PALLID STURGEON PROPAGATION
2003
Garrison Dam NFH

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Background/Introduction

The Pallid Sturgeon Recovery Plan (1993) established guidance for collection of wild brood fish, propagation, research needs, and reintroduction of progeny to accomplish recovery goals. This hatchery's role in the recovery effort focuses on the development of techniques for spawning and rearing of pallids and propagation for augmentation. Pallid Sturgeon propagation at Garrison Dam NFH began in 1997. Successful spawning has occurred annually since 1998. Both the 1999 and 2000 year classes propagated at Garrison were destroyed after being identified positive for Shovelnose Sturgeon Iridovirus (SSIV). April 2002 marked the first stocking of yearling (2001 year class) pallids from this facility. Recapture data from the stocked fish indicates that they have assimilated well to their native waters.

Objectives

Objectives for this year will be renewed emphasis on augmentation. All four hatcheries used in past pallid propagation will be utilized in 2003. We will attempt to collect three females and twelve males for spawning at Garrison Dam NFH. In addition to spawning and rearing of the twelve 2003 'confluence' family lots, the hatchery will again pursue spawning from the Upper Missouri River spawning site on the CM Russell NWR. Pairing for family lots will be based on results from the Genetics Lab at UC Davis. We plan on producing (3) 1X4 matings using the twelve broodfish. We will also evaluate fertilization rates using cryopreserved milt from both the 0.5 and 5ml straws.

Miles City SFH will be supplied with six adults, four males and two female. In addition to spawning in June they will be culturing four family lots from 2002 to a tagable size prior to stocking in RPA #2 later in the summer. Eggs from the Miles City spawning will be held at both the Miles City hatchery and Gavins Point NFH.

Bozeman FTC will be propagating 2003 progeny for stocking RPA #1. Plans are to spawn riverside again on the CM Russell Refuge. Eggs from this spawning event will be held at both the Bozeman hatchery and Garrison Dam NFH. Bozeman FTC will also be able to bring in eggs from both Miles City and Garrison Hatcheries for propagation.

Work will continue on PCR confirmation tests and in locating SSIV positive adult sturgeon in the upper Missouri River above Fort Peck Reservoir. Research into the advancement of a PCR

diagnostic test was to be accomplished at the University of California, Davis campus under the direction of Dr. Ron Hedrick. Additional samples of the 2002 year class fish that had been suspect for the virus were sent this Spring for use in the development and testing process.

Spring Capture 2003

Methods and Results

Pallid Capture at the Confluence

Through the efforts of the Montana Parks and Wildlife, the US Geological Survey, and the US Fish and Wildlife Service, pallids were captured near the confluence for Spring spawning. Water flows this year appeared to have triggered an upstream movement of the pallids as the majority of the fish were collected in the Yellowstone River upstream of the confluence near the Highway 200 bridge. Three females and eleven males were held at Garrison Dam NFH for spawning efforts. Three females and four males were transported to the Miles City SFH (Table 1).

Chronology of capture:

April 22 - Five boats fishing from 10:00 am through 5:00 pm. The four fish collected, all suspect males, were transported to Miles City SFH (7F7F065A4E, 115669540A, 132114552A, and 1F4B225A1A). Suspect 'male', A1A had previously been at the hatchery (2000) and collected in five of the past six years - a 'snaky' older looking fish. In 2000 it was injected but produced nothing, likely no longer capable of reproducing (this fish was later returned to the river when a more suitable candidate was found).

April 23 -Five boats fishing from 9:00 to 5:00. Four fish collected, one mature female, 7F7B026102, 1 confirmed male, 1F4A363031, the other two of unknown sex, 220E5F6E26 and 115675486A. The male, 1F4A363031, was one of two that was spawned at Garrison Dam NFH in 1998. Since the contribution from the male in 1998 was limited to only 100 progeny in RPA #2 we determined that it's genetic contribution was under-represented in the recovery program and that it's progeny could be stocked as well as having it's sperm cryopreserved.

April 24 - Two fish collected, one confirmed male, #7F7D291A07, the second a new fish, suspect male, #115676694A. The confirmed male was spawned in 1997 at Gavins Point Dam NFH. Progeny have been released from this fish but in low numbers (310 in RPA #2, 276 in RPA #1, and 181 in RPA #3). Cryopreservation of milt is needed as well as genetics workup on this fish. It will be used only as a backup for spawning purposes. Both fish were taken to Garrison Dam NFH.

April 25 - Three boats fishing fishing from 9:00-1:30. Two fish collected, one radio #26 the other a suspect male collected near Erickson Island - one of the few pallids collected in the

Missouri River this year. The fish was taken to Garrison Dam NFH.

April 29 - Three boats fishing 9:00 - 5:00. Two fish were collected, one male, one female. The male # 1F47760123 was a recapture spawned at Garrison Dam NFH in 1998, the female # 132256586A, a 'new' fish. Both were taken to Miles City SFH. Since there were only 100 progeny from the male released in RPA #2 it is still a viable candidate.

April 30 - Two boats fishing 10:30 - 3:15. Three fish collected. The first was collected between the railroad and Hwy 200 bridges at 11:00 am. The fish is suspect male, new capture, tagged 132313521A. The second was an 'unknown' from 1995, tagged with two tags, 1F521B1E56/1F54696C38. The third fish was a male with multiple tags, 41475D3C5D (7F7D365422, 4148382A26), captured downstream of the Hwy 200 bridge. The water temperature is 55°F. These fish were transported to Garrison Dam NFH. Also collected today were two radio tagged fish.

May 5 - Three boats fishing until 1:30, then only two. Collected two pallids, a female, #7F7F054855, spawned in 1999 at Garrison Dam NFH and an unknown 28 pound new capture, 115679394A (identified at spawning as a very small, gravid female). It will be interesting to note how female #855 performs. When spawned at Garrison, the ovulation went well, the egg fertility was nearly 50%, the hatch was good at 77% , but post spawn, all fry died within 8 days. The other two female lots did fine that year. Both fish hauled to Miles City and male # A1A returned to the river from Miles City.

May 6 - Two boats fishing until noon, three in the afternoon. Six fish collected (all later confirmed males), three were transported to Garrison Dam NFH. Pit tag #'s 7F7F06697C, 7F7D372A6B, 220E4E4E5D, and a new capture 132157621A.

May 7 - Captured four fish, three released at capture, the fourth taken to the hatchery, catheterized to determine sex (male - testes recovered), and returned to the river.

May 14 - Collected a 53 pound fish with spaghetti tag ES 10027 - pit tag not readable (7F7B016070), tagged in September of 1994. Tagged at the hatchery with PIT tag # 44426F185B. This fish is a gravid female.

Confluence Spawning at Garrison Dam NFH

Female #7F7B026102 was injected with LH-RH at 10:15 pm on the evening of June 23rd. The progesterone assay for this fish was 80% on June 17 and 100% on June 22. Polarity indices ranged from 0.07 to 0.1. The morning of the 24th at 11:30 the fish was given the resolving dose.

The second female, #7F7B016070 was injected at 10:20 pm on June 23th. The fish was injected with LH-RH at the usual 0.005 mg/kg rate for the initial injection. The following morning she received the resolving dose of 0.045 mg/kg at 11:30.

Two of the 8 males were injected on the evening of June 23rd. The fish were injected at 0.02 mg/kg and given only a single injection, intramuscular. The two males selected have a very limited number of progeny stocked out from the 1997 and 1998 spawning events. They were injected in advance to provide milt if the females responded more quickly than anticipated and to give us some lead time on cryopreservation since neither male is in the repository. The

remainder of the males were injected on the afternoon of June 24th at 2:00 pm also with LH-RH. The males injected earlier, #1F4A363031 and 7F7D291A07, were 'cruising' around the perimeter of the tank in response to the hormone injections.

June 25th Spawning began on female 6070 at 11:50 am. Ovulation proceeded well throughout the day with collections of about 400 mls per palpation attempt. A total of seven family lots were produced with female #6070. Due to poor egg quality late in the take, the final two family lots were likely not to amount to much (Table 2). The first male used, 3C5D, was inadvertantly used prior to observing motility. Motility for that male was less than 1%. (Surprisingly, fertilization and survival rates indicated that even at a low motility, due to shear numbers, you can get good results). The second female #6102 is not responding well to the injections. At 2:45 pm we are finally able to express a couple eggs by palpation. It isn't until 8:30 that we get a fair quantity, 100 mls of eggs. The fourth try at 11:00 pm we get an additional 150 mls. An attempt at 12:00 and a half hour later provides only a few eggs. The following morning the fish is palpated, no eggs are expressed. Egg quality of those few collected is poor and no hatch results (Table 3).

When we attempted to aspirate milt from one of the injected 'males' we have a surprise - a few eggs are pulled into the catheter. The eggs from this 30 pound gravid female (#115676694A) are checked and based on the polarity index it appears to be in spawning condition. Small batches of eggs are expressed from this fish over the next 24 hours (Table 4). A total of 38,000 eggs are spawned from the fish but only 254 hatch and of that 8 survive to the first month - 4 end up as six inch fish transferred to Gavins Point NFH for future broodstock.

The only thing that has been consistent with our spawning efforts has been it's inconsistency. We verify the condition of the eggs right up until injections and using the established protocols our results have been varied. There is something in the final egg maturation and ovulation processes that is being overlooked. Fortunately, we have had at least one female each year that has ovulated successfully and progeny continue to be produced in quantities that exceed our capacity at the hatchery. Arrangements are made to transfer eggs from the spawned females to Bozeman FTC.

June 26th eggs numbers were evaluated and boxed for shipping. The Conte Research Center (USGS) had requested eggs for research on larval drift. Approximately 4,000 eggs (100 mls) were shipped in water via Fed Ex. The researchers in charge were Boyd Kynard and Erika Henyey. Eggs destined for the Bozeman National Fish Hatchery were also boxed. Five boxes of 150 mls per box representing five of the seven crosses from female # 185B (6070) were sent (males #1E56, 3031,521A,2A6B,592B). Hatchery personnel from the two stations met in Terry, MT to transfer the eggs. The following day the two met in Fallon, MT to exchange eggs from the second female #694A. Four family groups from this female were sent along with two family groups from female #185B (6070). The male cross, #3C5D, wasn't expected to produce viable eggs due to low motility but after a day's incubation it appeared like there would be viable progeny. The other cross was male # 2A6B.

On June 28th the eggs from female #185B (6070) and male crosses (3D5E, 1E56, 3031, 1A07,

521A) began hatching at about 5:00 pm. Water temperature is 68° F. The following day the final two families (592B, 2A6B) started hatching along with eggs from the family 694A X 2A6B. On July 15th blood samples were taken from female #115676694A and three males. The female had turned pale and had acted lethargic for about a week. We were hoping that by evaluating blood levels we might get an idea of what the problem was and possibly correct it through IV injections. Five days later, on July 20th the fish was dead. Another female, #185B (6070), was now looking pale as well. On July 31st the fish was hauled back to the confluence. It was later found dead by the ND Game and Fish Department fisheries crew. Values for the blood samples are found on Table 21.

CART tags were attached to the post spawn males and female in August and they were returned to the river. Jack Siple of the Kootenai Tribal Hatchery in Idaho was at the station to assist the Missouri River Fish and Wildlife Management Office with attaching the transmitters. The units were wired through the dorsal fin. The procedure has worked well on the white sturgeon and was felt to be much less evasive to the fish.

