties** (state funded). Two stream alteration projects were evaluated and recommendations were submitted to the applicants.

PROCEDURES

Setlines and trammel nets were used to capture sturgeon. The setlines were 100 - 200 ft long with 7 - 15 hooks. Circular-type hooks were attached to the one-quarter inch diameter groundline by 16 inch long staging lines. The hooks ranged in size from 11/0 to 14/0. The setline was anchored in position with a 40 lb cement block at each end; a steel stake and block were used as anchors when the lines were set from the river bank. The terminal end was usually marked with a buoy. Setlines were positioned in the river either parallel, perpendicular or angled to the current and left overnight. Catch per unit effort for setline sampling was expressed as number of fish caught for an overnight set. This sampling method has been used with satisfactory results for white sturgeon in the Columbia River (personal communication, Kim Apperson, Idaho Fish and Game Dept.).

Trammel nets were 150 ft. long and 6 ft. deep. Two mesh sizes were used: 1 inch inner walls with 10 inch outer walls, and 2 inch inner walls with 12 inch outer walls. Mesh material for both inner and outer walls were light-weight for better fish tangle characteristics and to insure that the net could be retrieved off submerged objects in the event that net material had to be torn free. The trammel nets were set in snag-free areas of the river and allowed to drift with the current along the bottom. Distances of the drift varied from 50 to 400 yds. Catch per unit effort for drift netting was expressed as number of fish caught per drift.

Radio telemetry was used to monitor general movements of individual sturgeon and collect micro-habitat information at relocation sites. The telemetry system used consisted of an ATS model 2100 receiver, omni-directional and loop antennas, and two types of radio transmitters. The first type of transmitter was relatively small and was attached externally to the base of the dorsal fin. The transmitter was 2.2 in. long with a diameter of 0.50 in. and weighed about 0.5 ounce. The other type of transmitter was surgically implanted in the body cavity of the sturgeon. This transmitter was slightly larger and had an internal antenna encapsulated in the transmitter body. The transmitter was 3.9 in. long with a diameter of 0.80 in. and weighed about 1.3 ounce. Both of these transmitters had a battery life rated for 90 days, however, it was common for the transmitters to work for 6 months.

All sturgeon were measured to the nearest 0.1 inch and weighed to the nearest 0.1 pound. A numbered plastic cinch tag was attached to the keel of the dorsal fin for identification purposes. Morphometric measurements recorded from sturgeon were: total, fork and standard lengths, head length, barbel lengths, mouth width, distance between inner barbel and mouth; and distance between outer barbel and snout tip. These measurements were then used for a Character Index, as modified by Carlson and Pflieger (1981), to test for hybridization. This index gives a single expression of how each sturgeon scored in the analysis compares with every other sturgeon in the composite of the characters studied. It can be used to objectively rank the sturgeon with the most shovelnose-like characteristics at one extreme of the ranking and the most pallid-like characteristics at the other extreme.

The electroshocking system used to capture trout and whitefish was adapted from the system described by Novotny and Priegal (1974). The electroshocking apparatus was a boom-type and mounted on a 14-foot aluminum McKenzie style driftboat powered by a 10 hp outboard motor. Power was supplied by a 3500-watt AC generator. The alternating current was delivered to a Coffelt Model VVP-10 rectifying unit which changes the alternating current to continuous direct current. The positive electrode consisted of two circular hoops with twelve 16-inch stainless steel droppers fastened on each hoop. These electrodes were supported by fiberglass booms and were positioned about six feet in front of the boat. The hull of the boat served as the negative electrode. The unit was typically operated at 2-7 amps, 100-215 volts and continuous direct current.

The mark/recapture technique as described by Vincent (1971 and 1974) was used to estimate the trout populations in the Marias River. The following formula as modified by Chapman (1951) was used:

$$N = \frac{(M+1)\ (C+1)}{(R-1)}$$

Where:

N = population estimate
M = number of marked fish
C = number of fish in the recapture sample
R = number of marked fish in the recapture sample

DESCRIPTION OF STUDY AREA

The pallid sturgeon study area consists of a 175 mile reach of the mainstem middle Missouri River in northcentral Montana between Fort Benton and the headwaters of Fort Peck Reservoir near Lewistown (Fig. 1). There are two major tributaries entering the Missouri in this reach; the Marias River from the north and Judith River from the south. The present flow regimen of the Missouri River in the study area is not entirely natural because of regulation and storage at several upriver dams. The study area was divided into 8 study sections and the mileage for each is given in Table 1.

