

LOWER YELLOWSTONE RIVER STURGEON STUDY IV  
AND  
MISSOURI RIVER PALLID STURGEON CREEL SURVEY

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## Abstract

Gill and trammel nets were drifted on the Yellowstone River in 1994, below Intake Diversion Dam, for the purpose of tagging sturgeon. Sturgeon incidentally snagged and caught by anglers were also tagged. Collection efforts resulted in 1426 shovelnose sturgeon (1373 tagged, 53 not tagged) 4 pallid sturgeon and 309 fish of various species. Nets were then used upstream of Intake Diversion Dam to recapture sturgeon that were originally tagged downstream of Intake. A total of 695 shovelnose sturgeon, five originally tagged below Intake, and 375 other fish of varying species were netted.

## PART I - YELLOWSTONE RIVER STUDY

### Introduction and Objectives

Listing of the pallid sturgeon (Scaphirhynchus albus) as an endangered species in 1990 (Federal Register 1990) stimulated the question of its current abundance in the Yellowstone River. In response, the Bureau of Reclamation has provided funding for Yellowstone River pallid sturgeon investigations each year since 1991. Sampling efforts through 1993 upstream of Intake Diversion Dam, resulted in a single pallid (Watson and Stewart 1991); meanwhile pallids were being incidentally snagged by paddlefisherman below Intake each year. Because of this fact, efforts were redirected from locating pallids to investigating sturgeon passage over Intake.

The study objective below Intake Diversion Dam was to record lengths and weights and attach a tag to all sturgeon caught by drift nets, anglers or paddlefish snaggers from mid-May to early July. Above Intake, the goal was recapturing any previously tagged sturgeon that moved upstream of the diversion dam.

### Study Area Description

Intake Diversion Dam (River Mile 71.1) divides the two working areas; downstream work encompassed ten miles (down to river mile 61.0) of the Yellowstone River, while upstream netting covered the river from Intake to river mile 108. Streamflows on the Yellowstone River throughout the study period were lower than average except for the month of May (Table 1).

### Methods

Sinking gill and trammel nets were drifted from a boat for an average of thirty minutes per drift. Trammel nets were 150 feet long and six feet deep, with two-inch inner and twelve-inch outer mesh. Gill nets were 100 feet long by six feet deep with three-inch mesh. Netted fish were weighed, measured, tagged and returned to the river. Time (hours) and distance (miles) traveled were recorded for each drift by using a stopwatch and the River Mile Index of the Yellowstone River (DNRC 1976). Total hours and miles drifted per river section and time period were calculated (Tables 2 and 3).

