PERFORMANCE REPORT

STATE: MONTANA

GRANT TITLE: MONTANA ENDANGERED FISHES PROGRAM
GRANT NUMBER: E-7-11

LOCATION: Missouri River, (above Fort Peck Dam), Montana Recovery Priority Management Area 1

PERIOD COVERED: January 1, 2004 through December 31, 2004
(2004 field season**)**

PROJECT PERSONNEL:

Bill Gardner Fishery Biologist
Lewistown 406-538-4658

OBJECTIVES

1. To determine habitat preference, movements, abundance, feeding and growth of wild pallid sturgeon in Recovery Priority Management Area 1.

2. Conduct annual adult pallid sturgeon standardized netting to develop a baseline for future comparisons.

3. To assist with with collection of adult spawners for use in hatchery propagation efforts.

4. To assist with the release of hatchery-reared pallids and evaluate survival, growth and recruitment over the years.

5. To coordinate and implement recovery efforts in conjunction with North Dakota, South Dakota, and the U.S. Fish and Wildlife Service.

SUMMARY

This report details the pallid sturgeon recovery efforts for 2004 in Recovery Priority Management Area 1 (RPMA 1). Since 1998 there has been a total of 6,003 hatchery-reared juvenile pallid sturgeon released into RPMA 1. A total of 68 pallid sturgeon were captured this year consisting of 6 adults (comprised of 4 recaptures and 2 new fish), 57 hatchery 1997-year class pallid sturgeon (PS-97), 2 hatchery 2001-year class pallid sturgeon (PS-01) and

3 hatchery 2003-year class pallid sturgeon (PS-03). The fall pallid sturgeon standardized baseline survey resulted in a catch rate of 0.18 pallids/drift and this was 3.6 times greater than the survey's average long term rate. The PS-97 group density in the Robinson Bridge area was estimated to be 228 pallids, therefore, the minimum survival rate for these 7-year-old fish was 31%. The growth rate for the PS-97 group was 40 mm/year (fork length) and appears to be much less than expected. Three of PS-97 group were captured in upriver areas indicating that this group is still well dispersed in the area. Twenty-nine radio tagged, hatchery-reared, age-1pallid sturgeon were released into the Marias River and nealy all (90%) of the radioed pallids moved out of the Marias River and into the Missouri River in less than 50 days. By the end of the study (day 63) 72% of the radioed pallids had moved downstream of the lowest monitoring station (Judith Landing) approximately half way through RPMA 1. It was estimated that at least 53% (15) of the radioed pallids remained upstream of RM 1910 (the lowest downstream distance surveyed and 35 miles above the reservoir) at the end of the study. One female pallid was successfully spawned with two males resulting in fertilized eggs and progeny for 2004.

INTRODUCTION:

The Pallid Sturgeon Recovery Plan (Dryer and Sandvol 1993) lists the 230-mile unaltered reach of upper Missouri River above Fort Peck Reservoir as one of the six recovery-priority management areas (RPMA 1). There has been a long history of pallid sturgeon presence in this reach, however, losses of habitat and the migration barrier caused by the completion of Fort Peck Dam in the late 1930's probably initiated adverse impacts to the resident pallid sturgeon population. Significant flow and sediment regime alterations in the late 1950's as a result of operations at the newly constructed Canyon Ferry and Tiber Dams most likely further impacted the pallid population to the point of near extinction. A study that evaluated the status of pallid sturgeon during 1990-96 concluded that the population was endangered of going extinct within 10-20 years unless immediate actions are taken. A preliminary adult population estimate indicated that only 45 pallids remain in this reach. Additionally, the population was found to be senescent and that there have been no significant recruitment in the last 10 years (Gardner 1997).

Pallid sturgeon recovery in RPMA 1 consists of the following tasks as outlined in the Plan:

- 1.1. Restore Habitats and functions of the Missouri and Mississippi River ecosystems, while minimizing impacts on other uses of the rivers.
- 1.3. Increase public awareness of the laws and needs for protecting pallid sturgeon.
- 1.4. Establish refugia of pallid sturgeon broodstock.
- 2.1. Obtain information on life history and habitat requirements of all life stages of pallid sturgeon.
- 2.2. Research additional solutions to the impacts of man's activities on pallid sturgeon and their habitat.
- 2.4. Obtain information on population status and trends.
- 3.3. Reintroduce pallid sturgeon and/or augment existing populations.

- 4.1. Communicate with sturgeon researchers and managers.

The Montana Fish Wildlife and Parks (FWP) in cooperation with the U.S. Fish and Wildlife Service (FWS) initiated pallid sturgeon recovery in RPMA 1 with the release of 732 hatchery-reared, yearling pallid sturgeon during 1998.

RESULTS

Reintroduction:

Since 1998 there have been only 3 years that juvenile pallid sturgeon were released:

- 1998 a total of 732 yearling pallids were released (PS-97).
- 2002 a total of 2,063 yearling pallids were released (PS-01).
- 2004 a total of 3,050 yearling pallids (PS-03) and 158, 3-yr old pallids (PS-01).