Miles City Spawning

Spawning at Miles City was initiated on Monday, June 30th with both males and females injected at 4:00 pm. The resolving dose was given at 8:00 am the following morning.

The males at Garrison Dam NFH that were selected to be used at Miles City SFH were injected on June 30th at 9:30 am. The fish were injected at a 0.2 mg/kg rate with a single dose. Male #'s 132157621A and 220E5F6E26 were selected to be crossed with female # 586A. Males 115675486A and 220E4E4E5D were selected to cross with female 4855. Both males 4E5D and 486A were used to produce family lots at Garrison with limited results. Milt quality of male 4E5D was questionable. The milt was 70-80% motile for a very short time <20 seconds, then droped off quickly. Two other males were injected to replace those that did not produce viable milt. The first #7F7D372A6B produced a small family lot at Garrison NFH. The second 132313521A produced an even smaller family lot - this male was injected later in the day at 3:00 pm. Monte from the Miles City SFH flew up to pick up the sperm and deliver milt for cryopreservation. At the time of spawning milt from three of the six males available was used to produce progeny at Miles City creating two 1 X 3 family crosses.

Ovulation of the two known females went well at Miles City. They were also surprised by a small 28 pound suspect male producing viable eggs. At capture the protocol has been to catheterize only the fish that appeared gravid. After this season, it appears that we should consider checking all fish for the presence of eggs. After 'finding' the additional female, the fish was given a resolving dose of LH-RH to further the ovulation process.

A total of 2957mls (118,320) of eggs were collected from female #132256586A and crossed with three males. The second female #7F7F054855, (a previously spawned female) produced 1213 mls (48,520) of eggs and was also crossed with three males. Only 25 mls (1000)of eggs were collected from the 'surprise' female. Eggs from this fish were not easily expressed and it was

thought at the time they were likely not ready.

July 3rd eggs and milt were transported by hatchery truck from Miles City to Garrison Dam NFH and Bozeman FTC. 100 mls of eggs were shipped from each of five families, and 200 mls from the larger family lot (486A X 552A) to Garrison (Table 5). Eggs were treated with Betadine upon arrival - 100 ppm, 10 minute bath. The Miles City eggs hatched on July 6-7. The six week survival of eggs from the Miles City families at Garrison averaged 32.2%, much higher than at either Bozeman or Miles City (Table 8). Apparently there was little effect from the shipment.

Table 1. Pallid Broodstock Data.

2003 PALLID STURGEON BROODSTOCK DATA								
Tag Number	**Date**	**Sex**	**Wt lbs.**	**2nd Tag Number**	**Other Info**	**Spawn results**		**Spawn Site**
						Cryo	**Progeny**	
44426F185B	5/14/03	F	53	7F7B016070	Spaghetti tag ES 10027 (can't read 2nd pit tag)	-	yes	GAD
220E4E4E5D	5/6/03	M	35		One eye, recap	no	no	GAD
132157621A	5/6/03	M	35		new fish, cath - no eggs, Tagged at hatchery	yes (5%)	yes	GAD
7F7D372A6B	5/6/03	M	32		cath - no eggs	yes (20%)	no	GAD
132313521A	4/30/03	M	40		new fish	yes (5%)	yes	GAD
41475D3C5D	4/30/03	M		7F7D365422	4148382A26	no	yes	GAD
1F521B1E56	4/30/03	M	33	1F54696C38	recap 9/29/1995	yes (2%)	yes	GAD
1F4A13592B	4/25/03	M	36.5	220D4E6A57		yes (35%)	yes	GAD
7F7D291A07	4/24/03	M	38.5		Spawned in '97 (155 progeny released in RPA #2)	yes (20%)	yes	GAD
115676694A	4/24/03	F	30		new fish, died post spawn, progeny died	-	no- died	GAD
1F4A363031	4/23/03	M	45		Spawned in '98 (100 progeny released in RPA #2)	yes (50%)	yes	GAD
115675486A	4/23/03	M	27	A98R7RGKJ		yes (50%)	yes	GAD
7F7B026102	4/23/03	F	44		CATH - EGGS	-	no	GAD
220E5F6E26	4/23/03	F	56		CATH - NO EGGS (possible immature female)	no milt	no	GAD
115679394A	5/5/03	F	28		new fish	-	no	MC
7F7F054855	5/5/03	F	39		Spawned at GAD in 1999	-	yes	MC
132256586A	4/29/03	F	59		new fish, CATH - EGGS	-	yes	MC
1F47760123	4/29/03	M	33		Spawned in '98 (100 progeny released in RPA #2)	yes (2%)	yes	MC
7F7F065A4E	4/22/03	M	46		cath - no eggs - old radio tag - 1992, died pre spawn	-	no-died	MC
115669540A	4/22/03	M	32		Unknown recap from 2001	yes (<1%)	yes	MC
132114552A	4/22/03	M	24		new fish	yes(1%)	yes	MC

Table 2. Female #44426F185B (7F7B016070) - Spawning Results

FEMALE #44426F185B (7F7B016070)									
TIME	**DATE**	**MALE #**	**MLS EGGS**	**# EGGS @ 36.5/ML**	**Percent Fertilization (based on hatch)**	**Estimated Hatch Number (7/1/03)**	**Eggs to Bozeman @ 36.5/ML**	**Estimated Number (7/25/03)**	**Initial Survival**
11:50 a	6/25	41475D3C5D	400	14600	55%	6000	3650	2200	20%
12:50 p	6/25	1F521B1E56	400	14600	37%	8900	5475	4700	20%
1:35 p	6/25	1F4A363031	425	15513	19%	4560	5475	500	2%
2:26 p	6/25	1F521B1E56	410	14965					
3:37 p	6/25	7F7D291A07	500	18250	25%	4500	0	1900	10%
3:37 p	6/25	1F4A363031	400	14600					
4:35 p	6/25	132313521A	550	20075	29%	4500	5475	25	0%
5:40 p	6/25	7F7D372A6B	300	10950	2%	150	9125	0	0%
6:40 p	6/25	1F4A13592B	375	13688	7%	1500	5475	150	1%
11:05 p	6/25	1F4A13592B	375	13688					
7:25 a	6/26	7F7D372A6B	175	6388					
TOTAL			4310	157352	25%	30110	34675	9475	8%

Table 3. Female #7F7B026102 - Spawning Results

FEMALE #7F7B026102								
TIME	**DATE**	**MALE #**	**MLS EGGS**	**# EGGS @ 36.5/ML**	**Percent Fertilization**	**Estimated Hatch Number**	**Milt time**	**Comments**
2:45 p	6/25	1F4A13592B	0.1	4	0.0	0	2:24 p	
5:32 p	6/25	7F7D372A6B	0.05	0	0.0	0	2:05 p	
8:38 p	6/25	1F4A13592B	100	3650	0.0	0	2:24 p	
11:00 p	6/25	7F7D291A07	150	5475	0.0	0	10:55 p	
12:02 a	6/26	1F4A13592B	10	365	0.0	0	12:02 a	
12:30 a	6/26	1F4A13592B	5	183	0.0	0	12:02 a	
3:15 a	6/26	7F7D291A07	5	183	0.0	0	10:55 p	
TOTAL			270.15	9895	0.0	0		no hatch

Table 4. Female #115676694A - Spawning Results

FEMALE #115676694A									
TIME	**DATE**	**MALE #**	**MLS EGGS**	**# EGGS @ 36.5/ML**	**Percent Fertilization (based on hatch)**	**Estimated Hatch Number (7/1/03)**	**Eggs to Bozeman @ 36.5/ML**	**Estimated Number (7/21/03)**	**Initial Survival**
11:30	6/25	41475D3C5D	1	37	0%	0	0	0	0%
2:30	6/25	7F7D372A6B	7	256	3%	200	1825	6	0%
5:40	6/25	7F7D372A6B	1	37					
8:38	6/25	7F7D372A6B	3	110					
11:05	6/25	7F7D372A6B	3	110					
12:04	6/26	7F7D372A6B	3	110					
3:10	6/26	7F7D372A6B	6	219					
7:20	6/26	7F7D372A6B	40	1460					
10:45	6/26	7F7D372A6B	92	3358					
12:45	6/26	7F7D372A6B	30	1095					
2:35	6/26	7F7D372A6B	38	1387					
3:10	6/26	132313521A	137	5001	1%	45	1825	2	0%
4:04	6/26	132313521A	80	2920					
4:30	6/26	115675486A	80	2920	0%	6	1825	0	0%
4:55	6/26	115675486A	98	3577					
5:20	6/26	220E4E4E5D	98	3577	0%	3	1825	0	0%
10:15	6/26	220E4E4E5D	325	11863					
TOTAL			1041	38033	1%	254	7300	6	0%

Table 5. Miles City Spawning Results

Miles City Spawning Results									
Female #	**Male #**	**Eggs mls**	**# Eggs @40/ml**	**Percent Fertilization (based on hatch)**	**Estimated Hatch Number**	**Eggs to Bozeman FTC**	**Eggs to Garrison Dam NFH**	**Estimated Number @ MCSFH (8/15/2003)**	**Initial Survival**
132256586A	132114552A	1360	54400			4000	8000	800	
132256586A	13257621A	828	33120			4000	4000	350	
132256586A	1F47760123	769	30760			4000	4000	0	
7F7F054855	115669540A	444	17760			4000	4000	2200	
7F7F054855	115675486A	414	16560			4000	4000	950	
7F7F054855	132313521A	355	14200			4000	4000	0	
115679394A	1F47760123		40			1000	0	0	
TOTAL		2810	112400	0%	0	25000	28000	1150	0%

2003 Progeny Propagation Efforts

Tank screens were changed out and feeding was initiated at ten days post hatch using BioOregon's BioDiet Starter #1. The feeders were set to feed at 15 minute intervals 24/7. The 'Garrison' fish are feeding well by July 27th and mortalities have dropped off significantly. The fish appear ready for the next diet size and mixing of the Starter #2 began. The volume of feed is increased from 100 mls to 150-200 mls/day. Some of the 'Miles City' fish have elevated mortalities and a fair number of 'pin-heads.' In the tanks with 'pin-heads', the fish are swimming at the surface and appear to have scoliosis. We are feeding bloodworms and brine shrimp as well as Biodiet to get them started feeding. On July 29th a group of 'spinners'(586A X 621A) are moved to a separate tank. The fish were held separate to evaluate their survival. Fifteen days later the 'spinners' have returned to normal, taking a position on the tank bottom similar to the rest of the lots. Mortality it the tank was typical.

By August 6th the fish are moved to the larger production tanks at a rate of 375 fish per five foot tank and 260 fish per four foot tank. A mixture of Starter #2 and #3 at 200 mls/day is begun. On the 14th, BioDiet grower is mixed with the #3 to transition the fish up a level. Feeding rates were dropped to 100-120 mls/day.

September 1st, the fish are again needing to have density's reduced. Sample counts for the 'Garrison' fish average 1.9 grams/fish. The 'Miles City' fish are at 1.6 grams. All tanks in the hatchery including most of the 30 inch tanks are full to capacity.

September 3rd mortality begins in the green eight foot tank. On the 5th fish are moved to another building to reduce the density. The mortality explodes over the next few weeks. CLT is used in a 5ppm flow through treatment targeting any bacterial problems they may have. The rate was increased to 10 ppm for the next two treatments without effect.