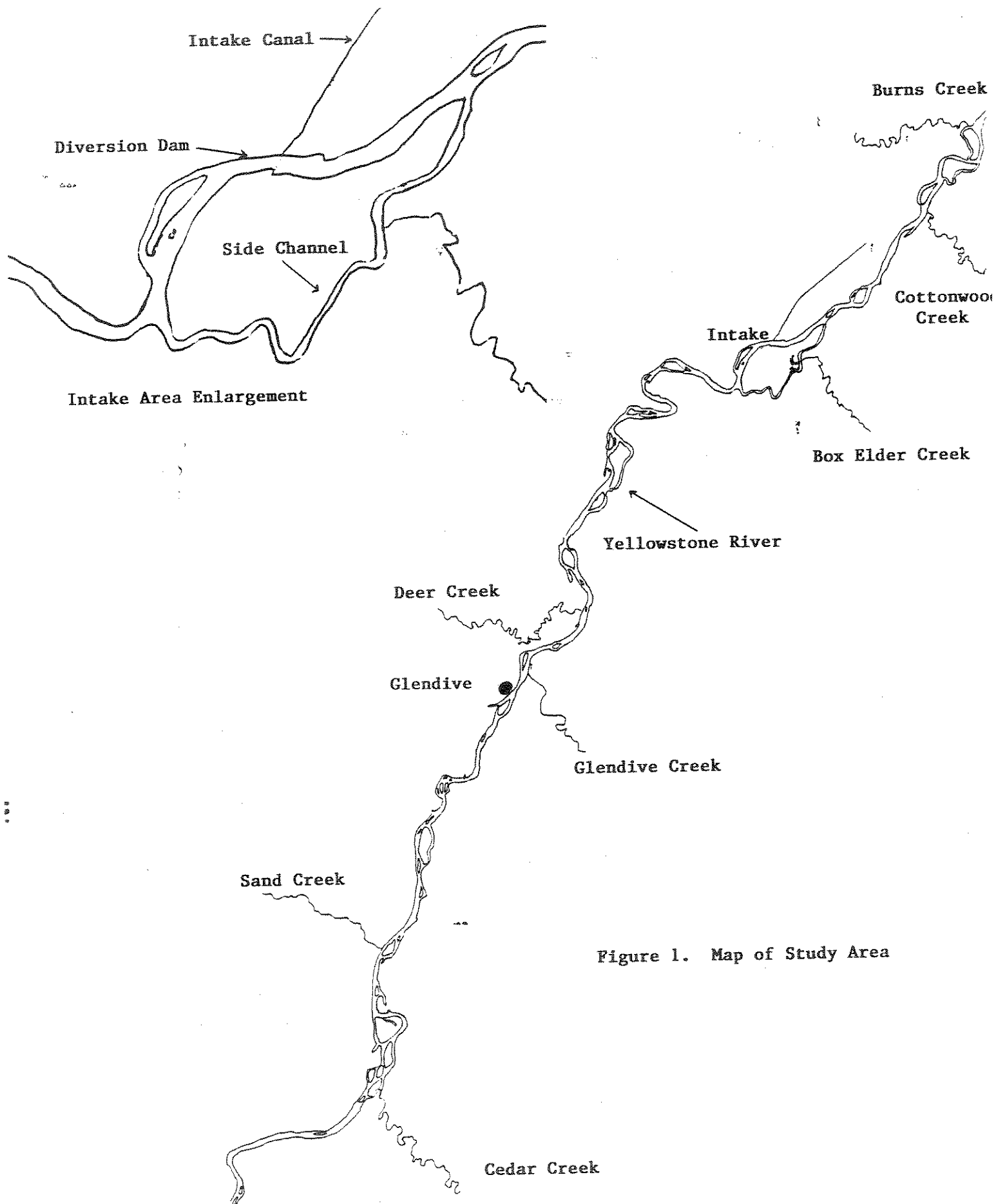


Figure 1. Map of Study Area

Fork lengths of shovelnose sturgeon and total lengths of other fish species were recorded in millimeters. Weights were recorded in kilograms. Captured shovelnose sturgeon were tagged with white cinch tags (numbered from 7-02000 to 7-03310). Pallids received a pink spaghetti tag and an internal pit tag. Sturgeon incidentally snagged by paddlefishermen and those that anglers did not keep were placed in steel tanks. Fork length and weight were recorded and an orange cinch tag (numbered from 7-00420 to 7-02883) was placed just below the dorsal fin before releasing the fish. Most sturgeon weighing less than 0.20 kilograms were not tagged.

## Results

During sampling below Intake, three pallid sturgeon were netted and one was snagged by a paddlefisherman. Table 4 provides dates and location of capture, lengths and weights and information from tags affixed to each pallid. Three of the four pallids were not tagged previously but the one caught on 6-8-94 had an old tag attached by Anne Tews, FWP biologist, below the Yellowstone and Missouri Confluence on 9-30-92. The pallid caught on 5-18-94 had an external radio transmitter affixed in addition to the external spaghetti tag and internal Pit tag. On 6-14-94 a small sturgeon weighing only 3.79 kilograms (8.34 pounds) appeared to possess physical characteristics of both sturgeon species. Additional morphometric measurements were collected from each pallid (caught in a drift net) to test for hybridization with shovelnose sturgeon. The small pallid appearing to possess characteristics of both sturgeon species was statistically compared to other sturgeon measurements from the Garrison Reservoir population, as found in Morphometric Comparisons of Upper Missouri River Sturgeon (Henrey, Tews and Clancey undated). Analysis and comparisons determined this sturgeon and the other two collected to be pallids.