The pallids stocked in 1998 (PS-97) were Yellowstone River stock raised at Gavins Point National Fish Hatchery. These fish arrived in very good condition and were released at three sites: Loma, Judith Landing and Robinson Bridge during late August. The pallids stocked in 2002 (PS-01) were Upper Missouri River stock raised at Bozeman Fish Technology Center. These fish arrived in good condition but exhibited fin curl of both the pectoral and pelvic fins. It was estimated by Matt Toner Bozeman Fish Technology Center (BFTC) that only 14.4% had minor or no noticeable fin curl; the remaining 86% of the pallids exhibited moderate to severe fin curl. Approximately 400 each were released during late July at Loma, Coal Banks and Judith Landing while 876 were released at Robinson Bridge. The pallids stocked in 2004 (PS-03) were Yellowstone River stock raised at Bozeman Fish Technology Center. These fish arrived in good condition but exhibited fin curl of both the pectoral and pelvic fins. The fin curl condition was estimated to be minor or not noticeable for about 25% of the PS-03's and didn't appear to be as severe as that reported for the PS-01 pallids. Approximately 600 each were released during late August at Marias River (Circle Bridge), Loma, Coal Banks, Judith Landing and Robinson Bridge.

We planned to stock pallids every year after 1998, however, concerns about an irido virus in the hatcheries and propagation failures precluded stocking during 1999, 2000, 2001, and 2003. The present pallid sturgeon stocking plan calls for stocking 5,600 yearling fish into RPMA 1 annually (FWP 2004).

It is important to evaluate the success of the pallid sturgeon augmentation program so that problems can be resolved early on in the program. Once again a considerable amount of effort was directed at evaluating the survival and growth of these released fish because over several million dollars have been invested raising them in the hatcheries for recovering and repopulating the Missouri River. Stocking densities, age of stocked fish, acclimation and growth of stocked fish, and location of release sites are all important aspects for evaluating survival and ultimately recruitment of the released hatchery juvenile pallid sturgeon. The study area is a 184-mile reach (RM 1867-2051) of the Missouri River immediately upstream of Musselshell River Confluence

(Fort Peck Reservoir) (Figure 1). A considerable effort is directed each year at evaluating the success of these releases. A variety of sampling methods are used including trammel drift netting, setline sampling, angling, and trawling.

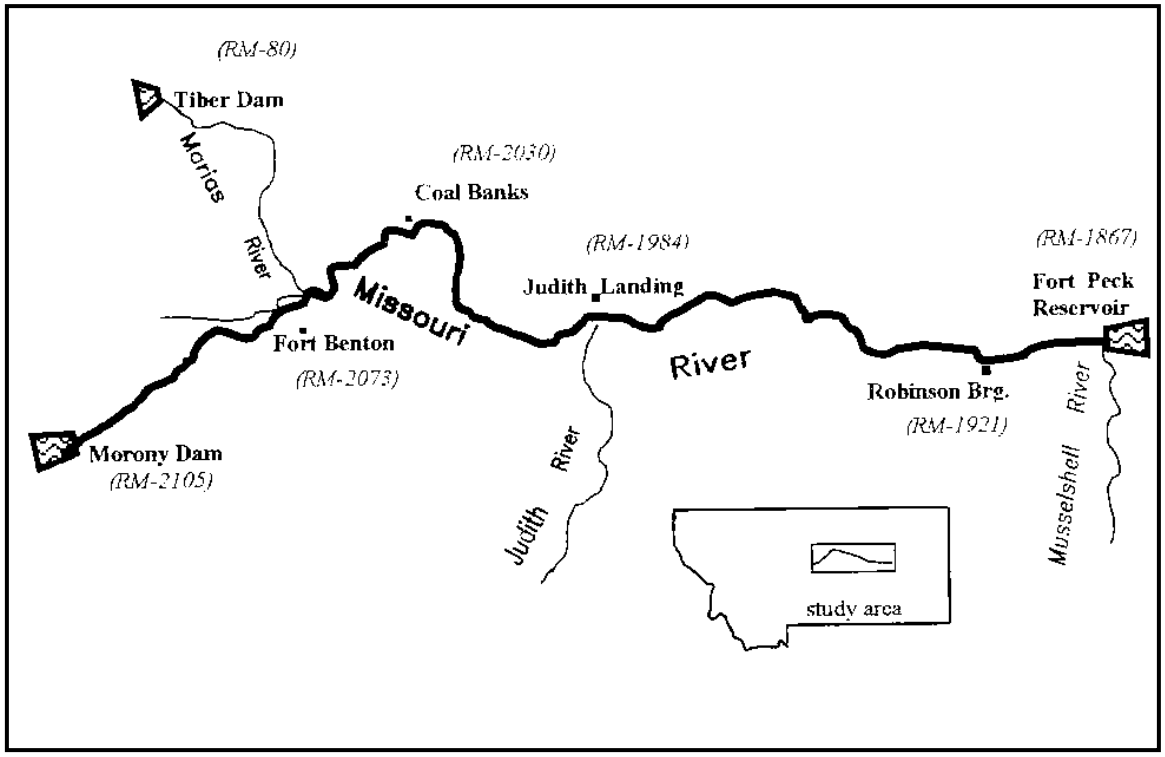

Figure 1. Map of the Middle Missouri River, MT, study area.