September 5th, switched to feeding the Silver Cup Salmon #2 feed at about 10% BW. On the 19th the average size of the fish is 6.5 grams - feed rate dropped to 7%. There has been a rise in mortalities in three other tanks by the 25th. The diet is now a mixture of S.C. Salmon #2 and #3.

The 3rd of October we started on a diet of straight #3 Silver Cup. Arrangements were made to stock fish that had not experienced mortality and Bozeman FHC was here for an inspection.

Fish for Gavins Point future broodstock as well as 2003 propagation efforts were hauled to Gavins Point on the 6th of October at an average size of 5 inches. Four family groups were hauled at 650 fish per compartment (up to 22.2 lbs/cmpt). The fish were shipped at 68° and were off loaded at Gavins Point at 63° F. Eleven boxes were also taken with representatives of smaller family groups. The fish in boxes were shipped with up to 17 fish per box. The nets used to package the fish were dipped in a Hyamine solution for disinfection. Apparently there was enough residual Hyamine on the nets during the transfer to cause mortality in the shipping boxes. Although seven boxes made it in great shape with no mortality, four of the boxes suffered 100% mortality and 57 fish died. You can be too safe! The same day 133 of the 2002 progeny 'runts' were hauled 575 miles to Mulberry Bend and stocked. These fish averaged ten inches and weighed 21.5 pounds. On the 15th of October an additional 1600 six inch fish weighing 52 pounds were sent to Yankton. The tanks were loaded with 400 fish each from four family lots

(Table 16). On the 30th of October the Neosho crew hauled 3,919 seven inch fish back to their facility (Table 17). The fish were loaded in a 3 compartment tank, ~250 gallons/compartment. A total of 203.1 pounds were loaded on the truck. There was some difficulty with the oxygen in the center tank that resulted in mortality during the haul. The inventory taken on December 1 at Neosho indicated that they had lost 377 fish over the month of November.

October 31st a group was assembled to tag the 2003 progeny prior to the Fall release. A coded wire tag (CWT) and pink elastomer was used to mark the fish. The elastomer was injected in the right side of the rostrum and parallel to the fish and the tag under the second dorsal scute posterior to the head. The fish are being fed at 5% body weight/day and the average size of the fish is now 20.0/lb.

On November 18th the water temperature was dropped to 52° F to match water temperature at the stocking sites. Feeding was reduced to 2% body weight. November 20th the first fall fish were hauled to the stocking site at Mulberry Bend, NE (Table 13). The fish averaged eight inches now. 1680 fish weighing 84 pounds were stocked using the 200 gallon slide-in unit. Loading temperature was 49° F and the temperature at the river was 43° F. The tank had cooled to 45° during transport and fish were stocked without tempering. Only 1 mortality was noted at stocking. The final shipment of 190 fish for Gavins Point were shipped in boxes for the trip. The fish were loaded with a maximum of 16 fish per bag.

November 24th -25th we tagged an additional 3600 pallids with 3 hand-held CWT units and elastomer injectors. These fish were scheduled for stocking at Bellevue and Booneville. The water temperature was dropped again to 49° to match stocking temperatures. Post tagging mortality during the 6 days prior was 1.5%. We lost a total of 54 fish.

The final shipment of the year was taken by the Blind Pony SFH crew. On December 2nd, they braved the snow to haul 3,550 fish to their stocking sites at Bellevue, NE and Booneville, MO (Table 14 and Table 15). The truck had four 300 gallon compartments. The fish were loaded on at 38°F to match the receiving water temperature. The trip lasted 17 hours and the report back indicated that the fish hauled great and only two fish looked weak at the time of stocking.

December 3rd we distributed the remaining fish into the 36 production tanks using a maximum density 0.5 pounds per square foot at a nine inch size (Table 18). Feeding rate was dropped to 1% since there is little feeding activity in the 49° F water.

Table 6. Survival Rates - Garrison Dam Progeny at Two Months

FEMALE #44426F185B (7F7B016070)												
Time	**Date**	**Male #**	**Eggs mls**	**# Eggs @ 37/ml**	**Percent Fert. (based on hatch)**	**Estimated Hatch Number (7/1/03)**	**Hatch Number (Backcalculated from Morts)**	**Eggs to Bozeman @ 37/ML**	**Estimated Number (7/25/03)**	**Inventory Estimate 8/12/03**	**Inventory 9/1/03**	**% Survival @ 2 months**
11:50a	6/25	41475D3C5D	400	14800	45.2%	6000	5019	3700	2200	3040	2975	59.3%
12:50p	6/25	1F521B1E56	400	14800	44.5%	8900	9220	5550	4700	6000	5942	64.4%
1:35 p	6/25	1F4A363031	425	15725	10.3%	4560	2569	5550	500	620	591	23.0%
2:26 p	6/25	1F521B1E56	410	15170								
3:37 p	6/25	7F7D291A07	500	18500	26.8%	4500	4954	0	1900	2940	3112	62.8%
3:37 p	6/25	1F4A363031	400	14800								
4:35 p	6/25	132313521A	550	20350	19.6%	4500	2901	5550	25	13	14	0.5%
5:40 p	6/25	7F7D372A6B	300	11100	4.3%	150	359	9250	0	0	0	0.0%
6:40 p	6/25	1F4A13592B	375	13875	3.8%	1500	839	5550	150	100	179	21.3%
11:05p	6/25	1F4A13592B	375	13875								
7:25 a	6/26	7F7D372A6B	175	6475								
TOTAL			4310	159507	21.4%	30110	25861	35150	9475	12713	12813	42.6%

Table 7. Survival Rates - Garrison Dam Progeny at Two Months

FEMALE #115676694A										
Time	**Date**	**Male #**	**Eggs mls**	**# Eggs @ 37/ML**	**Percent Fertilization (based on hatch)**	**Estimated Hatch Number (7/1/03)**	**Hatch Number (Backcalculated from Morts)**	**Eggs to Bozeman @ 37/ML**	**Estimated Number (7/21/03)**	**Initial Survival**
11:30	6/25	41475D3C5D	1	37	0.0%	0	0	0	0	0.0%
2:30	6/25	7F7D372A6B	7	259	5.5%	200	352	1850	6	0.0%
5:40	6/25	7F7D372A6B	1	37						
8:38	6/25	7F7D372A6B	3	111						
11:05	6/25	7F7D372A6B	3	111						
12:04	6/26	7F7D372A6B	3	111						
3:10	6/26	7F7D372A6B	6	222						
7:20	6/26	7F7D372A6B	40	1480						
10:45	6/26	7F7D372A6B	92	3404						
12:45	6/26	7F7D372A6B	30	1110						
2:35	6/26	7F7D372A6B	38	1406						
3:10	6/26	132313521A	137	5069	0.4%	45	25	1850	2	0.0%
4:04	6/26	132313521A	80	2960						
4:30	6/26	115675486A	80	2960	0.4%	6	21	1850	0	0.0%
4:55	6/26	115675486A	98	3626						
5:20	6/26	220E4E4E5D	98	3626	0.1%	3	13	1850	0	0.0%
10:15	6/26	220E4E4E5D	325	12025						
TOTAL			1041	38554	1%	254		7400	6	0%

Table 8. Miles City SFH Progeny Survival Rates at Six Weeks

Miles City SFH Progeny												
Female #	**Male #**	**Total mls Eggs**	**Eggs Taken @40/ml**	**Eggs at Miles City SFH**	**Inventory Estimate 8/15/2003**	**% Survival @MC SFH**	**Eggs to Bozeman FTC**	**Inventory 8/19**	**% Survival @ BFTC**	**Eggs to Garrison Dam NFH**	**Inventory 8/12**	**% Survival @ GAD NFH**
132256586A	132114552A	1360	54400	42400	800	1.9%	4000	50	1.3%	8000	1640	20.5%
132256586A	13157621A	828	33120	25120	350	1.4%	4000	1000+	25.0%	4000	1535	38.4%
132256586A	1F47760123	769	30760	22760	0	0.0%	4000	99	2.5%	4000	2280	57.0%
Family total		2957	118320	90280	1150	1.3%	12000	1149	9.6%	16000	5455	34.1%
7F7F054855	115669540A	444	17760	9760	2200	22.5%	4000	700+	17.5%	4000	1135	28.4%
7F7F054855	115675486A	414	16560	8560	950	11.1%	4000	1300+	32.5%	4000	1995	49.9%
7F7F054855	132313521A	355	14200	6200	0	0.0%	4000	0	0.0%	4000	436	10.9%
Family total		1213	48520	24520	3150	12.8%	12000	2000	16.7%	12000	3566	29.7%
115679394A	1F47760123	25	1000	0	0	-	1000	66	6.6%	0	0	-
TOTAL		4195	167840	114800	4300	3.7%	25000	3215	12.9%	28000	9021	32.2%

Table 9. Garrison Dam NFH Progeny - Survival Summary at Two Months

Garrison Dam NFH Progeny										
Female #	**Male #**	**Total mls Eggs**	**# Eggs @37/ml**	**Hatch Number (Back calculated)**	**% Hatch**	**Eggs to Bozeman FTC**	**Eggs at Garrison Dam NFH**	**Inventory 9/1/03**	**% survival egg to 2 months**	**% survival hatch to 2 months**
44426F185B	41475D3C5D	400	14800	5019	45.2%	3700	11100	2975	26.8%	59.3%
44426F185B	1F521B1E56	810	29970	9220	44.5%	5550	20720	5942	28.7%	64.4%
44426F185B	1F4A363031	825	30525	2569	10.3%	5550	24975	591	2.4%	23.0%
44426F185B	7F7D291A07	500	18500	4954	26.8%	0	18500	3112	16.8%	62.8%
44426F185B	132313521A	550	20350	2901	19.6%	5550	14800	14	0.1%	0.5%
44426F185B	7F7D372A6B	475	17575	359	4.3%	9250	8325	0	0.0%	0.0%
44426F185B	1F4A13592B	750	27750	839	3.8%	5550	22200	179	0.8%	21.3%
TOTAL		4310	159507	25861	21.4%	35150	120620	12822	10.6%	49.6%
115676694A	7F7D372A6B	222	8214	200	3.1%	1850	6364	0	0.0%	0.0%
115676694A	132313521A	217	8029	45	0.7%	1850	6179	0	0.0%	0.0%
115676694A	115675486A	178	6586	6	0.1%	1850	4736	0	0.0%	0.0%

Garrison Dam NFH Progeny										
Female #	**Male #**	**Total mls Eggs**	**# Eggs @37/ml**	**Hatch Number (Back calculated)**	**% Hatch**	**Eggs to Bozeman FTC**	**Eggs at Garrison Dam NFH**	**Inventory 9/1/03**	**% survival egg to 2 months**	**% survival hatch to 2 months**
115676694A	220E4E4E5D	423	15651	3	0.0%	1850	13801	0	0.0%	0.0%
TOTAL		9260	342620	254	0.8%	7400	31080	0	0.0%	0.0%
132256586A	132114552A	200		4970	62.1%	4000	8000	1713	21.4%	34.5%
132256586A	13157621A	100		3684	92.1%	4000	4000	1744	43.6%	47.3%
132256586A	1F47760123	100		3619	90.5%	4000	4000	2375	59.4%	65.6%
TOTAL				12273	76.7%	12000	16000	5832	36.5%	47.5%
7F7F054855	115669540A	100		3213	80.3%	4000	4000	1337	33.4%	41.6%
7F7F054855	115675486A	100		3061	76.5%	4000	4000	2317	57.9%	75.7%
7F7F054855	132313521A	100		735	18.4%	4000	4000	432	10.8%	58.8%
TOTAL				7009	58.4%	12000	12000	4086	34.1%	58.3%
GRAND TOTAL				45397	25.3%	66550	179700	22740	12.7%	50.1%