No pallids were collected above Intake.

The number and efficiency of capture (fish per hour) of shovelnose sturgeon caught in nets, above and below Intake, are recorded in Tables 5 and 6. A total of 1426 shovelnose sturgeon (netted and angler caught) were recorded below Intake, while 695 shovelnose sturgeon were netted above Intake (Table 7). Table 7 also shows maximum, minimum and mean lengths and weights calculated for shovelnose sturgeon above and below Intake. Table 8 displays the percentage of shovelnose sturgeon weighing less than 0.90 Kg and 0.45 Kg above and below Intake. Data collected in past years (Backes et. al. 1992; and Backes and Gardner 1994), indicate shovelnose sturgeon above Intake to be larger than those below. Table 8 reconfirms this result with 5.90 % of the fish above and 35.06% below Intake weighing less than 0.9 Kg. This consistent information suggests that Intake is at least a partial blockage for smaller shovelnose sturgeon.



A total of 684 other fish (non sturgeon) from twelve different species was collected, with 45% being blue suckers. Table 9 shows the number caught per time period below and above Intake collectively. Table 10 separates each species and the number caught by river section. From the total fish collected, a subsample (642) was weighed and measured to determine maximum, minimum, and mean lengths and weights for each species (Table 11).

Data from previously tagged shovelnose sturgeon that were recaptured above and below Intake are shown in Table 12. Five of the 36 sturgeon recaptured were originally tagged below Intake and recaptured upstream. One of these sturgeon, bearing a blue tag numbered 7-00057, was tagged in 1977. The other four bore white tags attached below Intake in 1994. These five recaptured fish indicate at least some ability of sturgeon to move upstream over Intake Diversion Dam.

### Discussion

As in past years, water flows and netting efficiency were inversely related in 1994. During July, below Intake, the netting efficiency for shovelnose sturgeon was 110 per hour (Table 6). This is the highest netting efficiency and lowest water flows experienced when compared to the past three years of Yellowstone River sturgeon netting (Backes et. al. 1992; Backes and Gardner 1994; and Watson and Stewart 1991).

Water flows would seem to be a limiting factor to fish passage over or around Intake. During high water years, paddlefish have been snagged upstream of Intake. During these years, fish can use the side channel around Intake, which provides an unblocked route upstream (Figure 1). However, three of the four shovelnose sturgeon tagged below and recaptured above Intake in 1994 passed over the dam because the side channel did not flow between time of tagging and recapture.

Sturgeon of at least some sizes can move upstream of Intake (Table 12), even at relatively low flows. However, very small sturgeon are probably unable to make this movement. In 1994, no sturgeon, in a fairly large sample of 695 fish, were smaller than 0.34 Kg at points upstream of Intake (Table 7). Fish less than 0.34 Kg were common downstream of Intake. Also, sturgeon weighing less than 0.45 kilograms make up only 0.58% of the sample upstream of Intake but constituted 11.08% of the sample downstream of Intake (Table 8).

There may also be movement problems for larger sturgeon. Data are accumulating that indicate pallid sturgeon are rare upstream of Intake and much more common downstream. Additional effort is needed to recapture sturgeon upstream of Intake in years of greater streamflow.

The blue sucker is a candidate species for threatened or endangered status. In summer 1994 there were large numbers present between river miles 84.0 and 89.0, not far downstream from Glendive. They were found in typical shovelnose sturgeon habitat. When drifting nets for blue suckers drift times should be kept to less than 15 minutes, because this species is quickly stressed in gill or trammel nets.

