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MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana PROJECT TITLE: Statewide Fisheries Investigations

PROJECT: F-78-R-2 STUDY TITLE: Survey and Inventory of Warmwater Streams

JOB NO: III-c JOB TITLE: Yellowstone River Paddlefish Investigations

PROJECT PERIOD: July 1, 1995 through June 30, 1996

REPORT PERIOD: April 1, 1995 through March 30, 1996

ABSTRACT

Creel census at Intake and statewide for the Yellowstone-Sakakawea population in 1995 indicated a Montana paddlefish harvest of 1831 fish of which approximately 80% was taken in the Intake vicinity. Catch rate at Intake was the highest since 1982. The trend of a lower female percentage in the harvest beginning in 1993, continued in 1995. Average size of female paddlefish caught at Intake is remaining steady, but the average size of males was the smallest in many years. Limited catch and release fishing at Intake was popular with anglers.

Average catch rate decreases beginning in about 1986 suggest a decline in density of paddlefish at Intake beginning in about that year. Tag return data suggest an increasing exploitation rate up to at least the year 1990. Since at least the late 1970's female exploitation rate is higher than the rate for males. Angler comments on surveys showed they were heavily in favor of catch and release. Wounding of fish caught and released did not appear to cause any mortality.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 1995. As many anglers as possible were questioned concerning amount of time spent fishing and number of fish caught. The interview total for fishing effort during periods requiring retention of fish caught was 732, or 35% of the estimated angler days. The corresponding figures for catch and release periods were 267 and 80%. Anglers were counted each day of the season during daylight hours. On days with no catch and release, eight counts were made. Eleven counts of anglers were made on days with catch and release. A twenty-four hour fishing day was used to estimate

fishing pressure. Analysis of the data was accomplished by adopting formulas 5 through 32 from Spence (1970) to the census. Calculations were made by computer.

For the third consecutive year a mail survey was used to obtain paddlefish harvest information from anglers at all Montana locations where the Lake Sakakawea paddlefish is harvested. These locations are the Yellowstone River and Missouri River downstream of Ft. Peck Dam. Anglers were questioned concerning number of days fished, number of fish caught by river reach and number of fish kept. Response was obtained from 2,674 anglers or 56% of anglers buying paddlefish tags.

Angler caught paddlefish were weighed to the nearest pound. Body length (center of eye to fork of caudal fin) was measured to the nearest millimeter. Sex was determined by internal examination of the gonad. Paddlefish were obtained for tagging by two methods. Most of the fish caught during catch and release were jaw tagged preceding release. Also floating drifted gill nets were used to obtain fish for tagging. These nets were 100-150 feet long and 10 feet deep, but tied up to six feet deep. Plastic, individually numbered tags were placed around the lower jaw bone. They were obtained from the National Band and Tag Co. Statistical level of significance was calculated by use of the "Students T test" as described by Li (1964).

RESULTS

General Observations

Yellowstone River conditions in 1995 were much different from 1994. River flows were much higher in 1995 and paddlefishing at Intake was good for most of the season. 1995 was also the first year since 1980 with legal catch and release fishing. Catch and release was very popular. Intake fishing pressure during catch and release hours averaged more than twice the fishing pressure during other hours.

A total of 4,787 angler purchased tags in 1995 (Table 1). This was higher than in 1994, but still below 1993 sales. The proportion of nonresidents buying paddlefishing tags was 17%, even lower than in 1994, which had been the previous low. The lower season limit, beginning in 1994 seems to have decreased nonresident interest in paddlefishing.

Paddlefish Size and Sex Ratio

A total of 1,448 paddlefish were weighed, measured and sexed from the angler catch at Intake in 1995 (Table 2). This total included approximately 100 fish caught at down-stream points, as far downstream as Cottonwood Creek and five or six fish caught at upstream points near Glendive. Females made up 43.6% of the total.