Table 10. Bozeman FTC Progeny

Bozeman FTC Progeny						
Female #	**Male #**	**Eggs**	**Inventory 8/19/03**	**% survival**	**Inventory 10/14/03**	**% survival egg to 2 months**
44426F185B	41475D3C5D	3700	67	1.8%	41	1.1%
44426F185B	1F521B1E56	5550	0	0.0%	0	0.0%
44426F185B	1F4A363031	5550	608	11.0%	540	9.7%
44426F185B	7F7D291A07	0	0	0.0%	0	0.0%
44426F185B	132313521A	5550	0	0.0%	0	0.0%
44426F185B	7F7D372A6B	9250	0	0.0%	0	0.0%
44426F185B	1F4A13592B	5550	0	0.0%	0	0.0%
Family Total		35150	683	1.9%	591	1.7%
115676694A	7F7D372A6B	1850	0	0.0%	0	0.0%
115676694A	132313521A	1850	0	0.0%	0	0.0%
115676694A	115675486A	1850	0	0.0%	0	0.0%
115676694A	220E4E4E5D	1850	0	0.0%	0	0.0%
Family Total		7400	0	0.0%	0	0.0%
132256586A	132114552A	4000	50	1.3%	0	0.0%
132256586A	13157621A	4000	1000+	25.0%	946	23.7%
132256586A	1F47760123	4000	99	2.5%	91	2.3%
Family total		12000	1149	9.6%	1037	8.6%
7F7F054855	115669540A	4000	700+	17.5%	495	12.4%
7F7F054855	115675486A	4000	1300+	32.5%	1647	41.2%
7F7F054855	132313521A	4000	0	0.0%	0	0.0%
Family total		12000	2000	16.7%	2142	17.9%
115679394A	1F47760123	1000	66	6.6%	53	5.3%
Grand Total		67550	3898	5.8%	3823	5.7%

Table 11. 2003 Pallid Sturgeon Progeny Inventory

Facility	Female ♀	Male ♂	Date	Estimate	Date	Number	Date	Number	Transfer #
Garrison NFH	132256586A	132114552A	08/12/03	1640	10/01/03	1712	2/1/04	360	1257
Bozeman FTC	132256586A	132114552A	8/04/03	50	10/14/03	0			
Miles City SFH	132256586A	132114552A	08/15/03	800					
TOTAL				**2,490**					
Garrison NFH	132256586A	132157621A	08/12/03	1535	10/01/03	1735	2/1/04	470	1078
Bozeman FTC	132256586A	132157621A	8/04/03	400-500	10/14/03	946			
Miles City SFH	132256586A	132157621A	08/15/03	350					
TOTAL				**2,285**					
Garrison NFH	132256586A	1F47760123	08/12/03	2280	10/01/03	2371	2/1/04	336	1929
Bozeman FTC	132256586A	1F47760123	8/04/03	100	10/14/03	91			
TOTAL				**2,380**					
Bozeman FTC	115679394A	1F47760123	8/04/03	100	10/14/03	53			
TOTAL				**100**					
Garrison NFH	7F7B016070	132313521A	08/12/03	13	10/01/03	14	2/1/04	0	14
TOTAL				**13**					
Garrison NFH	7F7B016070	1F4A13592B	08/12/03	100	10/01/03	177	2/1/04	94	50
TOTAL				**100**					
Bozeman FTC	7F7B016070	1F4A363031	8/04/03	300	10/14/03	540			
Garrison NFH	7F7B016070	1F4A363031	08/12/03	620	10/01/03	589	2/1/04	249	285

Facility	Female ♀	Male ♂	Date	Estimate	Date	Number	Date	Number	Transfer #
TOTAL				**920**					
Garrison NFH	7F7B016070	1F521B1E56	08/12/03	5999	10/01/03	3037	2/1/04	226	2111
TOTAL				**5,999**					
Bozeman FTC	7F7B016070	41475D3C5D	8/04/03	50	10/14/03	41			
Garrison NFH	7F7B016070	41475D3C5D	08/12/03	3040	10/01/03	1937	2/1/04	706	1146
TOTAL				**3,090**					
Garrison NFH	7F7B016070	7F7D291A07	08/12/03	2940	10/01/03	3107	2/1/04	194	2653
TOTAL				**2,940**					
Garrison NFH	7F7F054855	115669540A	08/12/03	1135	10/01/03	1193	2/1/04	407	910
Bozeman FTC	7F7F054855	115669540A	8/04/03	300-400	10/14/03	495			
Miles City	7F7F054855	115669540A	08/15/03	2200					
TOTAL				**3,635**					
Bozeman FTC	7F7F054855	115675486A	8/04/03	1000+	10/14/03	1647			
Garrison NFH	7F7F054855	115675486A	08/12/03	1995	10/01/03	2309	2/1/04	351	1846
Miles City SFH	7F7F054855	115675486A	08/15/03	950					
TOTAL				**3,945**					
Garrison NFH	7F7F054855	132313521A	08/12/03	436	10/01/03	429	2/1/04	241	107
TOTAL				**436**					

2002 Progeny Propagation Efforts

Mid January the water temperature was needing to be lowered to accommodate other fish requests on station. Prior to dropping the temperature we removed what we considered 'runt' fish from the production tanks and consolidated them in the 30 inch fry tanks. We would be able to provide that bank of tanks with warmer water through the winter to hopefully allow the fish to catch up with the others and be stocked the following Spring. A total of 779 fish were moved. Following the move, the production tanks were dropped about 5 degrees per day to get them from 55° F to 33° F. Feeding was also stopped with the drop in temperatures. Water temperatures in the 'runt' tanks was maintained at about 60° F - mortality spiked immediately after the move. Nitrogen supersaturation was suspected and confirmed at 110%. In keeping heated water to that bank of tanks we had to bypass the degassing units. Individual packed columns were added to each of the heated tanks and mortalities were reduced significantly. Dead fish were sent to Bozeman to evaluate - the results showed the fish iridovirus positive. To determine how significant the nitrogen was in causing mortalities we moved age 1+ shovelnose to tanks with the untreated heated water, they also died - gas bubbles present in the gill lamellae.

Mid February mortalities are on the rise in our production tanks. Two tanks suspected as virus positive are tempered up to 40° F to see what effect the warmer temperatures would have on the virus. The results indicated that warming the temperature likely allows the virus to replicate faster and mortality in those two tanks (10% and 27%) were higher that those left at 33°F (>6%). In spite of the virus outbreaks in about a dozen tanks, survival rates for February, March and April averaged 96%, 97% and 99% per month. Although the virus has the potential to cause high mortality levels, by maintaining good fish culture practices, we are able to minimize the effects (even at 33°F). An interesting note, a dark patch has shown up under the eyes of some of the suspected virus positive fish - 'coon eyes'. Fish from virus positive tanks were sent to UC Davis to aid in development of the PCR test.

April 2nd, Bozeman FTC personnel were on station taking 100 samples for the UC Davis PCR analysis verification. May 15th personnel were back conducting the pre-release assessment on a 60 fish sample, 2 fish per tank. May 20th the temperature in the pallid tanks was increased to nearly 50° F and feeding was initiated at about 1-2 % BW using a #3 Silver Cup Trout Crumble. Fish appear to be feeding well. The fish had been off feed and on 33°F water temperatures for 4 months. With the exception of five tanks that exhibited signs of the virus, fish in the remaining 32 tanks appear in good condition with minimal mortality for the month.

June 4th the water supply was switched from the Salmon Building to the Main and water temperature is 60°F. The effects of the virus have begun in a half dozen tanks with fish acting irritated, swimming apathetically around in the tanks.

Summer Stockings for RPA #4

Tagging for the RPA #4 stockings started July 14th and were completed the next day. Four crews of 4-5 were set up, one to enter data, one to measure length/weight, one to tag, one to load the tags and one to shuttle fish. Each fish was measured and injected with a pit tag into the base of the dorsal fin. The process took about 10 hours for 5295 fish tagged (Table below). Water temperature at tagging was 68°F. No mortalities were noted. The following morning the fish were loaded into the distribution trailer headed for Mulberry Bend, NE - the heaviest tank had 89 pounds. Oxygen was used to maintain the DO level around 11 ppm. Tank temperature was 68° F and temperature at the stock site was 78° F. Tempering was done over a period of an hour to 76°F. At about 10:00 pm on the evening of the 15th the load destined for Booneville, Missouri left in Gavins Point's distribution truck. The driver was changed out at Yankton the following morning and fish stocked after being in transit 18 hours. Not a single dead fish was noted. The last of the tagged 2002 year class went out on the morning of the 16th headed for Bellevue, NE. They were hauled in the Garrison Dam distribution tank to the site a distance of 700 miles. The fish arrived at the site at 72°F. The water in the river was 82°F. Tempering was done at the boat ramp for 45 minutes to acclimate the fish. We held on to 162 fish (3%) of the 2002 year class that were either sick, or to small to PIT tag. These fish were to be grown out over the Summer for a Fall stocking at Mulberry Bend, NE. On October 5th, the remaining 2002 'runts' are pit tagged and shipped the following morning to the Mulberry Bend stock site. A total of 133 fish were stocked. A summary of the 2002 progeny stockings.

Table. RPA #4 Stockings - 2002 Progeny

2002 Progeny - RPMA #4 Stockings								Total	
Female	Male	Mulberry, NE		Bellevue, NE		Booneville, MO		Fish Stocked	
		Number	Weight	Number	Weight	Number	Weight	Number	Weight
116224546A	1F477B3A65	578	64.2	500	70.2	245	36.9	1323	171.3
116224546A	116167123A	520	88.8	500	80.9	399	68.1	1419	237.8
116224546A	220F107A6F	575	89.0	556	89.6	470	75.0	1601	253.6
116224546A	7F7D461025	396	65.8	382	69.1	326	50.9	1104	185.8
		2069	307.8	1938	309.8	1440	230.9	5447	2917.5

Side Notes

A pallid sturgeon from the 1992 spawn at Blind Pony SFH held in a 400 gallon aquarium at Garrison Dam NFH for the past 7 years (previously held at Gavins Point) died the first of September. The fish weighed 1676 grams (3.7 pounds) and was full of jet black eggs. The ovaries weighed 243 grams gonadosomatic index(GSI) of 14.5%. The polarity index of the eggs indicated that the eggs were fully developed and ready for spawn. Apparently even under not so ideal conditions, some pallid females are sexually mature in 10 years and at less than 4 pounds!

A pallid sturgeon hybrid died on September 3rd and it was also gravid. This fish weighed 14.2 pounds and it's ovarian weight was 773 grams (1.7 pounds). The GSI for this fish was 12.0%. A subsample of eggs and ovarian tissue was taken, weighed and counted. The sample's weight was 18 grams and there were 1251 fully developed eggs counted. This amounted to 69.5 eggs per gram including ovarian tissue. Egg size without tissue was 83.4eggs/gram. The fecundity of this fish was 53,724 eggs.

A pallid from Garrison Dam NFH stocked in RPA #4 at Bellevue, Nebraska in April 2002 at 174 mm FL was recaptured this Spring. The length at capture was 350 mm - 6.9 inches of growth.