#### RECOMMENDATIONS

1. Continue work to determine the usage by sturgeon of the side channel around Intake during high water flows to determine whether sturgeon bypass Intake or cross over it.
2. Continue to tag shovelnose sturgeon to gain further information about fish movements with special emphasis on movements compared to water flows.
3. Take all measurements possible on pallid sturgeons, particularly smaller ones, so hybridization comparisons can be made.
4. Use gill nets during high debris periods to avoid spending excessive time cleaning trammel nets.

#### PART II - MISSOURI RIVER PALLID STURGEON CREEL SURVEY

The Missouri River upstream of Fort Peck Reservoir is one of the few remaining reaches of the Missouri where the pallid sturgeon is known to exist. The U.S. Fish & Wildlife Service Pallid Sturgeon Recovery Plan designated this portion of the Missouri as one of the six recovery-priority management areas, national-wide, because of the potential this portion of the Missouri exhibits for providing critical pallid sturgeon habitat. Montana Fish, Wildlife and Parks (MFWP) has been conducting a pallid sturgeon study here since 1989 and has captured 24 different pallids during this six year period. In addition to these pallid captures, several other unconfirmed pallid sturgeon sightings have been reported each year by fishermen in the Fred Robinson Bridge area.

The U.S. Bureau of Reclamation (USBR) has two large storage reservoirs that significantly alter the flow and sediment transport regimes of the Missouri River in the study area. Canyon Ferry Reservoir, located 150 miles upstream of the study area, has maximum storage of 2,043,000 acre-feet. Tiber Reservoir, located 80 miles upstream on the Marias River (a large tributary of the Missouri River), is the other USBR reservoir. Maximum storage of Tiber is approximately 1,190,000 acre-feet. The operation of these two projects could affect the pallid sturgeon population in the study area.

The USBR was interested in assisting with the pallid sturgeon study and it was agreed that a pallid sturgeon creel survey at the Fred Robinson Bridge would be beneficial for acquiring more information about this endangered species.

The purpose of the survey was to 1) locate any pallids caught by fishermen before they were released and tag and attach radio transmitters to them so that general movement and habitat utilization information could be collected; 2) distribute information pamphlets to paddlefish snaggers and bait fishermen and answer questions concerning identification and reporting of pallid sturgeon sightings; and 3) increase the amount of department activity in the area to ensure that anglers release all captured pallid sturgeon.

Fishermen were surveyed in a 22-mile reach of the Missouri River near the Fred Robinson Bridge (river mile 149-171). The eight established access sites in this reach were checked at least twice a day. All fishermen were interviewed concerning their fishing activity. Information about the pallid sturgeon along with an information pamphlet about the pallid was given to each fisherman.

A total of 3,461 paddlefish snagger days and 1,152 bait fisherman days were recorded during the period April 4 through June 12, 1994 (Table 13). Only one confirmed pallid sturgeon was caught and released by a fisherman while snagging for paddlefish. This pallid was not observed by MFWP personnel but was determined to be a pallid based on the approximate size reported by the angler. A total of 67 shovelnose sturgeon were harvested by bait fisherman during the study period.

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Table 1. 1994 and long term (for period of record) monthly mean stream flows (cfs), and 1994 monthly maximum, for key stream gauges in the study area.

	Tongue River Near Miles City (1938-1993)	Powder River Near Locate (1939-1993)	Yellowstone River at Miles City (1922-1993)
May 1994 Mean	737	929	19903
May 1994 Maximum	1270	1320	33200
Long Term Mean	719	1144	17320
June 1994 Mean	211	171	16379
June 1994 Maximum	495	285	26000
Long Term Mean	1312	1675	35060
July 1994 Mean	61.3	204	7519
July 1994 Maximum	167	628	12900
Long Term Mean	483	586	20480
Aug <sub>2</sub> 1994 Mean	19.1	39	3606
Aug <sub>2</sub> 1994 Maximum	51	59	4700
Long Term Mean	186	214	8172

<sup>1</sup> Data from USGS. 1994 data are provisional and subject to revision.