The trend in female percentage of the angler catch is definitely downward (Table 2). The years 1993, 1994 and 1995 averaged 47.2% female, while the preceding ten years (1983 through 1992) averaged 69.2% female. The lowest female percentage for the years 1983-1992 was 57.2% while 2 of the last 3 years have been under 50% (Table 2). Overall, data strongly indicate a trend with a greater proportion of male paddlefish and a lower proportion of female paddlefish in the adult fraction of the paddlefish population.

Table 3 shows average length and weight, by sex, for paddlefish at Intake. Average length and weight of female paddlefish is changing only very slowly, with a very slow increase in length and weight over the past 15 years which may have leveled off. Male paddlefish weight was 2.4 pounds less in 1995 than in 1994, and average length rather sharply decreased to 889 mm from 914 mm in 1994. The rather sharp decrease in mean size suggests an influx of young, smaller, first time migrating males in 1995.

Creel Census

Results from the 1995 creel census at Intake are shown in Table 4. Results for 1995 can be compared with previous years in Table 5. In 1995 at Intake anglers fished an estimated 2098 days with an average of 2.10 hours per day to catch an estimated 2008 fish with an estimate of 1657 fish kept. The harvest figure is considered an overestimate. Both statewide mail creel (estimated Intake harvest of under 1500 fish) and numbers of fish weighed, measured (1448) and cleaned (1462) at Intake indicate the actual Intake harvest was approximately 1500 fish. The harvest estimate is probably high because of a decrease in 1995 of numbers of people fishing at night. The creel census program uses a 24 hour fishing day, but angler counts are made only during the daylight hours. Work done in the 1970's suggested night fishing pressure was equal to daylight fishing pressure. Many anglers considered fishing to be better at night, in spite of difficulties associated with night fishing. In 1995 daylight fishing was very good. As a result I believe fewer people fished at night, causing an overestimate of fishing pressure and a resultant over estimate of harvest.

Angler success rate in 1995 at 0.39 fish per hour was the highest measured since 1982 (Table 5). Fishing pressure at Intake was approximately twice the 1994 value, but still less than most past years. The decrease to a one fish per season limit, beginning in 1984, will probably prevent fishing pressure from reaching levels of the 1980's and early 1990's.

Fishing regulations in 1995 allowed limited catch and release fishing at the Intake Fishing Access Site for the first time since 1980. Catch and release times were each Sunday and Wednesday from 3:00 p.m. to 9:00 p.m. Creel census results for catch and release are shown separately in Table 4. The estimate of 351 fish caught during catch and release periods is a little low. Department

personnel monitored all catch and release fishing in 1995. The actual catch is known, by count, to be very close to 420 fish. Catch and release fishing at Intake was very popular. The average instantaneous angler count during catch and release was 10.75 anglers, more than twice the value for non-catch and release periods.

A mail creel census of all anglers purchasing paddlefish tags was completed for a third consecutive year in 1995. Returns were received from 56% of the 4,787 paddlefish anglers. Results are shown in Table 8 and averages for the three year period in Table 9. From these two tables and the Intake Creel Census (Table 5) it is clear that most of the pressure and harvest is consistently at Intake.

The Montana harvest of the Yellowstone-Sakakawea paddlefish population will be under a 1500 fish quota for the first time in 1996. The statewide mail creel was done largely to give information on total harvest and to allow quick estimation of total harvest from information collected only at Intake. Total harvest at any point during the paddlefish snagging season could conceivably be estimated either from numbers of paddlefish weighed and measured at Intake or from numbers of paddlefish cleaned by the Glendive Chamber (Table 8). This would allow closing of the season early, if necessary to prevent anglers from exceeding the quota. The number of fish cleaned by the Glendive Chamber of Commerce and Agriculture is a better index of total harvest than fish weighed and measured. A running total for both categories can easily be kept day by day through the season. For all three years fish cleaned by the Chamber was very close to 80% of the total harvest (Table 8). With this information, when 1200 fish have been cleaned by the Glendive Chamber at Intake, the total harvest will probably be very close to 1500 fish.