In July 2003, MFWP personnel collected 21 of the 2001 progeny. Garrison Dam NFH had stocked 1626 of the 2001 progeny at 5 sites in RPA #2 on July 25th of 2002. Garrison's fish were marked with a single green elastomer and PIT tag. Fifteen of the twenty-one fish sampled were from Garrison Dam NFH (three had lost the elastomer). Six fish were from Miles City SFH (1277 stocked). The average growth of the recaptured fish was 2 inches in the year spent at large. The range was 0.5 - 3.4 inches. Five more hatchery reared pallid sturgeon were sampled in August, two in September, and two in October for a total of 30 sampled. Three of the last four fish sampled were caught on a setline with nightcrawler. Two of the three caught were from Garrison's 2001 progeny. They had grown to twelve and a half inches FL. One of the October fish sampled from Garrison was stocked at Intake, moved down the Yellowstone 70 miles and back up the Missouri 62 miles where it was sampled. The fish had grown 3 inches in the 14 months at large. These fish had undergone the same culture conditions as the past two year classes. These fish were the lot that received multiple formalin treatments for the amoeba and costia parasites. They made it through the Winter months without feed and at 33° F.

In RPA #1 there were 32 hatchery progeny recaptured this year, 29 from the 1997 stocking and 3 from the 2001 stocking. To date there have been 57 individual pallid sturgeon recaptured of the 750 stocked in the 1997 stocking - 7.6% of the total stocked number.

In RPA #3 seventy-two hatchery progeny were recaptured. Condition factors were calculated from the collected fish to determine by year class how the fish were faring. The 2001 year class had a condition factor of 0.9, the best of the five year classes. Garrison Dam progeny made up the entire 2001 year class in RPA #3. Although the data from hatchery stockings is fairly sketchy, what information we have collected indicates that the hatchery progeny are acclimating to their natural environments, they appear to be foraging sufficiently and don't appear to have any short term ill effects from hatchery propagation.

Four males were injected August 4th@ the 0.02 mg/kg rate with LH-RH to obtain milt for cryopreservation. The four were 4E5D, 521A, 1E56, and 621A. None of the fish responded to the injections. Water temperature in the tank was 60 °F. All four fish had been given injections in June for milt collections as well and did produce viable sperm. Previously we sampled gonadal tissue during Fall collections and were able to activate sperm cells at that time. The question was raised as to whether viable milt could be obtained at any time during the year. It appears that there is a post spawn period where spermiation can not be initiated by hormonal injections of LH-RH. It would be interesting to experiment further on shovelnose collected in the Fall to see if spermiation can be induced.

We have results from age samples on seven adults. The ages of the fish when corrected to 2003 indicate that they were from a spawn event 36-63 years ago. The ages of the fish are all between 31 and 55.

When comparing the Coefficient of Condition, K, between Gavins Point NFH, Miles City SFH, and Garrison Dam NFH, Garrison's fish tended to be the least robust. The median K X 10 value for Garrison was 3.33, Gavins Point - 3.96 and Miles City - 3.67. An interesting observation considering Garrison's fish have consistently had higher liver lipid levels.

Diagnostic blood analysis was performed on five broodstock pallids post spawn to document values in stressed fish and attempt to identify what is ultimately causing mortality in the post spawn fish. Blood values from the two female would be representative of a critically stressed fish. Those from the males would be considered from the typical post spawn stressors (Table 21) . From the 2004 broodstock collections we hope to collect blood samples at capture to give us an indication of what 'normal' values are for this fish. If a pattern can be identified using blood values early enough, we are hoping actions may be taken to alleviate the problem. Gary Marty, DMV from UC Davis was consulted to evaluate the cause of death in female #694A. He was also asked to consider addressing the problems of post spawn mortality. He indicated that the project would require several years worth of data to identify significant trends and that he was not aware of any methods of monitoring the health of individual broodstock sturgeon. He was willing to take on the project if funding could be found.

Submitted a Science Support Partnership (SSP) joint study proposal titled "Development of clinical tests to evaluate fatty liver disease in pallid sturgeon." The investigator for the project would be the USGS/BRD Upper Midwest Environmental Sciences Center, Mark Gaikowski, Research Physiologist. The original project was 'to evaluate the effect of fatty livers on pallid sturgeon survival,' but the investigator felt that it was necessary first to determine what effect the histological diagnosis of a fatty liver condition had on the actual liver function. The proposal would develop clinical liver function tests (clearance and enzyme levels) as the first step in the evaluation of artificial and natural diets. The outcome of the study would correlate pallid liver function with tissue pathology. The study was not funded.

Preserved egg samples from past years' polarity index evaluations were sent to Molly Webb at Oregon State University. The egg samples will be examined histologically to determine if there were any changes between the time of capture and spawning. What we are hoping to develop is a method of evaluating eggs that relates to the likelihood of spawning success. If specific changes are observed that correspond to unsuccessful spawning , we could opt to not induce ovulation to avoid further stress in females that have already aborted their eggs.

Table 12. Tagging for RPA #4 - 2003 Progeny - November 25, 2003

Female	Male	Tank	Number	Weight (lbs)	#/lb
44426F185B	7F7D291A07	56	193	12.2	15.8
(7B7B016070)	7F7D291A07	81	76	4.9	15.5
	7F7D291A07	65	45	2.4	18.8
	7F7D291A07	N8	906	42.9	21.1
	1F521B1E56	R1	639	11.3	56.5
	1F521B1E56	G8	192	7.0	27.4
	41475D3C5D	58	274	13.8	19.9
	41475D3C5D	74	86	2.9	29.7
TOTAL			2411	97.4	24.8
7F7F054855	115669540A	52	102	2.9	35.2
	115669540A	77	45	1.2	37.5
	115675486A	76	123	8.0	15.4
	115675486A	6	17	0.8	21.3
	115675486A	9	76	5.2	14.6
TOTAL			363	18.1	20.1
132256586A	132114552A	66	101	7.8	12.9
	132157621A	72	64	4.3	14.9
	132157621A	62	110	7.6	14.5
	1F47760123	71	76	4.6	16.5
	1F47760123	83	211	14.3	14.8
	1F47760123	1	74	6.1	12.1
	1F47760123	2	75	4.3	17.4
	1F47760123	54	97	6.0	16.2
	1F47760123	63	22	0.9	24.4
TOTAL			830	55.9	14.8
GRAND TOTAL			3604	171.4	21.0

Table 13. Mulberry Bend Stocking, -2003 Progeny - November 3, 2003.

Female	Male	Tank	Number	Weight (lbs)	#/lb
44426F185B	7F7D291A07	65	68	3.7	18.4
(7B7B016070)	7F7D291A07	67	248	15.8	15.7
	7F7D291A07	N 8	272	11.6	23.4
	1F521B1E56	G 8	246	7.4	33.2
	1F521B1E56	R 1	189	4.7	40.2
	41475D3C5D	S 8	184	8.4	21.9
TOTAL			1207	51.6	23.4
7F7F054855	115675486A	FT 4	86	5.4	15.9
TOTAL			86	5.4	15.9
132256586A	1F47760123	63	35	1.8	19.4
	1F47760123	FT 29	98	6.9	14.2
	1F47760123	FT 30	149	11.2	13.3
	132114552A	59	56	3.5	16.0
	132114552A	66	6	0.3	20.0
	132157621A	50	36	1.8	20.0
	132157621A	62	90	4.6	19.6
TOTAL			470	30.1	15.6
GRAND TOTAL			1763	87.1	20.2

Table 14. Booneville MO Stocking, December 2, 2003.

Female	Male	Tank	Number	Weight (lbs)	#/lb
44426F185B	7F7D291A07	61	294	15.1	19.5
(7B7B016070)	7F7D291A07	73	291	14.9	19.5
	1F521B1E56	56	415	9.1	45.4
	41475D3C5D	G8	180	10.8	16.7
TOTAL			1180	49.9	23.6
7F7F054855	115669540A	G8	73	2.0	35.9
	115675486A	G8	108	7.0	15.4
TOTAL			181	9.0	20.0
132256586A	132114552A	2	51	4.0	12.9
	132157621A 1F47760123	66	357	23.8	15.0
TOTAL			408	27.8	14.7
GRAND TOTAL			1769	86.7	20.4

Table 15. Bellevue NE Stocking, December 2, 2003.

Female	Male	Tank	Number	Weight (lbs)	#/lb
44426F185B	7F7D291A07	60	303	15.5	19.5
(7B7B016070)	7F7D291A07	78	294	15.1	19.5
	1F521B1E56	N8	415	9.1	45.4
	41475D3C5D	71	180	10.8	16.7
TOTAL			1192	50.5	23.6
7F7F054855	115669540A	83	72	2.0	35.9
	115675486A	81	108	7.0	15.4
TOTAL			180	9.0	20.0
132256586A	132114552A	1	50	3.9	12.9
	132157621A 1F47760123	51	359	23.9	15.0
TOTAL			409	27.8	14.7
GRAND TOTAL			1781	87.4	20.4

Table 16. Gavins Point NFH Pallid Transfers - 2003 Progeny

Female	Male	Tank	Number	Weight (lbs)	#/lb	Date
44426F185B	7F7D291A07	N8	400	9.4	42.6	10/15
(7B7B016070)	1F521B1E56	55	51	0.8	63.8	10/6
	1F521B1E56	61	351	11.4	30.8	10/6
	1F521B1E56	68	248	6.4	38.8	10/6
	41475D3C5D	69	43	0	0.0	10/15
	41475D3C5D	78	357	12.2	29.3	10/15
	1F4A363031	79	17	0	0.0	10/6
	1F4A363031	79	16	0	0.0	11/20
	1F4A363031	71	17	0	0.0	10/6
	1F4A13592B	19	17	0	0.0	10/6
	1F4A13592B	26	17	0	0.0	10/6
	1F4A13592B	26	16	0	0.0	11/20
	132313521A	25	14	0	0.0	10/6
TOTAL			1564	40.2	35.0	
7F7F054855	115669540A	60	370	4.0	92.5	10/6
	115669540A	77	30	1.1	27.3	10/6
	115669540A	7	125	1.4	89.3	10/6
	115669540A	18	125	1.4	89.3	10/6
	115675486A	6	90	0	0.0	10/15
	115675486A	8	155	0	0.0	10/15
	115675486A	9	155	0	0.0	10/15
	132313521A	70	17	0	0.0	10/6
	132313521A	70	57	0	0.0	11/20
	132313521A	80	17	0	0.0	11/20
	132313521A	80	16	0	0.0	10/6
TOTAL			1157	7.9	82.3	

Female	Male	Tank	Number	Weight (lbs)	#/lb	Date
132256586A	1F47760123	2	150	5.2	28.8	10/6
	1F47760123	24	150	5.5	27.3	10/6
	1F47760123	27	150	4.0	37.5	10/6
	1F47760123	28	148	5.4	27.4	10/6
	1F47760123	29	52	2.1	24.8	10/6
	132114552A	75	61	2.2	27.7	10/6
	132114552A	12	139	3.4	40.9	10/6
	132114552A	13	150	5.2	28.8	10/6
	132114552A	14	150	4.6	32.6	10/6
	132114552A	15	150	4.6	32.6	10/6
	132157621A	10	158	0	0.0	10/15
	132157621A	11	158	0	0.0	10/15
	132157621A	23	9	0	0.0	11/20
	132157621A	20	75	0	0.0	11/20
TOTAL			1700	42.2	30.8	
115676694A	mix	23	4	0	0.0	10/6
GRAND TOTAL			4425	90.3	37.2	