<sup>2</sup> Figures through August 28.

Table 2. Trammel net and gill net sampling effort by time period.

Date	2" Trammel Net			3" Gill Net		
	Hours	Miles	# Drifts	Hours	Miles	# Drifts
5/16 - 5/31	7.9	20.1	22	2.8	7.4	9
6/1 - 6/15	8.5	19.1	18	0.9	1.8	2
6/16 - 6/30	8.9	18.4	22			
7/1 - 7/15	5.5	12.5	14	1.4	3.4	3
7/16 - 7/28	0.6	1.8	2	7.4	12.5	17
8/1 - 8/15	8.8	20.9	26			
8/16 - 8/17	2.5	4.3	6			
Totals	42.7	97.1	110	12.5	25.1	31

Table 3. Trammel net and gill net sampling effort by river section.

River Section	2" Trammel Net			3" Gill Net		
	Hours	Miles	# Drifts	Hours	Miles	# Drifts
Below Intake	26.8	60.5	67	3.7	9.2	11
Above Intake	15.9	36.6	43	8.8	15.9	20
Totals	42.7	97.1	110	12.5	25.1	31

Table 4. Pallid sturgeon tagged below Intake Diversion Dam.

Date Caught	River Mile	Fork Length (mm)	Weight (Kg)	Tags Attached
5-18-94	67.1	1384	18.18	External Pink Spaghetti #R6-10060 Internal Pit Tag #7F7D517479 External Transmitter Freq. 48.561
6-8-94	69.8	1094	8.18	External Pink Spaghetti #R6-10053 Internal Pit Tag #7F7F064F27 External Yellow Carlian #01323
6-14-94	70.0	981	3.79	External Pink Spaghetti #R6-10055 Internal Pit Tag #7F7D4B0A42
5-21-94 <sup>2</sup>	71.0	----	----	External Orange Cinch #7-00498

<sup>1</sup> Tag from previous capture on 9-30-92 near confluence of the Yellowstone and Missouri Rivers.

<sup>2</sup> Fish snagged by paddlefish snaggers was tagged but no length or weight was taken.

Table 5. Number of shovelnose sturgeon caught in drift nets by time period and river section (hours of netting effort in parentheses).

Time Period	River Sections		Period Total
	Below Intake	Above Intake	
5/16 - 5/31	261 (10.7)		261 (10.7)
6/1 - 6/15	264 (9.4)		264 (9.4)
6/16 - 6/30	695 (8.9)		695 (8.9)
7/1 - 7/15	165 (1.5)	52 (5.4)	217 (6.9)
7/16 - 7/28		117 (7.9)	117 (7.9)
8/1 - 8/15		482 (8.8)	482 (8.8)
8/16 - 8/17		44 (2.6)	44 (2.6)
Totals	1385 (30.5)	695 (24.7)	2080 (55.2)

Table 6. Number of shovelnose sturgeon caught per hour of netting effort by time period and river section.

Time Period	River Sections	
	Below Intake	Above Intake
5/16 - 5/31	24.4	
6/1 - 6/15	28.1	
6/16 - 6/30	78.1	
7/1 - 7/15	110.0	9.6
7/16 - 7/28		14.8
8/1 - 8/15		54.8
8/16 - 8/17		16.9
Mean	45.5	28.1

Table 7. Maximum, minimum and mean fork length and weight for shovelnose sturgeon by river section (netted and angler caught sturgeon).

	Below Intake		
	Fish Tagged	Fish Not Tagged	Above Intake
		Fork Length (mm)	
Max	950	965	1000
Min	210	264	455
Mean	663	376	725
		Weight (Kg)	
Max	3.90	3.79	5.23
Min	0.07	0.06	0.34
Mean	1.27	0.24	2.08
Sample Size	1373	53	695

Table 8. Percentages of shovelnose sturgeon weighing less than 0.90 kg and 0.45 kg above and below Intake.