Historical Catch Rate at Intake

Angler catch rates for paddlefish at Intake from 1972 through 1995 are shown in Table 9. Mean success rate for the two periods 1972-79 and 1981-85 are similar. The same is true for the periods 1986-90 and 1991-95 (Table 9). However, the average success rate for the two later periods (0.21 fish per hour) is only about half the success rate for the two earlier periods (0.39 fish per hour). This difference is significant at the probability level of 0.995. This constitutes some rater substantial evidence of a decreased density of paddlefish at Intake in the later years and suggests that the population size of adult fish may have also decreased since the mid 1980's. The same conclusion was reached in an earlier report using data through 1992 (Stewart, 1993).

This difference is probably not related to magnitude of river flows during the paddlefish season. Mean May 15-June 30 discharge values for the Yellowstone River at Sidney are shown for each of the four

time periods (Table 9). The period 1991-95 has the highest average flow, but the lowest success rate. Overall, mean May 15-June 30 flows for 1985 and earlier are very similar to 1986 through 1995. The values are 28,046 cfs for the earlier years and 26,285 cfs for the later years.

To some extent anglers have compensated for decreased catch rates by fishing more hours per day (Table 9) This results in lesser differences over the years in number of fish per angler day. Fish per angler hour is a much better indicator of fish density than fish per day.

Tagging, Tag Return and Exploitation Rate

Return rate of individually number plastic bands placed around the dentary bone are used to infer angler exploitation rate. Of 7,101 paddlefish tagged in the Yellowstone River (mostly near Intake) at least 1,614 (22.7%) have been harvested by anglers (Table 10).

In 1995, 99 tags were recovered from paddlefish tagged in the Yellowstone River in Montana (Table 10). Of these 99, six were caught by anglers in North Dakota near the Yellowstone-Missouri confluence. The remainder were caught by anglers at Intake or up to a few miles downstream of Intake. An additional 28 fish caught at Intake were tagged in the Yellowstone or Missouri River in North Dakota. Of the 99 tag returns of Montana tagged fish, 68 were tagged in 1995. These 68 tagged fish made up 15.4% of the fish tagged in Montana in 1995.

Data from Table 10 are grouped by time periods in Table 11. There is good evidence that an increasing proportion of the paddlefish spawning population is being harvested by anglers. For fish tagged 1964 through 1970, probably no additional tags will be returned and the percentage returned by anglers will never exceed the 16.3% already returned. The same is nearly true for fish tagged in the years 1971 through 1980 and the percentage returned for this period will not increase above 25%. For fish tagged 1981 through 1990, the percentage returned has already reached 36.9% and because many of these fish are still alive, the percentage returned will probably exceed 40% in a few years. Fish tagged in the period 1991-95 are being harvested under more restrictive regulations that began in 1994 (one fish season limit instead of two). Hopefully, tag return rate will decrease for fish tagged in the decade of the 1990's.

Beginning in 1995 paddlefish regulations are allowing limited catch and release paddlefishing. Rules require mandatory release of all paddlefish caught between the hours of 3:00 p.m. and 9:00 p.m. on Wednesdays and Sundays during the May 15-June 30 paddlefish season. This gives an excellent opportunity for Department personnel to obtain paddlefish for tagging. In 1995, 380 of the 442 total paddlefish tagged (Table 10) were obtained by angler snagging.

Tables 12 and 13 indicate average annual exploitation rates for paddlefish tagged in various years. Rates are calculated for only the first five years following tagging to minimize the compounded error from angler caught but unreported tagged fish and natural mortality of tagged fish. These rates show no clear-cut trend for years 1984 through 1990, for which the 5 years period is over. Table 12 suggests somewhat decreased exploitation rate beginning in about 1993. Calculated rates in Table 13 average a little over 5%, but actual rates may be closer to 10%, because of natural mortality of tagged fish and failure of some angler to return tags.