A total of 68 pallid sturgeon were captured this year consisting of 6 adults (comprised of 4 recaptures and 2 new fish), 57 hatchery 1997-year class pallid sturgeon (PS-97), 2 hatchery 2001-year class pallid sturgeon (PS-01) and 3 hatchery 2003-year class pallid sturgeon (PS-03) (Table 1). All but two of the pallid sturgeon were captured in the Robinson Bridge Section (RM 1887.1 – 1925.5), although sampling occurred throughout the entire study area. Individual capture information is given in Appendix A.

Table 1. Effort by sampling method and number of pallid sturgeon captured in the Middle Missouri River, MT, during 2004.

	Effort	Adults	Juv-97	Juv-01	Juv-03	Total
Trammel net -	128 drifts	1	19	2 [1/]	2	24
Spawning nets -	195 drifts	4	0	0	--	4
Trawl -	154 tows	--	1	0	0	1
Setlines -	183 sets	0	33	0	0	33
Angling -	28 hrs	1	4	0	0	5
Other -	--	0	0	0	1	1
		6	57	2	3	68

[1/] Both of the PS-01 were released in 2004 as 3 yr olds.

Juvenile pallid sturgeon netting survey:

Attempts were made to capture the juvenile pallid sturgeon by drifting small mesh trammel nets. A total of 1 adult, 19 PS-97 2 PS-01 and 2 PS-03 pallids were captured by drift netting. The largest proportion (50%) of the 24 pallids was captured at inside bend macro-habitat areas. Eighty percent of the pallids were netted at depths of less than 2 meters. Additionally, a total of 702 fish representing 18 species were sampled while netting throughout the study area (Table 2). Shovelnose sturgeon, flathead chub and river carpsucker dominated the catch, comprising 55, 9 and 7 percent of the fish sampled, respectively.

Table 2. Average catch rates (no./drift) of fish sampled while drifting trammel nets in the Middle Missouri River, MT, May-October, 2004.

	Coal Bnk	Judith L.	Robinson	Total #
Blue sucker	0.1	0.1	T	7
Burbot			T	2
Carp	0.1		0.3	29
Channel catfish		0.1	0.1	11
Flathead chub	0.4	0.4	0.5	61
Freshwater drum			T	3
Goldeye	0.4	0.4	0.2	33
Longnose sucker	1.5	0.3		33
Pallid sturgeon		0.1	0.2	23
Rainbow trout			T	1
River carpsucker	0.3	0.3	0.4	47
Sauger	0.2	0.5		14
Shorthead redhorse	0.3	0.3	0.1	20
Shovelnose sturgeon	4.6	2.5	2.8	386
Smallmouth buffalo		0.1	0.2	20
Smallmouth bass	0.1			1
Walleye			0.1	9
White sucker	0.1			2
Total # fish	147	96	457	702
Total # drifts	18	19	91	128
Average depth (m)	1.3	1.8	1.8	
Average distance (m)	203	292	280	
Avg. duration (min.)	7.0	6.3	7.2	

Setline sampling**:**

Setline sampling enables us to effectively sample difficult places to net that could be important habitat areas for juvenile pallid sturgeon. Preliminary sampling with setlines during 2003 showed this method was fairly productive for catching juvenile pallids. A total of 183 sets were made during April-June, 2004 and results are given in Table 3. Thirty-three pallids, all PS-97, were sampled using setlines. The majority (55%) of pallids were caught on setlines fished in the channel cross-over macro-habitat type. Additionally, a total of 564 fish, representing 13 species, were sampled. Goldeye, stonecat and flathead chub dominated the catch, comprising 28, 17 and 14 percent of the fish sampled, respectively.

Angling with a rod and reel was also used to capture pallid sturgeon. A total of 1 adult and 4 PS-97 pallids were caught using this method. Additionally, 1 other pallid (PS-03) was sampled inadvertently while conducting routine electrofishing surveys in the upper reach.

Benthic trawling**:**

The main purpose for trawling was to evaluate pallid and shovelnose sturgeon spawning success. A total of 1,330 fish, representing 18 species, were sampled while trawling during August in the Coal Banks and Robinson Bridge sections of the Missouri River and in the confluence area of the Marias River (Table 4). Most of the trawling occurred in the lower 36 miles of the study area between RM-1921 and RM-1885 where it is thought most of the age-0 shovelnose sturgeon (SNS) usually reside. Similar to years past, longnose dace, age 0 channel catfish, sturgeon chub, and stonecat dominated the catch comprising 26, 23, 19, and 18 percent of the fish sampled, respectively. The trawling results, once again indicates there is a fairly healthy sturgeon chub population at Coal Banks. Prior to 2003 sturgeon chub were not known to occur here.

Only 1 age-0 SNS was sampled this year compared to 2 in 2003 (Gardner 2004). During the first year of intensive trawling (1995) a total of 28 age-0 SNS were sampled in about 100 tows (Gardner 1996) indicating this method was effective at sampling age-0 SNS when they are more numerous. Based on the low catches of age-0 SNS this year and previous years, it appears there has been poor SNS spawning success at least during the past 6 years.

Fall pallid sturgeon standardized baseline survey:

A total of 9 pallid sturgeon were sampled while conducting the standardized fall survey in the 16-mile Robinson Bridge trend area (Table 5). This was the most pallids ever netted here while conducting the survey and is mainly the result of the abundance of the PS-97 pallids and the improved efficiency of netting these larger fish. The nine juvenile hatchery pallids were comprised of 6 PS-97, 2 PS-01 and 1PS-03. This baseline survey has been completed 8 times since 1996; Table 5 summarizes these survey results.