	Below Intake (1426 Fish)		Above Intake (695 Fish)	
	Number	Percent	Number	Percent
Less than 0.90 kg	500	35.06	41	5.90
Less than 0.45 kg	158	11.08	4	0.58

Table 9. Fish species and number caught by time period (excluding sturgeon).



Table 9. Fish species and number caught by time period (excluding sturgeon).

Species	5/16-5/31	6/1-6/15	6/16-6/30	7/1-7/15	7/16-7/28	8/1-8/15	8/16-8/17	Total
Bigmouth buffalo	3	2						5
Blue sucker	4	12	3	17	10	248	15	309
Carp	10	10	5	8	3	3	4	43
Channel catfish	5	2	3	5		2	2	19
Goldeye	45	27	5	2			1	80
Longnose sucker					2	9	2	13
Paddlefish	16	13	1					30
River carpsucker	31	54	24	9				118
Sauger	10	7	2	2		3		24
Shorthead redhorse				5	3	6		14
Smallmouth buffalo		6	3	7		6	6	28
White sucker						1		1
Totals	124	133	48	55	18	256	30	684

Table 10. Fish species and number caught by river section (excluding sturgeon).

Species	Below Intake	Above Intake	Total
Bigmouth buffalo	5		5
Blue sucker	24	285	309
Carp	25	18	43
Channel catfish	10	9	19
Goldeye	77	3	80
Longnose sucker		13	13
Paddlefish	30		30
River carpsucker	109	9	118
Sauger	19	5	24
Shorthead redhorse		14	14
Smallmouth buffalo	10	18	28
White sucker		1	1
Totals	309	375	684

Table 11. Maximum, minimum and mean total length and weight for a subsample of all species collected (excluding sturgeon).

Species	Total Length (mm)			Weight (kg)			Sample Size
	Max.	Min.	Mean	Max.	Min.	Mean	
Bigmouth buffalo	725	609	671	8.18	3.82	5.71	5
Blue sucker	874	492	708	5.91	0.92	2.86	309
Carp	620	398	495	2.96	0.78	1.50	36
Channel catfish	665	249	434	3.64	0.11	0.97	18
Goldeye	361	285	315	0.45	0.17	0.29	79
Longnose sucker	432	333	387	0.89	0.46	0.64	11
Paddlefish	1234	794	1027	43.64	8.18	20.60	30
River carpsucker	582	313	428	2.94	0.36	1.08	98
Sauger	490	254	363	0.90	0.13	0.42	24
Shorthead redhorse	447	305	410	0.88	0.28	0.70	13
Smallmouth buffalo	725	418	625	5.91	1.12	3.67	18
White sucker	408	408	408	0.82	0.82	0.82	1
Total							642

Table 12. Tagged shovelnose sturgeon recaptured in 1994.