Table 14 compares tag return rate by sex for fish tagged in the years 1977 through 1995. This data is expanded from similar information by Stewart (1994), but the conclusions reached from both data sets are similar. The percentage of tags returned from female paddlefish is higher than the percentage for male paddlefish for all years but one. The differential is largest for fish tagged in the 1970's when many smaller male fish were legally released, but the differential has persisted in later years when hi-grading of fish has been illegal. The difference in tag return rate by sex is significant at the 0.995 probability level. Either considerable illegal hi-grading is persisting or female paddlefish are inherently more vulnerable to snagging. Perhaps both are true. The implication is that harvest rates of female paddlefish may be more significant than overall harvest rates.

Gill Net Catch Rate

As an indicator of paddlefish density in the Yellowstone River near Intake, gill net drifts are timed to allow calculation of number of paddlefish caught per unit time (Table 15). The catch rate in gill nets in 1995 was much higher than in 1994. Although paired data is available only since 1993, gill net catch rate and angler catch rate (fish per angler hour, Table 5) seem to be correlated. Both figures may be representative of relative paddlefish density in the Intake area.

Paddlefish Angler Comments

Results of two paddlefish angler surveys are shown in Tables 16 and 17. Table 16 gives results for a survey given only to catch and release anglers, asking them to comment on catch and release. Table 17 shows responses from the mail creel survey. Only comments made by more than one individual are shown in the two tables.

Anglers in both groups heavily favored catch and release, especially in that it allowed additional fishing opportunity. Both groups also expressed concern for injury and possible death of released paddlefish. Both groups had considerable to say about regulations. Preference for a two fish limit heavily outweighed the preference for a one fish limit (Table 17). Catch and release anglers favored expanding opportunities for catch and release and

favored voluntary catch and release so that high-grading was allowed.

Considerable appreciation was expressed for Department paddlefish management and interaction with Department personnel (Table 17).

Paddlefish Caviar

The Glendive Chamber of Commerce and Agriculture continued their collection of paddlefish roe at Intake for the sixth consecutive year. They also continue to clean fish for anglers in return for roe donation. The cleaning service is very popular and the Glendive Chamber cleans in excess of 90% of the fish caught in the Intake area.

The Chamber cleaned 1,453 fish of which 641 (44.4%) were females. From those fish 6,225 pounds of raw ovaries were collected. This yielded 4,203 pounds of processed roe from which 4,146 pounds of caviar were sold for $234,698 or $56.61 per pound.

Catch and Release Wounding

Most paddlefish released during catch and release hours at Intake were inspected for wounds and scars. Of 409 fish inspected, 64 (15.6%) were released with one or more wounds. A wound was considered to be anything more than a simple hook puncture. Some of these fish had flesh tears up to 4 inches in length. Others had a wound from a previous hooking at Intake in 1995. Some had circular wounds ("divots"), that are probably formed by necrosis of tissue around hooks that remained in the fish when fishing line broke. Other fish were caught with a treble hook lodged in the flesh from a pervious hooking.

Of the 409 inspected an additional 11 fish (2.7%) had what appeared to be an old hook scar. These were circular discolored spots on the skin of approximately one-two inches diameter. An additional eight fish (2.0%) carried what appeared to be propeller wounds. These were multiple arcs in a row usually on the side of the fish. I observed one fish with a scar in a narrow band all around the fish in front of the dorsal fin. The fish was noticeably constricted in the scar band. This was a large female paddlefish in good condition. The scar was probably formed by fishing line wrapped tightly around the fish.

Although some of the wounds observed were several days old, no bacterial or fungal growth was noticed in wounds. No dead or moribund paddlefish were observed or reported by anglers. On two days in June 1995, following catch and release days, both sides of the river were inspected for a distance of 12 miles downstream for dead, moribund or injured paddlefish. No paddlefish were observed. To date, there is no evidence of paddlefish mortality related to hooking, landing and immediate release.

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Date Prepared: March 8, 1996

Waters Referred to: Yellowstone River Sec. I 21-1350-02

Key Words:

Angler success rate
Fishing pressure
Creel census
Paddlefish caviar
Paddlefish exploitation rate
Paddlefish sex ratio
Paddlefish tagging
Paddlefish hooking wounds
Paddlefish regulations

Table 1. Number of anglers purchasing paddlefish tags.