Table 3. Average catch rates (average number/set) of fish sampled by setlines in the Middle Missouri River, MT, 2004.

	- - - C P U E - - -			Total #
	Coal Banks	**Judith L.**	**Robinson**	**Fish**
Burbot			T	2
Carp	0.2	0.1	0.2	28
Channel catfish	0.2	0.5	0.3	59
Flathead chub	0.2	0.6	0.4	81
Freshwater drum	0.4	T	0.1	25
Goldeye	1.0	1.2	0.8	159
Longnose sucker	T			2
Pallid sturgeon		0.1	0.2	33
River carpsucker			T	3
Sauger	0.1	0.1	0.1	24
Shorthead redhorse	0.4	0.1	0.1	21
Shovelnose			0.2	29
Stonecat	0.1	0.5	0.6	98
Total # Fish	60	73	431	564
# Sets	23	22	138	

Survival growth and dispersal:

A total of 6,003 hatchery-reared pallid sturgeon have now been released into RPMA 1 since 1998 consisting of three age-classes. Attempts were made to sample as many juvenile pallids as possible for evaluation of growth, movement patterns, habitat selection and abundance estimates. All release site areas were sampled, although a much greater amount of effort was directed in the Robinson Bridge area. A density estimate of the PS-97 pallid group was completed in the Robinson Bridge area using a simple mark-recapture, "with replacement" estimator model. I used PIT tag numbers for the marks to identify if the fish was a new or previously sampled fish. A total of 26 fish were classified as marked during 2003 and in our recovery run during 2004 a total of 34 were classified as captured (C) fish for estimate purposes; 3 of these fish were recaptures from the previous year (R). The density of PS-97 in the Robinson Bridge area (RM 1887 – 1925) was 228 (95%C.I. 93-569) in this 38-mile reach. A total of 732 PS-97 pallids were released into RPMA 1 on August, 1998, therefore the survival rate for the 1997-year class is 31%. This is a minimum estimate because it does not include the other PS-97 pallids in upriver areas. The survival model used in the 2004 stocking plan (FWP 2004) predicts that 83 PS-97 will survive through age 7 (2004). It appears that the observed 31% survival rate (228) is considerably greater than predicted (83).

Table 4. Average catch rates (average number/tow) of fish sampled by trawling in the Middle Missouri River, MT, 2004.

	Marias R.	**Coal Banks**	**Robinson**	**Total #**
Burbot y			T	1
Carp y		0.1	T	3
Channel catfish y		0.6	2.1	305
Emerald shiner	0.2	0.1	T	5
Flathead chub	6.0	0.1	0.2	56
Hybognathus spp	0.5		T	4
Longnose dace	1.5	9.5	T	340
Longnose sucker		0.2		7
Pallid sturgeon (jv)			T	1
Mottled sculpin	0.5	0.1		5
Sand shiner	0.5			2
Sauger y			T	2
Shorthead redhorse y		0.1	T	4
Shovelnose sturgeon y			T	1
Sicklefin chub			0.8	111
Stonecat	7.2	5.5	0.1	233
Sturgeon chub	0.2	0.9	1.6	249
White sucker y	0.2			1
# Fish	68	601	661	1330
# Tows	4	35	135	135
Avg. Depth (m)	0.6	1.4	1.8	
Macro-habitat type (%)				
CHXO	25	40	62	
ISB		21	19	
OSB	75	13	18	
SCC		9		
TRM		17		

Table 5. Sampling statistics recorded for the pallid sturgeon standardized sampling program in the Middle Missouri River, MT, 1996-2004.

	Average (1996 – 2002)	2003	2004
Pallid Strugeon:			
Number sampled	2.7	6	9
Number adults	0.8	1	0
Number juveniles	1.8	5	9
Avg number/drift	0.05	0.12	0.18
Shovelnose Sturgeon:			
Number sampled	217	239	196
Avg Wt. (gm)	1,524	1,407	1,566
Number/drift	4.4	4.8	3.9
Avg. drift duration (min)	6.8	7.0	7.1
Avg. drift distance (m)	256	284	273
Avg. depth @ drift site (m)	2.0	1.6	1.6

Only 2 PS-01 pallids were sampled this year, both released in 2004 as 3-year old fish, however, none of the PS-01's that were released as yearlings (during 2002) were captured this year. Three PS-03 were also sampled. It is probably too early to make any meaningful predictions regarding the survival of these two groups this early in the evaluation.

Evaluations regarding growth of the juvenile hatchery pallids were basically confined to the PS-97 group because adequate numbers of observations were gathered only on this group. Average lengths and weights for the three pallid groups sampled this year were:

- PS-03 (N=2) average FL = 358 mm
- PS-01 (N=2) average FL = 578 mm; average WT = 570 g (* released as 3-yr old)
- PS-97 (N=57) average FL = 531 mm (458 – 711) (SD = 144)
  average WT= 488 g (317 – 1225) (SD = 153)

The PS-97 group appeared to be growing at a slower rate than expected. It was interesting that the PS-01 pallids released as 3-year olds during this year were larger than the average age-7 PS-

97 pallid. There also was a wide variability in sizes within the PS-97 group as demonstrated by the high standard deviation values.