Table 1. Locations of study sections on the middle Missouri River.

SECTION	RIVER MILE upper	lower	LOCATION
Fort Benton	0	18	T24N R8E Sec26 to T25N R10E Sec28
Loma	18	33	T25N R10E Sec28 to T26N R11E Sec28
Coal Banks	33	51	T26N R11E Sec28 to T26N R13E Sec31
White Rocks	51	76	T26N R13E Sec31 to T23N R15E Sec31
Judith Landg.	76	100	T23N R15E Sec31 to T23N R18E Sec33
Stafford F.	100	122	T23N R18E Sec33 to T23N R21E Sec3
Cow Island	122	142	T23N R21E Sec3 to T22N R23E Sec17
Robinson Bg.	142	175	T22N R23E Sec17 to T21N R27E Sec10

The study area for the Tiber Dam tailwater study is a 21 mile reach of the Marias River extending from the dam near Chester to the Circle Bridge at Highway 223. Tiber Reservoir is a water storage reservoir with no hydroelectric power generation. Flows in the river downstream are completely controlled by discharges from the dam.

FINDINGS

Present Status of the Pallid Sturgeon Population

A total of 11 pallid sturgeon, not previously caught before, were captured in the study area. Four pallid sturgeon that had been caught in previous years were also captured, for a total of 15 pallids captured during the 1992 field season. Two of the