Color	Tag Number	Original Tagging Data				Recapture Data			
		Date	Length (mm)	Weight (kg)	River Mile	Date	Ln. (mm)	Fork Wt. (kg)	River Mile
Orange	7-00304	6/28/92	713	1.14	71.0	5/24	661	1.16	69.8
	7-00367	5/23/93	803	2.53	71.0	5/26	810	2.02	66.2
	7-0428	6/9/94	645	1.14	71.0	6/13	640	1.10	69.1
	7-0356	6/3/93	635	1.19	71.0	6/15	950	0.96	70.0
	7-0385	6/16/93	790	2.16	71.0	6/16	760	1.80	70.0
	7-00387	6/14/93	718	1.31	71.0	6/16	690	1.27	70.0
	7-02384	6/10/94	700	1.31	71.0	6/16	687	1.21	70.0
	7-00226	6/9/92	650	1.05	70.1	6/21	660	1.10	70.0
	7-02399	6/12/94	575	0.65	71.0	6/23	561	0.64	69.7
	7-00363	5/26/94	915	4.21	71.0	6/27	904	3.30	66.8
	7-00259	6/25/92	827	2.56	71.0	6/30	813	2.12	70.0
	7-00479	5/20/94	665	1.11	71.0	7/5	644	1.08	69.0
	7-00356 <sup>2</sup>	6/3/93	635	1.19	71.0	7/7	655	1.05	69.3
	7-00468 <sup>2</sup>					7/7	840	2.60	69.4
	7-00446 <sup>3</sup>	5/29/94	560	0.74	71.0	7/7	685	1.15	69.4
	7-00434 <sup>3</sup>	5/21/94	770	1.53	71.1	8/24	977	1.86	1577.5
Blue	7-02831 <sup>2</sup>	7/27/93	702	1.45	68.8	6/13	640	1.10	69.1
	7-00941 <sup>2</sup>	5/7/79	737	1.57		6/15	770	1.80	70.3
	7-0035 <sup>4</sup>	10/20/77	875	1.74		6/21	830	2.20	70.1
	7-02839 <sup>4</sup>	7/27/93	817	2.07	68.8	6/23	815	2.05	69.7
	7-02849	7/27/93	739	1.71	68.8	6/23	737	1.64	70.0
	7-02851 <sup>5</sup>	7/27/93	719	1.54	68.8	7/5	724	1.60	69.0
	7-00057	10/9/77	990	3.09	71.0	8/12	905	4.20	81.6
Yellow	R6-05416	10/13/93	822	1.00	51.0	6/23	635	1.00	69.7
	R6-05109 <sup>2</sup>	10/8/92	840	1.09	1581MR	6/23	830	2.36	69.5
	7-05083 <sup>2</sup>					6/30	690	0.64	70.0
	7-05100 <sup>2</sup>					7/6	695	1.18	69.1
	7-05019 <sup>2</sup>					7/6	840	2.40	69.1
	G-5379 <sup>2</sup>					7/7	664	1.14	69.4

Table 12. Continued

Color	Tag Number	Original Tagging Data			Recapture Data				
		Date	Length (mm)	Weight (Kg)	River Mile	Date	Fork Ln. (mm)	Weight (Kg)	River Mile
Green	566 <sup>2</sup>					6/29	750	1.85	69.9
	689 <sup>2</sup>					7/7	813	2.60	69.4
White	7-02006 <sup>5</sup>	5/17/94	558	0.60	66.2	8/2	577	0.74	89.1
	7-02680 <sup>5</sup>	6/21/94	608	0.94	70.1	8/9	630	1.10	85.8
	7-02462 <sup>5</sup>	6/15/94	728	1.82	70.3	8/10	705	1.60	87.2
	7-02493 <sup>5</sup>	6/16/94	761	1.92	69.1	8/12	763	2.19	81.6

Abbreviations : MR = Missouri River

- <sup>1</sup> Unknown whether lengths are total or fork lengths.
- <sup>2</sup> Some or all of original tagging information could not be located.
- <sup>3</sup> Recaptured by field workers on the Missouri River.
- <sup>4</sup> Replaced blue tag with white tag # 7-02877.
- <sup>5</sup> Tagged fish recaptured above Intake.

Table 13. Fishermen survey and sturgeon creel information for the Missouri River at the Fred Robinson Bridge area, April 6 - June 13, 1994.

Survey Period	Number of Angler Days		No. Pallids Caught and Released	No. of Shovelnose Sturgeon Harvested
	Paddlefish	Bait Fisherman		
4/4 - 4/10	61	0	0	1
4/11 - 4/17	68	0	1	0
4/18 - 4/24	76	56	0	1
4/25 - 5/1	209	96	0	8
5/2 - 5/8	646	176	0	7
5/9 - 5/15	610	187	0	7
5/16 - 5/22	600	197	0	21
5/23 - 5/29	736	224	0	10
5/30 - 6/5	394	156	0	12
6/6 - 6/12	61	60	0	

14 One angler day amounts to 5 hours of fishing.