Table 17. Neosho NFH Pallid Transfers - October 30, 2003 - 2003 Progeny

Female	Male	Tank	Number	Weight (lbs)	#/lb
44426F185B	7F7D291A07	56	86	4.8	17.9
(7B7B016070)	7F7D291A07	51	359	18.3	19.6
(front tank)	1F521B1E56	57	145	7.3	19.9
	1F521B1E56	55	300	12.5	24.0
	41475D3C5D	69	202	11.9	17.0
	1F4A363031	71	235	10.6	22.2
TOTAL			1327	65.4	20.3
7F7F054855	115669540A	52	113	2.8	40.4
(middle tank)	115675486A	53	246	10.6	23.2
	115675486A	76	127	6.6	19.2
	115675486A	4	49	2.7	18.1
	115675486A	73	373	21.6	17.3
	115675486A	81	269	15.4	17.5
	115675486A	3	77	4.2	18.3
TOTAL			1254	63.9	19.6
132256586A	1F47760123	63	194	9.2	21.1
(rear tank)	1F47760123	64	251	14.0	17.9
	132114552A	66	250	15.3	16.3
	132114552A	75	195	10.2	19.1
	132157621A	62	32	1.2	26.7
	132157621A	72	255	14.1	18.1
	132157621A	21	158	9.8	16.1
TOTAL			1335	73.8	18.1
GRAND TOTAL			3916	203.1	19.3

Table 18. Pre-winter Tank Distribution

Female ♀	Male ♂	Source	#'s	pounds of 7" fish	pounds of 8" fish	pounds of 9" fish	# of Tanks			Density of 7 inch fish	Density of 8 inch fish	Density of 9 inch fish
							4'	5'	8'			
132256586A	132114552A	MCSFH	393	18.7	28.1	39.3	1	3	0	0.2621	0.39316	0.55042
132256586A	132157621A	MCSFH	478	22.8	34.1	47.8	0	5	0	0.232264	0.3484	0.487755
132256586A	1F47760123	MCSFH	391	18.6	27.9	39.1	1	3	0	0.260771	0.39116	0.547619
7F7B016070	1F4A363031	GDNFH	255	12.1	18.2	25.5	2	1	0	0.271046	0.40657	0.569196
7F7B016070	1F521B1E56	GDNFH	228	10.9	16.3	22.8	0	0	1	0.216278	0.32442	0.454183
7F7B016070	41475D3C5D	GDNFH	709	33.8	50.6	70.9	1	3	1	0.277647	0.41647	0.583059
7F7B016070	7F7D291A07	GDNFH	203	9.7	14.5	20.3	1	1	0	0.300207	0.45031	0.630435
7F7B016070	1F4A13592B	GDNFH	100	4.8	7.1	10.0	0	1	0	0.242954	0.36443	0.510204
7F7F054855	115669540A	MCSFH	428	20.4	30.6	42.8	1	3	0	0.285448	0.42817	0.59944
7F7F054855	115675486A	MCSFH	411	19.6	29.4	41.1	1	3	0	0.27411	0.41116	0.57563
7F7F054855	132313521A	MCSFH	253	12.0	18.1	25.3	2	1	0	0.26892	0.40338	0.564732
			3849	183.3	274.9	384.9	10	24	2	0.263039	0.39456	0.552382

Table 19. Milt Collections 2003

Milt Collections 2003						
Tag Number	Collection Time	Date	Milt Quantity (mls)	Motility	Vitality	Comments
1F4A363031	11:00 am	6/25/03	60	50%		26 mls to WS
132313521A	11:00 am	6/25/03	60	70%		26 mls to WS
7F7D372A6B	11:00 am	6/25/03	60	60%		26 mls to WS
1F521B1E56	11:00 am	6/25/03	60	60%		26 mls to WS
1F4A13592B	11:00 am	6/25/03	35	60%		24 mls to WS
41475D3C5D	11:00 am	6/25/03	60	< 1%		26 mls to WS
7F7D291A07	11:00 am	6/25/03	60	50%		26 mls to WS
41475D3C5D	11:35 am	6/25/03	60	<5%		
1F521B1E56	11:45 am	6/25/03	65			
7F7D291A07	11:45 am	6/25/03	37	45%	2	
1F4A363031	1:35 pm	6/25/03	65			
1F4A13592B	2:24 pm	6/25/03	60			
41475D3C5D	2:10 pm	6/25/03	65	< 1%		
132313521A	2:15 pm	6/25/03	65			
7F7D372A6B	2:05 pm	6/25/03	65	50%	2+	
7F7D372A6B	10:50 pm	6/25/03	65	60%	3	

Milt Collections 2003						
7F7D291A07	10:55 pm	6/25/03	65	50%	2+	
1F521B1E56	10:53 pm	6/25/03	65			
132313521A	10:55 pm	6/25/03	65			
7F7D291A07	11:57 pm	6/25/03	36			
1F4A363031	12:00 m	6/25/03	65			
1F4A13592B	12:02 am	6/26/03	65			
220E4E4E5D	7:12 am	6/26/03	65			
115675486A	7:16 am	6/26/03	65			
7F7D372A6B	10:32 am	6/26/03	65			
132313521A	2:30 pm	6/26/03	65			
220E4E4E5D	4:01 pm	6/26/03	60			
220E4E4E5D	10:13 pm	6/26/03	65			
132157621A	10:00 am	7/1/03	65	95%		for Miles City
220E5F6E26	10:00 am	7/1/03	-	didn't produce		for Miles City
220E4E4E5D	10:00 am	7/1/03	-	poor quality		for Miles City
115675486A	10:00 am	7/1/03	65	good		for Miles City
132157621A	11:30 am	7/1/03	65	good		for Miles City
115675486A	11:30 am	7/1/03	65	good		for Miles City
7F7D372A6B	11:30 am	7/1/03	65	good		for Miles City
132313521A	11:30 am	7/1/03	65	good		for Miles City

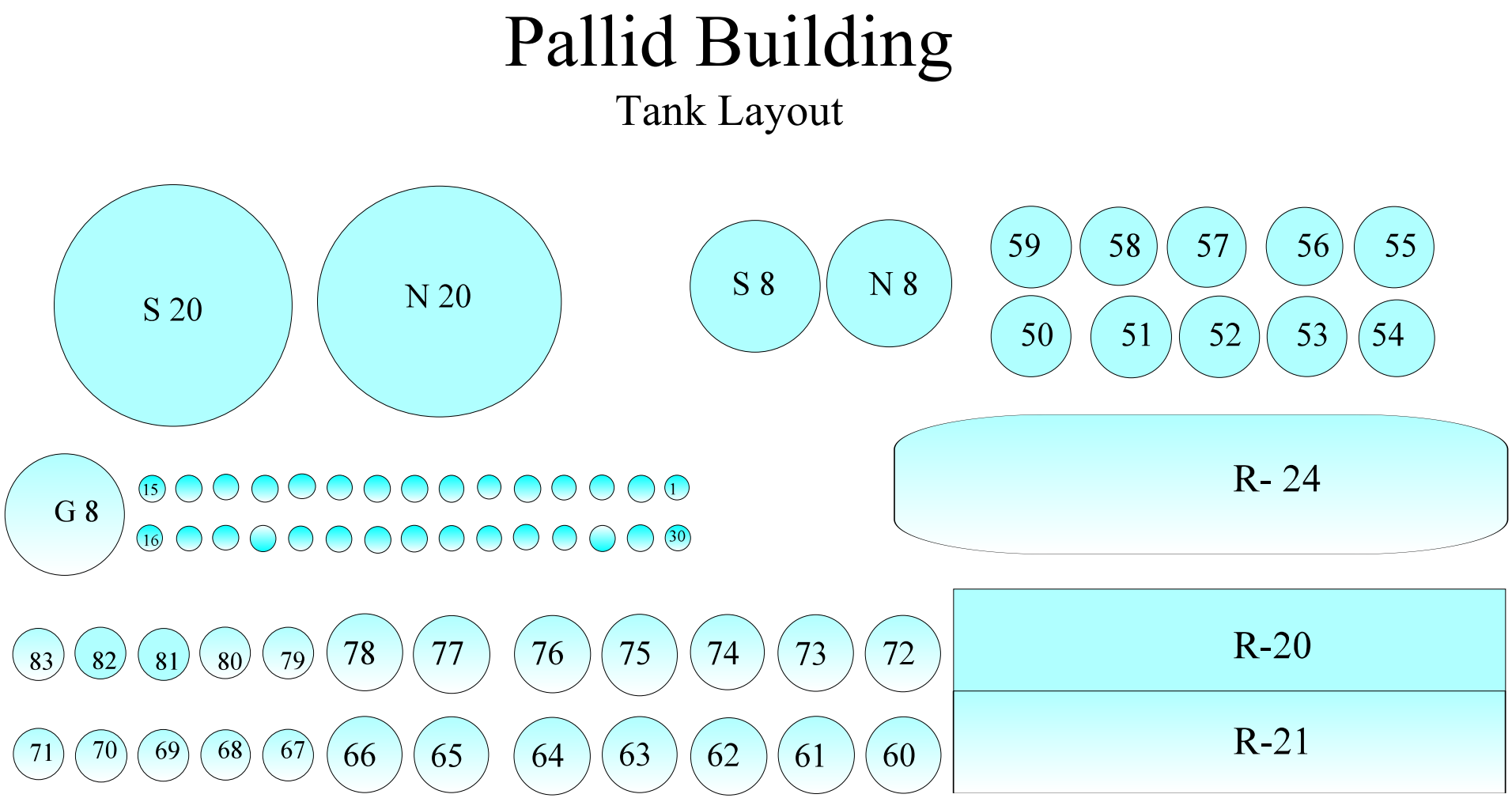
Table 20. Milt Cryopreservation

2003 PALLID STURGEON CRYOPRESERVATION DATA SHEET														
Tag Number	**Spawn Site**	**Can #**	**Milt Date**	**Freeze Date**	**By**	**Hormone**	**Color**	**Volume mls**	**Pre freeze motility**		**Post freeze motility**		**Straws**	**Comments**
452738076E	CMR	1	6/6	6/10	RH	none	2%		90%	5	5%	2	106	9-5 ml straws
1F4A4B5973	CMR	-	6/16		RH	none	light	20	0 %	-	-	-	-	DOA, froze in 2001
411D0E2C5F	CMR	5	6/11	6/13	RH	none	v light	20	90%	5	5+%	3	100	4 -5 ml straws
452A4E1F15	CMR	2	6/6	6/10	RH	LH-RH	2%	110	90%	5	5%	3	104	12-5 ml straws
452A4E1F15	CMR	6	6/6	6/19	GL				60%	3	40%	2	98	2nd sample
220E4E4E5D	GAD			6/26	GL				70%	3	0%	-	0	Straws discarded
132157621A	GAD	4	6/30	7/1	ME?				90%		5%	3	100	7-5 ml straws
7F7D372A6B	GAD	8	6/25	6/25	GL				70%	2+	20%	2	100	MeOH change
132313521A	GAD	8	6/25	6/25	GL				70%	2+	5%	1	100	
757D365422	GAD	-	6/25	-	-				<1%	1	-	-	0	
1F521B1E56	GAD	6	6/25	6/25	GL				60%	3	2%	2	100	jerky
1F521B1E56	GAD	1	6/25	7/4	ME				60%	3	5%	2	100	2-5 ml straws
1F4A13592B	GAD	9	6/25	6/26	GL				60%	3	35%	2	100	
7F7D291A07	GAD	7	6/25	6/25	GL				80%	3	20%	3	100	jerky
1F4A363031	GAD	7	6/25	6/25	GL				30%	2	50%	4	99	jerky
115675486A	GAD	10	6/25	6/26	GL				60%	3	50%	3+	99	
220E5F6E26	GAD		6/30	7/1										no milt
1F47760123	MC	3	7/2	7/3	ME				65%	2	2%	3	100	
115669540A	MC	2	7/2	7/3	ME				50%	1	<1%	1	100	
132114552A	MC	9	7/2	7/4	ME				40%	1+	1%	1	100	