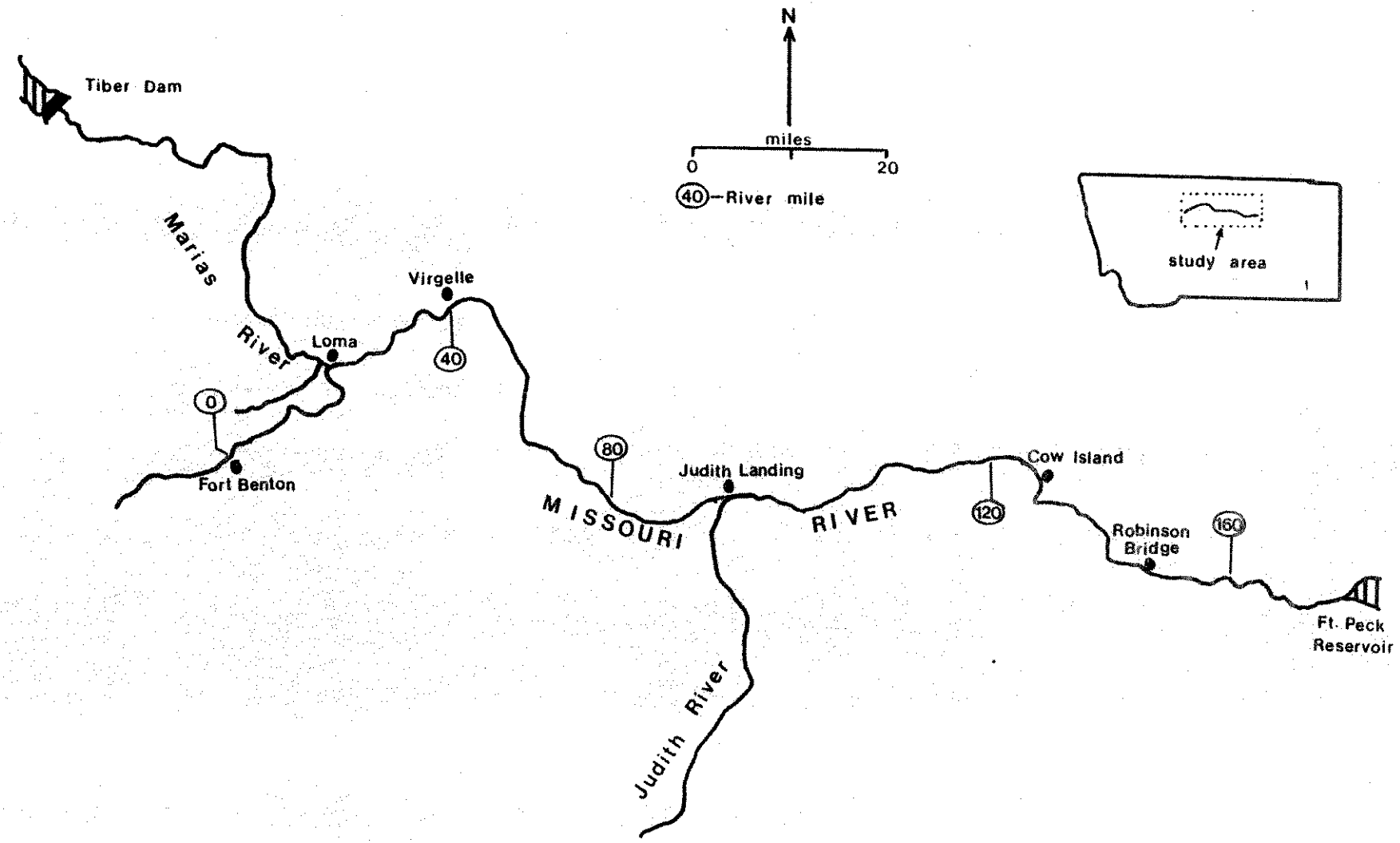

Figure 1. Map of the study area.

recaptured pallids had been caught in 1990, one was from 1991 and another was originally captured in 1992. Thus far a total of 19 different pallid sturgeon have been captured since this study commenced in 1989. There were 2 confirmed sightings of pallid sturgeon in the study area by anglers in addition to the 15 pallids sampled by this study in 1992. Anglers caught and released the 2 pallids while bait fishing in the Robinson Bridge section.

Trammel nets were used to capture of 9 pallids and setlines captured the remaining 6 pallids caught by study personnel in 1992. The difference in catch between gear types is probably related to the more intensive use of the trammel nets compared to setlines. A total of 231 trammel net drifts were completed during the year compared to 54 setline sets. Setline gear could not be used after June because of the large amounts of drifting filamentous algae present in the river after this date. The algae would collect on the lines, covering and burying them, thereby making the setlines ineffective.

Table 2 is a record of the various morphometric measurements taken from each pallid. Pallid sturgeon averaged 52.7 inches fork length and 33 pounds. The 12 "new" pallid sturgeon were caught in a 60 mile reach of river between Stafford Ferry and a point located 14 miles upriver from the headwaters of Fort Peck Reservoir. All were captured in deep pool areas with sandy substrates.

Table 2. Morphometric measurements (in english units) of new pallid sturgeon sampled in the middle Missouri River, Montana, 1992. (Acronyms for individual measurements listed below).

Tag No.	Captr. Date	Wt.	FL	SL	HL	MW	OUTB	INB	IRL	MIB
G01747	May 6	37.5	55.5	52.5	17.0	5.0	6.4	2.8	7.3	2.5
G01795	May 12	28.5	50.5	47.7	16.5	4.8	5.8	1.8	7.2	2.2
G01799	May 13	29.5	51.3	47.5	15.2	4.3	6.2	2.1	6.8	2.2
G01640	May 28	29.5	52.0	50.0	15.2	4.6	5.0	1.7	6.5	2.0
G01838	Jun 23	17.5	42.7	40.2	12.4	4.2	3.8	2.2	4.5	2.2
G02230	Jul 22	40.0	54.9	51.6	16.3	4.5	5.3	2.0	6.3	2.4
G03582	Oct 1	32.0	54.3	51.4	16.3	4.8	6.6	2.0	7.1	2.4
G03583	Oct 2	31.5	51.3	48.5	15.4	4.8	5.5	2.0	6.7	2.0
G03584	Oct 13	40.0	56.5	54.6	16.9	4.8	5.6	1.9	7.9	2.3
G03127	Oct 28	37.0	56.3	53.2	17.7	5.1	5.6	2.0	8.3	2.0
G03144	Oct 30	41.0	54.0	51.5	17.0	4.7	6.5	2.0	7.5	2.0

Wt - Weight
FL - Fork Length
SL - Standard Length
HL - Head Length
MW - Mouth Width
OUTB - Outer Barbel Length
INB - Inner Barbel Length
IRL - Innerrosteral Length
MIB - Mouth to Inner Barbel Length

Six pallid sturgeon and 4 shovelnose sturgeon were equipped with radio transmitters. Three pallids and 3 shovelnose sturgeon had internal type transmitters, and the remaining 3 pallids and 1 shovelnose had external transmitters. One of the internal transmittered sturgeon and one of the external transmittered sturgeon could not be relocated after 1 week, probably as a result of transmitter failure. A total of 147 radio relocations were made during the period May - October, 1992. Information on general movements and micro-habitat use, determined by radio telemetry, will be presented next year.