A total of 115 PS-97's have been captured and measured over the past seven years. Table 6 shows the average fork length for these pallids. Over the last five years the PS-97 group has been growing at the average rate of 40 mm (FL) per year. This is considerably less than what has been reported for hatchery released white sturgeon in the Kootenai River, Idaho. Ireland et al. (2002) reports an average growth rate of 64 mm (TL) per year.

Table 6. Average sizes of the 1997- year class pallid sturgeon captured over the years since being released in 1998. Middle Missouri River, MT, 1998-2004.

	------ Average Fork-length (mm) at Age-class -----						
	1yr	**2yr**	**3yr**	**4yr**	**5yr**	**6yr**	**7yr**
Pallid juvenile-97 -	292	389	462	439	478	525	531
Number measured -	3	3	5	7	9	31	57

Twenty-nine of the 38 PS-97 captured in the Robinson Bridge area during 2004 had PIT tags, therefore, their stocking histories could be traced for additional information. Nearly 50% (14) of the PS-97 sampled in the Robinson area had been released in the general area indicating good survival of these fish compared to the PS-97 released at the two upriver sites (RM 1984 and RM 2051). Since we were emphasizing our sampling effort in the Robinson area this does not come as a great surprise. It is believed that a portion the upriver released PS-97 pallids still remain upstream of our Robinson Bridge sampling area. The survival rate of the upriver released PS-97 pallids remains unknown and because of the extensive river length above the Robinson area (~130 miles) it will be difficult to evaluate this with the current amount of effort. Most likely the PS-97 pallids released at Loma and Judith Landing have a similar survival rate to that observed at Robinson area and they are more dispersed throughout this upper reach. It is desirable to have the stocked pallids dispersed throughout RPMA 1 for better utilization of the available habitat, therefore, stocking in the upriver areas should continue.

This year the Marias River, 60 miles upstream of the confluence, was added to the existing four pallid sturgeon release sites in RPMA 1. The Marias River has a solid record of pallid sturgeon use prior to and a few years after damming of this river. The increase in miles of river may help give more time for the hatchery fish to acclimate to natural conditions. I wanted to evaluate if and how fast the pallids would drift out the Marias and where they eventually took residence in the Missouri River. The result of using this new site was evaluated with radio telemetry. Twenty-nine of the PS-03 pallids were surgically implanted with a nano radio transmitters and released in the Marias at Circle Bridge (RM 60) on August 24, 2004. Automatic radio receiving stations were positioned on the Missouri River at Loma (Missouri/Marias River confluence) (RM 2051), Coal Banks (RM 2031) and Judith Landing

(RM 1984). The pallids were monitored through October 26 when the battery life of the transmitters were projected to expire (63d). Table 7 summarizes the results of the juvenile pallid dispersal study. It was fairly obvious that nealy all (90%) of the radioed PS-03 pallids moved out of the Marias River and into the Missouri River in less than 50 days. By the end of the study (day 63) 72% of the radioed pallids had moved downstream of the lowest monitoring station (Judith Landing) approximately half way through RPMA 1. Finally, it was estimated that at least 53% (15) of the radioed pallids remained upstream of RM 1910 (the lowest downstream distance surveyed and 35 miles above the reservoir) at the end of the study. This was determined by accounting for the eight radios above Judith Landing (based on the loggers) and locating seven more by airplane between Judith Landing and RM 1910.

Table 7. Percentage of radio PS-03 that passed the radio receiving stations within the indicated time period. The PS-03 radio pallids were initially released in the Marias River, 60 miles upriver from the Loma Station (located at the confluence). Fish were monitored from August 24 to October 26, 2004 (63d).

Days at large	**Loma** (RM 2051)	**Coal Banks** (RM 2031)	**Judith Landing** (RM 1984)
4 – 9d	52	45	10
10 – 29d	28	28	38
30 – 49d	10	7	17
$\geq$ 50d	3	3	7
Percent of radios undetected [1/]	7	17	28

[1/] Most likely radio pallids remained upriver.

Propagation assistance:

Preserving a representation of the Upper Missouri River pallid sturgeon gene pool is an important goal for recovery. To that end, a pilot effort was initiated in 2000 to test the feasibility of collecting sperm from wild male pallids in this area and ship the fresh milt to Garrison National Fish Hatchery (GNFH) for use in their pallid sturgeon propagation program and cryopreserve representative sperm samples. Results from the initial effort proved worthwhile and collection of pallid sperm from the wild population was incorporated into my work plan.

River flow conditions during June were less than normal, with discharges ranging from about 7,200 to 11,000 cfs during June. These lower June flows made netting for adult pallid

sturgeon fairly effective. Two females and three males were captured and examined for spawning readiness. A list of the pallid sturgeon captured and their sizes and tag numbers are presented in Appendix B. One of the females contained mature eggs, while the other female had small immature eggs. All three male pallids and the one mature female were held in a 16 ft diameter tank for staging. A 17-gram radio transmitter was surgically implanted into the immature female before she was released back into the river so that she could be located next year. The one female was spawned on the site and crossed with two of the males in the tank and with another two Yellowstone River males (shipped sperm). The spawning was successful and the fertilized eggs were hatched-out and resulting fry reared at the BFYC. Sperm samples from two of the (new) male pallids sturgeon were shipped to GNFH and cryopreserved for use in the future propagation efforts and brood stock development.