Table 21. Post Spawn Blood Values

Blood Analysis - Pallid Sturgeon Garrison Dam NFH - 2003					
Female #	**694A (♀)**	**185B (♀)**	**486A (♂)**	**6E26 (♂)**	**6102 (♂)**
WBC	26,015 ul		11,660 ul	4,180 ul	12,155 ul
RBC	0.59 x 10^6		1.66 x 10^6	1.26 x 10^6	0.85 x 10^6
PCV	15.0%		46.0%	34.5%	23.5%
hemo			marked Hemol	mod. Hemol	
HGB	3.8 g/dl		13.2 g/dl	11.6 g/dl	6.9 g/dl
TPP	2.9 g/dl		4.1 g/dl	5.3 g/dl	4.1 g/dl
ALB	0.00 g/dl	0.94 g/dl	0.33 g/dl	0.47 g/dl	0.64 g/dl
ALKP	118 U/L	145 U/L	181 U/L	112 U/L	73 U/L
ALT	<10 U/L	< 10 U/L	<10 U/L	<10 U/L	<10 U/L
AMYL	0 U/L	5 U/L	0 U/L	7 U/L	0 U/L
BUN	0.6 mg/dl	0.8 mg/dl	0.8 mg/dl	0.5 mg/dl	0.9 mg/dl
Ca	6.85 mg/dl	7.46 mg/dl	7.44 mg/dl	7.60 mg/dl	8.86 mg/dl
CHOL	159.4 mg/dl	297.9 mg/dl	159.4 mg/dl	213.0 mg/dl	114.3 mg/dl
CREA	0.42 mg/dl	0.35 mg/dl	0.45 mg/dl	0.42 mg/dl	0.26 mg/dl
GLU	1.6 mg/dl	29.4 mg/dl	27.3 mg/dl	34.7 mg/dl	43.3 mg/dl
PHOS	4.86 mg/dl	6.73 mg/dl	8.85 mg/dl	7.79 mg/dl	8.68 mg/dl
TBIL	<0.10 mg/dl	<0.10 mg/dl	<0.10 mg/dl	<0.10 mg/dl	<0.10 mg/dl
T Protien	1.96 g/dl	3.95 g/dl	2.87 g/dl	3.69 g/dl	3.53 g/dl
GLOB	1.96 g/dl	3.01 g/dl	2.55 g/dl	3.22 g/dl	2.88 g/dl
Na	115.8 mmol/l	104.1 mmol/l	133.8 mmol/l	127.7 mmol/l	134.7 mmol/l
K	– mmol/l	3.53 mmol/l	– mmol/l	– mmol/l	– mmol/l
Cl	99.1 mmol/l	86.0 mmol/l	110.8 mmol/l	110.4 mmol/l	114.0 mmol/l
PCV	16%	22%	35%	33%	23%

Figure 1.


Pallid Building
Tank Layout
S 20
N 20
S 8
N 8
59
58
57
56
55
50
51
52
53
54
G 8
15
1
16
30
R- 24
83
82
81
80
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
60
R-20
R-21

Appendix 1. Garrison Dam NFH Tank Capacities at ½ Pound Per Square Foot

Tank Size	Num	sqft each	# 5 inch fish	# 7 inch fish	# 8 inch fish	# 9 inch fish	total capacity 5 inchers	total capacity 7 inchers	total capacity 8 inchers	total capacity 9 inchers
4 foot circ.	10	12.6	359	132	88	63	3591	1323	882	630
5 foot circ.	24	19.6	559	206	137	98	13406	4939	3293	2352
8 foot circ.	3	50.2	1431	527	351	251	4292	1581	1054	753
TOTAL	37						21290	7844	5229	3735
Overflow Options										
20 foot circ.	2	628	17898	6594	4396	3140	35796	13188	8792	6280
Raceway 24	1	480	13680	5040	3360	2400	13680	5040	3360	2400

Appendix 2. 2003 Stocking of 2002 Pallid Sturgeon Progeny

Family Cross		Garrison Dam NFH			Gavins Point NFH			Miles City SFH			Neosho NFH		
Female	Male	#	Date	RPA	#	Date	RPA	#	Date	RPA	#	Date	RPA
116224546A	1F477B3A65	1323	7/16	4	653	8/28	2				793	10/24	4
					120	7/25	3						
					383	9/4	4						
					40	brood	GAP						
116224546A	116167123A	1419	7/16	4	652	8/28	2						
					121	7/25	3						
					40	brood	GAP						
116224546A	220F107A6F	1601	7/16	4	120	7/25	3	2173	8/07	2	738	10/24	4
					529	9/4	4						
					40	brood	GAP						
116224546A	1F4A27214F				120	7/25	3						
					361	9/4	4						
					40	brood	GAP						
116224546A	7F7D461025	1104	7/16	4	653	8/28	2				728	10/24	4
					120	7/25	3						
					262	9/4	4						
					40	brood	GAP						
4310187B69	7F7D434B54	47	8/25	GAP		brood							
TOTAL		5494			4294			2173			2259		

Appendix 3. 2002 Stocking of 2001 Pallid Sturgeon Progeny

Family Cross		Garrison Dam NFH		Gavins Point NFH		Miles City SFH		Bozeman FTC		Neosho NFH		TOTALS	
Female	Male	#	RPA	#	RPA	#	RPA	#	RPA	#	RPA	#	RPA
411D262C1F	41476A0462	424	2					553	1			2058	1
		352	3										
		1461	4										
411D262C1F	17509415139	338	2					546	1			3061	2
		70	3										
		170	4					85	2				
411D262C1F	411D0B4E09	191	2					176	1			843	3
411D262C1F	1F4A4B5973	353	2					494	1			6840	4
		70	3										
		69	4					73	2				
411D262C1F	411D0E2C5F	320	2					289	1				
		70	3										
		1671	4										
7F7F06672B	7F7D3C5708	70	3			247	2			289	4		
		564	4										
7F7F06672B	115631222A	71	3			298	2						
		180	4										
220E345E09	1F4A27214F	70	3			366	2			21	4		
		1071	4										
220E345E09	1F4A111C6A	70	3			366	2			646	4		
		698	4										
TOTAL		8353		0		1277		2216		956			

Appendix 4. Milt Repository at Garrison Dam NFH

Pit Tag	Year	Source	Straw Size (ml)	~ #	Dewar #	Cane Location #	Motility (fresh)	Motility (pre freeze)	Motility (post freeze)
7F7F054773	2000	GAD	0.5	4	1	4	90%		
2202236E31	2000	CMR	0.5	4	1	4	95%	5%	
115712453A	2000	GAD	0.5	4	1	4	85%		
1F4A004552	2000	GAD	0.5	4	1	4	90%		
1F4A33194B	2000	GAD	0.5	4	1	4	95%		
1F4A143350	2000	GAD	0.5	5	1	4	90%		
1F4A27214F	2001	MC	0.5	25	1	1			
	2001	MC	5	3	1	2			
1F4A111C6A	2001	MC	0.5	20	1	1			
	2001	MC	5	4	1	2			
115631222A	2001	MC	0.5	20	1	1			
	2001	MC	5	3	1	2			
7F7D3C5708	2001	MC	0.5	20	1	1			
	2001	MC	5	4	1	2			
411D0B4E09 (2265)	2001	CMR	5	1	1	4			
	2001	CMR	0.5	10	1	4			
17509415139	2001	CMR	0.5	10	1	4			
41476A0462	2001	CMR	0.5	20	1	4			
	2001	CMR	5	1	1	4			
411D0E2C5F	2001	CMR	0.5	20	1	4			
	2001	CMR	5	1	1	4			
1F4A4B5973	2001	CMR	0.5	5	1	4			
7F7D434B54	2002	GAD	0.5	40	1	5	40%		
1F477B3A65	2002	GAD	0.5	10	1	5	90%		
	2002	GAD	0.5	70	1	7	90%		
7F7D461025	2002	CMR	0.5	40	1	6			
7F7F065834	2002	GAD	0.5	40	1	6			
115556461A	2002	GAD	0.5	40	1	7			
1F4772396F	2002	GAD	0.5	40	1	8	35%		
220F107A6F	2002	GAD	0.5	40	1	8	85%		

Pit Tag	Year	Source	Straw Size (ml)	~ #	Dewar #	Cane Location #	Motility (fresh)	Motility (pre freeze)	Motility (post freeze)
116167123A	2002	GAD	0.5	40	1	9	75%		
1F4A3E1445	2002	GAD	0.5	40	1	9	80%		
115544332A	2002	GAD	0.5	40	1	10	90%		
452738076E	2003	CMR	0.5	130	2	1	90%		5%
	2003	CMR	5	6	2	3	90%		
411D0E2C5F	2003	CMR	0.5	100	2	5	90%		5+%
	2003	CMR	5	5	2	5	90%		
452A4E1F15	2003	CMR	5	5	2	4			
	2003	CMR	0.5	80	2	10	60%	30%	<1%
	2003	CMR	0.5	100	2	6		80%	40%
	2003	CMR	0.5	100	2	2			5%
132157621A	2003	GAD	0.5	70	2	4	95%		1-5%
7F7D372A6B	2003	GAD	0.5	50	2	8	70%	30-80%	20%
132313521A	2003	GAD	0.5	70	2	8	70%	1-25%	5%
1F521B1E56	2003	GAD	0.5	80	2	6	80%	0-80%	1 - 5%
	2003	GAD	0.5	70	2	1			<1%
1F4A13592B	2003	GAD	0.5	70	2	9	85%	50-85%	35%
7F7D291A07	2003	GAD	0.5	80	2	7	80%	1-20%	20%
1F4A363031	2003	GAD	0.5	80	2	7	50%	0-5%	50%
115675486A	2003	GAD	0.5	70	2	10	60%	30-70%	50%
1F47760123	2003	MC	0.5	70	2	3	65%	65%	1-2%
115669540A	2003	MC	0.5	60	2	2	50%	55%	<1- 2%
132114552A	2003	MC	0.5	80	2	9	40%	40%	1%
Total Straws (including 5 ml)				2008					

Dewar Capacity: 2000 ½ ml straws (10 straws/cane - 20 canes/canister - 10 canisters/dewar)

Thirty-nine males are represented in the repository as of 2003.