Marias River - Tiber Dam Tailwater

A trout fishery in the 21 mile reach of Marias River immediately below Tiber Dam is maintained by coldwater release. Prior to 1985 the coldwater fishery existed far below its potential because of inadequate instream flows and periodic surface warmwater releases from the dam (Gardner and Berg 1983). The Montana Fish Wildlife and Parks has recommended a minimum instream flow of 500 cfs be maintained in the river below Tiber Dam for the trout fishery.

The trout fishery has improved substantially since 1985, most likely in response to better flow and temperature conditions (Gardner 1988). Field studies in 1987 showed marked improvements in trout numbers, sizes and reproductive success. Results from the 1988 survey indicated that the trout populations had stabilized and did not continue to improve as anticipated.

A number of mountain whitefish, brown and rainbow trout were sampled while conducting the population estimates in late summer, 1992 (Table 3). Data indicated that populations of all three species were dominated by large older fish. Numbers of younger trout have been exceptionally low since 1989. Fish population estimates confirmed a steady decline in numbers of trout, especially the smaller size group (Table 4). Population estimates indicate total trout numbers have declined 59% between 1987 and 1992 and 26% between 1991 and 1992.

The rainbow trout population in the Marias River downstream from Tiber Reservoir does not appear to be improving. The 1992 estimate for 11+ inch rainbows is only 59% of what it was in 1987. Reasons for this decline are still unclear but it is fairly evident that recruitment to the population is extremely low. In response to the declining rainbow trout population, a plan was developed in 1990 to stock the Marias with wild fingerling rainbows from the Madison River. This action was taken to: 1) increase numbers of rainbow trout to anglers, 2) possibly enhance natural reproduction by introducing rainbow from a population known to reproduce effectively by spawning in a mainstem river, and 3) determine whether or not survival of juvenile fish during the first year is a critical limiting factor.

Table 3. Comparison of size statistics for mountain whitefish and trout sampled in the Marias River below Tiber Dam during 1987-92.

Year	Number	Avg. Length (inches)	Avg. Weight (pounds)	Mode (inch)	Median (inch)
Mountain whitefish					
1988	104	12.3	0.78	9	12.6
1989	99	13.1	0.91	15	13.2
1990	114	13.1	0.95	12	13.3
1991	99	13.1	0.99	9	13.3
1992	108	15.0	1.41	16	15.0
Brown trout					
1987	102	15.7	2.00	8	17.0
1988	111	14.0	1.24	13	13.9
1989	27	17.0	1.89	16	16.3
1990	118	17.0	1.92	17	17.6
1991	118	17.7	1.79	18	18.1
1992	84	17.4	1.47	17	17.7
Rainbow trout					
1987	108	12.2	0.87	7	12.3
1988	124	11.5	0.63	10	11.5
1989	5	13.8	1.00	15	15.1
1990	65	14.9	1.19	15	15.2
1991	79	13.8	0.88	16	14.0
1992	76	15.2	1.27	15	15.7

Table 4. Standing Crop estimates of trout in a 4.5 mile reach of the Marias River below Tiber Dam during 1987- 1991.

Size Group	Year 1987	1988	1990	1991	1992	Number of Fish Smpld
Rainbow						
(6.0 - 10.9)	202	126	--	48	24	(4 - 51)
(11.0 - 20.4)	222	176	124	105	131	(56 - 73)
Brown						
(6.0 - 10.9)	50	38	50	--	--	(3 - 33)
(11.0 - 32.0)	156	134	195	200	106	(85 - 123)

The first plant of Madison River rainbows was made on 25 September, 1990 when 5,085 fingerlings averaging 2.8 inches were stocked below Tiber Dam. All the fingerlings were adipose clipped so that the stocked fish could be identified during electrofishing surveys the following year. Only two of these fish were captured during electrofishing in fall 1991, suggesting the first year of stocking was largely unsuccessful. The program continued during spring, 1991 with the collection of approximately 6,000 rainbow trout eggs from the Madison River. A total of 4,300 fingerlings averaging 2.7 inches were stocked in the Marias below Tiber Dam during fall, 1991 after being reared at the Giant Springs hatchery in Great Falls. Only five of these fish were captured as yearlings in the fall 1992 electrofishing, indicating poor success of the second year of stocking as well.