Habitat restoration:

The long-term recovery objective is to down list and de-list the pallid sturgeon through protection and habitat restoration activities by 2040 (Dryer and Sandvol 1993). No habitat restoration has been accomplished in RPMA 1 because habitat requirements for pallid sturgeon are largely unknown. Two hypotheses suggested as possible reasons for causing pallid sturgeon near-extinction in RPMA 1 are that Canyon Ferry and Tiber Dams have altered stream flows to the point that pallid sturgeon habitats are not being maintained. Also, the operations of these dams may have altered the timing and magnitude of the spring pulse, thereby affecting behavior queues important for initiating the spawning migration. The second hypothesis is that Fort Peck Reservoir is a barrier to pallid sturgeon larvae drift and any of the larvae drifting into the reservoir will die because the lentic conditions of the reservoir are unsuitable habitat for age-0 pallid. Additionally, Fort Peck Dam is a barrier to both up and down river migrations for pallid sturgeon, thus isolating RPMA 1 pallid sturgeon.

There has been two spring pulse flows from Tiber Dam (Marias River) since 1997 as a direct results of discussions with the US Bureau of Reclamation. An 8-day pulse-flow peaking at 4,510 cfs occurred in 1997 and a 32-day pulse-flow peaking at 5,280 cfs occurred during 2002. The effects of these pulse-flows on pallid sturgeon were not evaluated so it is unknown if any of the desired objectives were accomplished. An aerial survey of the river during the pulse-flow was completed and it was noted that basic channel forming functions were occurring, such as flooding of the immediate floodplain, flushing of large amounts of organic matter into the channel and an increased sediment load. Very little damage of bank side infrastructure was noticed.

Fort Peck Reservoir at the bottom end of RPMA 1 has decreased in volume to an all time low. During 1997 the reservoir was at one of its highest levels (2248.6 msl), but since then the recent severe drought has draughted the reservoir 45 feet to an elevation of 2203.8 msl at the end of June. This presently has exposed approximately 20 miles of river. Pallid sturgeon have been found in this “new” section of river. Three PS-97 (6% of total) were sampled in this area this year, however the sampling effort was limited compared to upriver areas.

RECOMMENDATIONS

1. Continue with multi-sampling methods for hatchery-reared juvenile pallid sturgeon. The survival rate for the PS-97 group was finally determined but this was only after the group was 7 years old. It would be better to get a survival estimate sooner after the fish are released.

2. The fall pallid sturgeon abundance survey should be continued on an annual basis as funding allows. The hatchery pallid sturgeon should be approaching a size where they are more effectively sampled and this effort will more accurately describe their abundance in the area and be a better measure for comparisons in the future.

3. The Upper Missouri River pallid sturgeon gene pool needs to be preserved. Efforts to collect sperm from ripe males and eggs from females should continue as conditions allow. The fresh sperm should be either used during the current propagation year or stored in cryopreservation.

4. Continue sampling for age-0 pallid and shovelnose sturgeon with the trawl. Trawling has provided a considerable amount of information on shovelnose spawning success and the distribution and abundance of several unique fish species such as the sicklefin and sturgeon chubs.

5. A greaterer effort should be directed at evaluating habitat changes as a result of spring pulse flows provided from Canyon Ferry and Tiber Dams. Also, the value of additional river resulting from the low Fort Peck Reservoir pool should be evaluated to determine if more pallid sturgeon habitat is created. Additional funding will be required to address these important habitat issues.

6. Annual releases of hatchery pallid sturgeon are essential for developing a pallid population with a genetically diverse and sound age structure. This has not happened in RMA-1 because of the difficulty with propagation and a severely restrictive ban on releasing hatchery pallids in the area due to pallid sturgeon irido virus (PSIV) concerns. These potential fish that were not stocked due to the ban were invaluable because of the impending threat of extinction in the area. The MTFWP needs to consider allowing healthy hatchery pallid sturgeon to be stocked into RMA-1 from all the pallid sturgeon hatcheries providing they test negative for PSIV. This will insure that releases of pallid sturgeon will occur on a regular basis in RMA-1.

LITERATURE CITED

Dryer, M.P. and A.J. Sandvol. 1993. Recovery plan for the pallid sturgeon (*Scaphirhynchus albus*). U.S. Fish and Wildlife Service. Bismarck, ND. 55 pp.

Gardner, W.M. 1996. Missouri River pallid sturgeon inventory. Montana Fish Wildlife and Parks. Fed. Aid to Fish and Wildlife Rest. Proj. F-78-R-2. Helena.

_____ . 1997. Missouri River pallid sturgeon inventory. Montana Fish Wildlife and Parks. Fed. Aid to Fish and Wildlife Rest. Proj. F-78-R-3. Helena.

_____. 2004. Montana Endangered Fishes Program. E-7-10. Helena.

Ireland, S.C., R.C.P. Beamesderfer, V.L. Paragamian, V.D. Wakkinen and J.T. Siple. 2002. Success of hatchery-reared juvenile white sturgeon *(Acipenser transmontanus)* following release in the Kootenai River, Idaho. Journal of Applied Icthyology 18 (4-6), 642-650.