Appendix 5. Genetics Samples

Genetics Samples from Upper Basin Pallid Sturgeon								
Pit Tag #	Sex	Weight	Spawning Location	Stocked progeny	Milt Cryo	Capture Site	Comments	Yr of Genetics
1F4A436E66	F	46		N		Confluence	immature eggs, released fish	2000
1F47715752	F	55	GAD	N		Confluence	Spawned, overripe eggs, no survival	2000
1F477B3A65	M	27		N	Y	Confluence	Spawned in 1999 also	2000
7F7F054773	M	50	GAD	N	Y	Confluence		2000
7F7F065A3D	F	55		N		Confluence	atritic eggs at capture	2000
1F4A143350	M	28	GAD	N	Y	Confluence		2000
1F4B225A1A	?	31		N		Confluence	old fish - Injected in 2000 - no results	2000
1F4A004552	M	25	GAD	N	Y	Confluence		2000
7F7B081579	M	32	GAD	N		Confluence		2000
1F4A33194B	M	45	GAD	N	Y	Confluence		2000
115712453A	M	27	GAD	N	Y	Confluence		2000
1F4849755B	M	33	GAD	N		Confluence		2000
115713555A	F	57	GAD	N		Confluence	mature eggs, poor spawn, no survival	2000
115676690A	F			N		Confluence	immature hybrid shovelnose??	2000
11552S534A	M	32	GAD	N		Confluence		2000
2200F0F6213	F	36	GAD	N		Confluence	aged at 36 years, ♀ died post spawn	2000
2202236E31	M	61	GAD	N	Y	Confluence		2000
7F7F06672B	F	43	MCSFH			Confluence	Spawned	2001

Genetics Samples from Upper Basin Pallid Sturgeon								
Pit Tag #	Sex	Weight	Spawning Location	Stocked progeny	Milt Cryo	Capture Site	Comments	Yr of Genetics
220E345E09	F	59	MCSFH			Confluence	Spawned	2001
115631222A	M	29	MCSFH		Y	Confluence	Spawned	2001
7F7D3C5708	M	50	MCSFH		Y	Confluence	Spawned	2001
1F4A111C6A	M	30	MCSFH		Y	Confluence	Spawned	2001
1F4A27214F	M	48	MCSFH		Y	Confluence	Spawned	2001
411DOB4E09	M	-	CM Russel	Y	Y	Upper Mo	Spawned	2001
41476A0462	M	34.0	CM Russel	Y	Y	Upper Mo	Spawned	2001
17509415139	M	31.3	CM Russel	Y	Y	Upper Mo	Spawned	2001
411D0E2C5F	M	33.0	CM Russel	Y	Y	Upper Mo	Spawned	2001
411D262C1F	F	49.1	CM Russel	Y		Upper Mo	Spawned	2001
1F497F1801	F		MCSFH	N	N	confluence	spawned - no survival of eggs	2002
1F482F3F2B	?	26.5	MCSFH	N	-	confluence	no milt	2002
7F7F065834	M		MCSFH	N	Y	confluence		2002
115556461A	M		MCSFH	N	Y	confluence		2002
115553544A	F	41	-	-	-	confluence	immature eggs, taken to hatchery	2002
4310187B69	F	37	GAD	N	-	confluence	progeny for broodstock only	2002
115544332A	M	55	GAD	N	Y	confluence		2002
1F4A3E1445	M	34	GAD	N	Y	confluence	1F4A2F3A2E, two tags	2002
1F477B3A65	M	28	GAD	N	Y	confluence	spawned 3 other times	2002

Genetics Samples from Upper Basin Pallid Sturgeon								
Pit Tag #	Sex	Weight	Spawning Location	Stocked progeny	Milt Cryo	Capture Site	Comments	Yr of Genetics
1F4772396F	M	53	GAD	N	Y	confluence	Died post spawn	2002
115716093A	M	40	GAD	N	N	confluence	new fish, gasket around head	2002
116167123A	M	50	GAD	Y	Y	confluence	new fish	2002
7F7D434B54	M	30	GAD	N	Y	confluence	future brood only	2002
116224546A	F	60	GAD	Y	-	confluence		2002
1F5420727B	F	68	GAD	N	-	confluence	Died pre-spawn 'hormone shock'	2002
1F53312736	M		GAD	N	N	confluence	2nd tag # 1F52167900	2002
220F107A6F	M	~50	GAD	Y	Y	confluence		2002
NO TAG	F		-	-	-	confluence	shovelnose hybrid ? Mature eggs	2002
44426F185B	F	53	GAD	Y	-	confluence		2003
220E4E4E5D	M	35	GAD	N	N	confluence		2003
132157621A	M	35	GAD	Y	Y(5%)	confluence		2003
7F7D372A6B	M	32	GAD	N	Y(20%)	confluence		2003
132313521A	M	40	GAD	Y	Y(5%)	confluence		2003
41475D3C5D	M		GAD	Y	N	confluence		2003
1F521B1E56	M	33	GAD	Y	Y (2%)	confluence		2003
1F4A13592B	M	36.5	GAD	Y	Y(35%)	confluence		2003
7F7D291A07	M	38.5	GAD	Y	Y (20%)	confluence		2003
115676694A	F	30	GAD	N	-	confluence	♀ died - a few progeny survived	2003

Genetics Samples from Upper Basin Pallid Sturgeon								
Pit Tag #	Sex	Weight	Spawning Location	Stocked progeny	Milt Cryo	Capture Site	Comments	Yr of Genetics
1F4A363031	M	45	GAD	Y	Y (50%)	confluence		2003
115675486A	M	27	GAD	Y	Y (50%)	confluence		2003
7F7B026102	F	44	GAD	N	-	confluence		2003
220E5F6E26	F	56	GAD	N	-	confluence	no milt	2003
115679394A	F	28	MC	N	-	confluence	progeny for future broodstock	2003
7F7F054855	F	39	MC	Y	-	confluence		2003
132256586A	F	59	MC	Y	-	confluence		2003
1F47760123	M	33	MC	Y	Y (2%)	confluence		2003
7F7F065A4E	M	46	MC	N	N	confluence	died prior to spawning	2003
115669540A	M	32	MC	Y	Y (<1%)	confluence		2003
132114552A	M	24	MC	Y	Y(1%)	confluence		2003
43105C602B	?	28	-	-	-	Dredge Cuts	Collected 11/19/03	2004

Appendix 6. Pallid Augmentation in Recovery Priority Areas 1-3.

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
1997	Gavins Point NFH 2 x 3* Ne = 4.8	E04	439	138	4.8 2 X 3	10.4 %	154	4.8 2 X 3	10.4 %	80	4.8 2 X 3	10.4 %	369
		E04	A07	138			154			80			373
		E04	83D	138			154			79			372
		354	439	138			163			76			377
		354	A07	138			155			101			394
1998	Garrison Dam NFH 1 X 2 Ne = 2.7	171	123	0			100	7.5 3 X 5	6.7 %	49	7.5 3 X 5	6.7 %	149
		171	031	0			100			49			149
1999	Gavins Point NFH 1 X 2* Ne = 2.7	573	774	0			160	10.2 4 X 7	4.9 %	67	10.2 4 X 7	4.9%	159
		573	83D	0			159			50			159
		573	62A	0			160			65			160
2001	Miles City SFH (2) 1 X 2 Ne = 5.4	E09	C6A	0			366	12.9 5 X 9	3.9%	0	10.2 4 X 7	4.9%	366
		E09	14F	0			366			0			366
		72B	708	0			247	15.5 6 X 11	3.2%	0	10.2 4 X 7	4.9%	247
		72B	22A	0			298			0			298

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
2001	Bozeman FTC 1 X 5 Ne = 3.3	CIF	973	494	8.7	5.7 %	73			0			567
		CIF	C5F	289	3 X 8		0			0			289
		CIF	462	553			0			0			553
		CIF	E09	176			0			0			176
		CIF	139	546			85			0			631
2001	Garrison Dam NFH (2) 1 X 2 Ne = 5.4	E09	C6A	0			0			70	12.9 5 X 9	3.9 %	70
		E09	14F	0			0			70			70
		72B	708	0			0			70	15.5 6 X 11	3.2 %	70
		72B	22A	0			0			71			71
	1 X 5 Ne = 3.3	CIF	973	0			353	19.5 7 X 16	2.6 %	70	19.1 7 X 15	2.6 %	423
		CIF	C5F	0			320			70			390
		CIF	462	0			424			352			776
		CIF	E09	0			191			0			191
		CIF	139	0			338			70			408

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
2002	Garrison Dam NFH 1 X 4 Ne = 3.2 1 X 1 Ne = 2.0	546A	3A65	0			0			0			0
		546A	123A	0			0			0			0
		546A	7A6F	0			0			0			0
		546A	1025	0			0			0			0
		7B69	4B54	0			0			0			0
2002	Gavins Point NFH 1 X 5* Ne = 3.3	546A	3A65	0			653	22.9 8 X 20	2.2 %	120	22.5 8 X 19	2.2 %	773
		546A	123A	0			645			121			766
		546A	7A6F	0			0			120			120
		546A	1025	0			653			120			773
		546A	214F	0			0			120			120
2002	Miles City SFH	546A	7A6F	0			2173	22.9 8x20	2.2%	0			2173

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
2003	Garrison Dam NFH 1 X 5 Ne = 3.3	185B	1A07	0			0			0			0
		185B	1E56	0			0			0			0
		185B	3C5D	0			0			0			0
		185B	3031	0			0			0			0
		185B	592B	0			0			0			0
	1 X 3 Ne = 3.0	4855	540A	0			0			0			0
		4855	486A	0			0			0			0
		4855	521A	0			0			0			0
	1 X 3 Ne = 3.0	586A	0123	0			0			0			0
		586A	552A	0			0			0			0
		586A	621A	0			0			0			0
2003	Miles City SFH (2)1X2 Ne =5.3	4855	540A	0			0	28.2 10 X 24	1.8%	0			0
		4855	486A	0			0			0			0
		586A	552A	0			0			0			0
		586A	621A	0			0			0			0

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
2003	Gavins Point NFH	185B	1A07	0			0			0	26.2	1.9%	0
		185B	1E56	0			0			0	9 X 24		0
	1 X 5 Ne = 3.3	185B	3C5D	0			0			0			0
		185B	3031	0			0			0			0
		185B	592B	0			0			0			0
	1 X 3 Ne = 3.0	4855	540A	0			0			0	29.2	1.7%	0
		4855	486A	0			0			0	10 X 27		0
		4855	521A	0			0			0			0
	1 X 3 Ne = 3.0	586A	0123	0			0			0	32.2	1.6%	0
		586A	552A	0			0			0	11 X 30		0
		586A	621A	0			0			0			0

Pallid Augmentation in the Upper Basin													
Year of Spawn	**Hatchery of origin** Mating design Effective population(Ne)	**Female** Pit tag (last 3 digits)	**Male** Pit tag (last 3 digits)	**RPA #1**			**RPA #2**			**RPA #3**			**Total stocked per family**
				Number stocked	Cumulative*		Number stocked	Cumulative*		Number stocked	Cumulative*		
					Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)		Effective population size (Ne)	Frequency of inbreeding (F/gen)	
2003	Bozeman FTC 1 X 2 Ne = 2.7	185B	3C5D	0	11.4	4.4%	0			0			0
		185B	3031	0			0			0			0
	1 X 2 Ne =2.7	4855	540A	0	14.1	3.5%	0			0			0
		4855	486A	0			0			0			0
	1 X 2 Ne =2.7	586A	0123	0	16.8	3.0%	0			0			0
		586A	621A	0			0			0			0
TOTAL	0			2748	16.8	3.0%	8644	28.2	1.8%	2140	32.2	1.6%	13532

*Numbers are approximate and based on what could have been achieved with equalized representation

Listing of Tables