Approximately 18,000 eggs were collected from Madison rainbows in spring 1992. Approximately 4,300 fingerlings averaging 2.8 inches were stocked in the river below Tiber in fall 1992 while 10,000 fingerlings were heldover in the hatchery through the winter and stocked in April, 1993. Fingerlings heldover in the hatchery averaged 5.3 inches long when stocked in spring 1993 and are expected to have better survival than small fingerlings stocked in fall.

A final collection of 36,000 rainbow eggs was made from the Madison River in spring 1993. Approximately 11,000 fingerlings are scheduled to be stocked in the Marias in fall 1993 and around 15,000 fingerlings will be held through the winter for stocking in spring 1994. Annual electrofishing surveys will be continued to monitor survival and growth of these fish and to determine if natural reproduction improves as a result of their introduction.

RECOMMENDATIONS

1. Continue with the pallid sturgeon study. Sampling efforts were very successful this year. Both setline and trammel net methods should continue to be used to capture pallids. Radiotelemetry should be continued to acquire pallid sturgeon micro-habitat use information.

2. Discontinue stocking of Madison River strain rainbows in the Marias River below Tiber Dam after spring, 1994. Monitor trout population trends, success of wild rainbow fingerling plants, and extent of natural reproduction in the Tiber Dam tailwater section by obtaining annual standing crop estimates at least through 1997. Analyze the results of stocking experiments to determine what factors limit rainbow trout abundance. Develop management recommendations (such as habitat improvements or stocking programs) to address limiting factors and enhance rainbow populations.

ACKNOWLEDGEMENTS

Randy Rodencal and Matt Baxter assisted with all aspects of the sturgeon sampling and data collection. Their efforts were greatly appreciated.

LITERATURE CITED

Carlson, D. M. and W. L. Pflieger. 1981. Abundance and life history of the lake, pallid, and shovelnose sturgeons in Missouri. Missouri Dept. of Consv. Jefferson City. Endangered Species Proj. SE-1-6. Sturgeon Studies in Missouri, Job I. 63 pp.

_____, W. L. Pflieger, L. Trial, and P. S. Haverland. 1985. Distribution, biology and hybridization of Scaphirhynchus albus and S. platorrynchus in the Missouri and Mississippi Rivers. Environmental Biology of Fishes 14: 51-59.

Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological sample censuses. Univ. of Calif. Pub. in Stat. 1(7):131-160.

Gardner, W. M. 1988. Northcentral Montana Fisheries Study, Middle Missouri River Basin - instream flow studies. Mont. Dept. of Fish Wildlife and Parks. Helena. Fed. Aid to Fish and Wildlife Rest. Proj. F-38-R-3. Study No. II, Job B. 20pp.

_____ and R. K. Berg. 1983. Instream flow requirements for the Marias River fishery downstream of Tiber Dam. Mont. Dept. Fish, Wildlife & Parks. Helena. 32 pp.

Holton, G. 1980. The riddles of existence: fishes of "special concern". Montana Outdoors 11(1): 26 pp.

Keenlyne, K. D. 1989. A report on the pallid sturgeon. U.S. Fish and Wildlife Service. Pierre, SD. 51 pp.

Novotny, D. W. and G. R. Priegal. 1974. Electrofishing boats - improved designs and operational guidelines to increase the effectiveness of boom shockers. Wisc. Dept. Nat. Res. Tech. Bull. No. 73. 48 pp.

Pflieger, W. L. 1975. The fishes of Missouri. Missouri Dept. of Consv., Jefferson City, MO. 343 pp.

U.S.Fish and Wildlife Service. 1989. Endangered and threatened wildlife and plants; rule to list the pallid sturgeon as an

endangered species. Federal Register. Vol. 55, No. 173. pp 36641 - 36647.

Vincent, E. R. 1971. River electrofishing and fish population estimates. Prog. Fish Cult. 33:163-167.

_____. 1974. Addendum to river electrofishing and fish population estimates. Prog. Fish. Cult. 36:182.

Prepared by: William M. Gardner

Date: September, 1993

Code numbers of waters referred to in this report are:

16-2520	Missouri River	Section 06
16-2522	Missouri River	Section 06B
17-4864	Missouri River	Section 07
14-3240	Marias River	Section 01