Montana Fish Wildlife and Parks. 2004. A Stocking Plan for Pallid Sturgeon in Recovery Priority Areas 1 & 2. Montana Fish Wildlife and Parks.

Prepared by: William M. Gardner May 30, 2004

Appendix A.
A list of pallid sturgeon captured in the Upper Missouri River, MT, 2004.

Id #	PIT Num	Type	Cap.date	FL	WT	Elasto	RECAP	Meth	RM	HAB	FLOW	PITTAG1	RADIO
1	?	JV-97	20040623	553	573	?	?	TNT1	1897.3	ISB	7190	?	
2	132126586A	JV-97	20040501	475	330	blue	NO	LL	1918.1	CHXO-bar	5088	LOST	
3	132129383A	JV-97	20040805	489	378	orange	?	TNT1	1911.4	ISB	3880	LOST	40.621PG
4	132133555A	JV-97	20040521	476	367	green	NO	TNT1	1913.8	CHXO-isl.	5590	LOST	
5	132156240A	JV-97	20040901	525	455	orange	?	TNT1	1911.3	OSB	4980	132156240A	
6	132161665A	JV-97	20040727	556	588	yellow	?	TRAWL	1893.8	OSB	4000	LOST	40.791PG
7	132179611A	JV-97	20040505	472	317	yellow	NO	LL	1918.5	CHXO-bar	5452	LOST	40.031PG
8	132211792A	A	20040604	1289	17500		YES	GN-6X10	1920.3	ISB-pool	10000	132211792A	
9	132222105A	JV-97	20041015	458	367	green	?	TNT1	1899.5	ISB	4200	132222105A	
10	132252257A	JV-97	20040526	546	480	green	NO	LL	1987.1	CHXO-pool	9150	LOST	
11	132255346A	JV-97	20040921	657	928	orange	?	TNT2	1925.0	OSB	4730	132255346A	
12	132262326A	JV-97	20040414	526	430	blue	NO	LL	1901.0	ISB	4670	LOST	40.600PG
13	132276383A	JV-97	20040421	518	429	orange	NO	LL	1907.0	ISB	4270	LOST	10.101PG
14	132311450A	JV-97	20040505	492	415	green	NO	LL	1918.5	CHXO-bar	5452	LOST	40.091PG
15	132313570A	JV-97	20040501	470	323	green	NO	LL	1918.1	CHXO-bar	5088	LOST	
16	132335326A	JV-97	20040415	566	598	orange	NO	LL	1894.1	ISB	4600	LOST	
17	132335370A	JV-97	20040415	510	404	yellow	NO	LL	1920.5	TRM	4670	LOST	40.641PG
18	132335370A	JV-97	20040505	503	399	yellow	YES	LL	1918.1	CHXO-bar	5452	132335370A	40.641PG
19	132335691A	JV-97	20040820	569	608	orange	?	TNT1	1916.1	ISB	4000	LOST	
20	132335691A	JV-97	20040921	568	624	orange	YES	TNT2	1916.7	ISB	4730	LOST	
21	17610815796	JV-97	20040630	497	403	green	?	TNT1	1987.1	CHXO	6380	17610815796	
22	17611258756	JV-97	20040609	520	470	orange	?	LL	1919.6	CHXO-bar	10250	17611258756	
23	17611374869	JV-97	20040610	546	518	yellow	?	LL	1918.3	CHXO	11625	17611374869	
24	1F4A4B5973	A	20040602	1257	12700		YES	GN-6X10	1916.0	CHXO-isl.	11000		149.800/017
25	410870674F	JV-97	20041015	563	557	green	NO	TNT1	1899.5	ISB	4200	410870674F	
26	41093A4D0B	JV-97	20040414	520	452	yellow	NO	LL	1887.6	ISB	4670	41093A4D0B	
27	410945166F	JV-97	20040414	589	624	yellow	NO	LL	1887.6	ISB	4670	410945166F	

Appendix A. (Continued)

Id#	PIT Num	Type	Cap.date	FL	WT	Elasto	RECAP	Meth	RM	HAB	FLOW	PITTAG1	RADIO
28	41094F4F3D	JV-97	20040413	563	540	yellow	NO	LL	1897.5	ISB	4670	41094F4F3D	40.611PG
29	410956305D	JV-97	20040616	522	473	blue	NO	TNT1	1893.0	ISB	10400	410956305D	
30	4109586D19	JV-97	20040606	502	425	yellow	NO	LL	1918.2	CHXO-bar	9000	4109586D19	
31	414746273A	A	20040409	1429	18100		YES	ROD	1905.5	OSB-pool		414746273A	
32	414D431A5D	JV-97	20040504	483	353	green	NO	LL	1918.1	CHXO-bar	5320	414D431A5D	40.041PG
33	414D44475A	JV-97	20040508	488	338	orange	YES	LL	1917.9	CHXO-bar	5650	414D44475A	40.721
34	414D447D55	JV-97	20040501	498	364	orange	YES	LL	1918.1	CHXO-bar	5088	414D447D55	
35	414D460667	JV-97	20040401	520	404	green	NO	ROD	1901.1	ISB	4860	414D460667	40.131PG
36	414D471439	JV-97	20040415	503	408	blue	NO	LL	1901.0	ISB	4670	414D471439	40.681PG
37	414D496D64	JV-97	20040331	526	445	orange	NO	ROD	1901.4	ISB	4860	414D496D64	40.011PG
38	414D4D2D11	JV-97	20040331	495	361	red	NO	LL	1908.7	ISB	4860	414D4D2D11	40.751PG
39	414D507C16	JV-97	20040504	587	607	red	NO	LL	1918.1	CHXO-bar	5320	414D507C16	40.761PG
40	414D547923	JV-97	20040503	495	320	red	YES	LL	1918.1	CHXO-bar	5320	414D547923	40.061PG
41	414D547A34	JV-97	20040623	560	558	blue	NO	TNT1	1896.4	ISB	7190	414D547A34	
42	414D547B17	JV-97	20040920	561	567	green	NO	TNT2	1920.5	TRM	4720	414D547B17	
43	414D556218	JV-97	20040428	584	572	orange	YES	LL	1916.4	CHXO	4156	414D556218	
44	414D574F03	JV-97	20040423	615	755	yellow	NO	TNT1	1925.2	CHXO-isl.	4000	414D574F03	40.651PG
45	414D5C252F	JV-97	20040501	508	508	green	NO	LL	1918.1	CHXO-bar	5088	414D5C252F	
46	414D5E4E63	JV-97	20040624	541	536	green	NO	LL	1909.4	ISB-bar	7190	414D5E4E63	
47	414D5F2146	JV-97	20040413	515	430	orange	NO	LL	1894.1	ISB	4670	414D5F2146	
48	414D5F2146	JV-97	20040901	522	458	orange	YES	TNT1	1907.0	ISB	4980	414D5F2146	
49	414D60616C	JV-97	20040526	518	435	blue	NO	LL	1987.1	CHXO-pool	9150	414D60616C	
50	414D606661	JV-97	20040920	561	562	orange	NO	TNT2	1922.3	ISB	4720	414D606661	
51	414D610D5E	JV-97	20040414	533	463	red/red	YES	LL	1887.6	ISB	4670	414D610D5E	40.781
52	414D614B09	JV-97	20040421	502	365	blue	NO	LL	1907.0	ISB	4270	414D614B09	40.071PG
53	414D622051	JV-97	20040414	523	465	yellow	NO	TNT1	1910.2	OSB	4670	414D622051	40.141PG

Appendix A. (Continued)

Id #	PIT Num	Type	Cap.date	FL	WT	Elasto	RECAP	Meth	RM	HAB	FLOW	PITTAG1	RADIO
54	414D63303B	JV-97	20040414	492	357	blue	NO	ROD	1905.3	OSB-pool	4670	414D63303B	40.671PG
55	414D661A52	JV-97	20040604	492	351	red	NO	LL	1918.2	CHXO	10000	414D661A52	
56	435D6A1054	JV-01	20040921	552	481	pink/blu	NO	TNT2	1916.4	ISB	4730	435D6A1054	
57	435D755069	JV-01	20040921	604	658	?	NO	TNT2	1917.7	CHXO-pool	4730	435D755069	
58	44427B2A72	JV-03	20040909	322	90	red/grn	NO	elec	2034.0	OSB	4434	44427B2A72	
59	4443046601	JV-03	20040921	393		red/yell	NO	TNT2	1915.9	ISB-isl.	4730	4443046601	
60	444362342F	JV-03	20041014			red/yell	NO	TNT1	1913.5	OSB	4200	444362342F	
61	4527066B0F	JV-97	20040331	539	531	orange	NO	ROD	1901.4	ISB	4860	LOST	40.111PG
62	45272B3964	JV-97	20040323	505	408	green	NO	LL	1905.3	ISB	5140	LOST	
63	45294F7023	JV-97	20040922	558	527	yellow	?	TNT2	1913.4	CHXO-isl.	4740	lost	
64	452A3D6110	JV-97	20040428	585	646	green	YES	LL	1915.7	CHXO-isl.	4156		
65	452A4E1F15	A	20040428	127	13200		YES	TNT-1	1914.3	CHXO-pool	4156	452A4E1F15	149.800/016
66	452A646C21	JV-97	20040921	711	1225	yellow	?	TNT2	1925.1	OSB	4730	lost	
67	7F7D487531	A	20040506	140	13600		YES	GN-6X10	1915.6	CHXO-isl.	5518	7F7D487531	149.800/012
68	7F7E42795C	A	20040608	136	16100		YES	GN-6X10	1920.7	CHXO	8875	7F7E42795C	149.800/010

Appendix B. A list of pallid sturgeon spawners captured during spring 2003, Upper Missouri River, MT.

PIT #	Date	FL(mm)	WT(kg)	RM	Sex	Recap	# Days in tank
132211792A	June 4	1289	17.5	1920.3	F	No	8
414746273A	June 2	1435	16.1	1920.5	F	Yes	1
7F7E42795C	June 6	1363	16.1	1920.7	M	Yes	6
757D487531	June 1	1407	13.6	1916.1	M	Yes	13
1F4A4B5973	June 2	1257	13.0	1916.0	M	Yes	12