Year	Total	Resident	Nonresident	% Nonresident
1995	4787	3985	802	17
1994	4030	3210	820	20
1993[3]	5541	4169	1372	25
1992[3]	4779	3503	1276	27
1991	4438	3021	1417	32
1990	3960	2826	1134	29
1989[4]	4255	3081	1174	28
1988[4]	3526	2620	906	26
1987	2877[2]	2182	695	24
1986	3696[2]	2661	1035	28
1985	3593			
1984	5063			
1983	4636			
1982[1]	4834			
1981[1]	4166			

[1] Tags were free in 1981

[2] Resident and nonresident tag sales were calculated separately beginning in 1986.

[3] Previous to 1992 tags were required only for Yellowstone River paddlefish snagging. Beginning in 1992 tags were required statewide.

[4] Data for 1988 through 1992 is updated from previous reports to show complete sales

Table 2. Summary of paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-1995.

Year	No. of fish Measured	Average Total Length (Inches)	Eye-fork Length (mm)	Average Weight (pounds)	Percentage of Females
1963	46	43.4		29.6	0
1964	920	48.8		21.0	2.8
1965	453	50.6		21.3	2.9
1966	28	49.2		21.2	0
1967	123	50.9		21.8	0
1968	149	52.6		25.0	4.3
1969	499	51.9		23.4	3.7
1970	700	52.0		25.6	11.4
1971	1136	53.1		30.8	45.4
1972	1678	55.5		34.0	48.2
1973	1696	53.9		33.1	44.1
1974	1910	55.1		35.6	51.2
1975	1158	57.3		42.3	67.8
1976	940	57.6		47.4	67.8
1977	1003	58.2		48.2	64.0
1978	809	55.6		43.0	68.0
1979	637	60.1[1]		50.4[2]	67.5
1980	-	58.3[1]		49.1[2]	80.2
1981	2528		1086	46.7	75.1
1982	2004		1078	45.1	71.2
1983	1400		1086	50.2	82.6
1984	2691		1080	44.0	69.1
1985	628		1087	47.2	78.7
1986	1462		1064	43.7	63.3
1987	1412		1091	49.7	77.2
1988	1780		1058	43.5	61.0
1989	1583		1084	47.0	70.0
1990	1493		1073	45.6	65.4
1991	2558		1055	45.0	57.2
1992	670		1087	48.7	67.3
1993	1659		1005	36.9	35.1
1994	309		1070	47.4	62.8
1995	1448		1003	39.1	43.6

[1] Based on 62 measurements
[2] Based on 131 measurements

Table 3. Summary of paddlefish average length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963-1995.

	Males			Females		
Year	Sample Size	Length (E-F,mm)	Weight (pounds)	Sample Size	Length (E-F,mm)	Weight (Pounds)
1963	46		29.6			
1964	28		21.2			
1967	123		21.8			
1968				6		42.3
1970	620		26.3			
1971	620		25.7	516		52.6
1972	869		23.5	809		53.4
1974	932		24.4	978		55.4
1976	303		25.9	637		60.2
1978	259		30.0	550		66.0
1979	207		25.0	430		61.6
1981	630	954	27.8	1898	1130	53.0
1982	577	937	24.4	1427	1138	53.8
1983	244	932	25.8	1156	1117	55.3
1984	832	954	24.0	1859	1136	52.9
1985	134	914	24.2	494	1134	53.4
1986	537	932	24.7	925	1142	54.7
1987	322	916	25.6	1090	1143	56.8
1988	695	929	25.5	1085	1141	55.0
1989	475	931	24.8	1108	1150	56.9
1990	516	922	23.8	977	1153	57.1
1991	1080	916	24.9	1462	1159	60.3
1992	214	917	24.7	451	1170	60.2
1993	1076	925	25.2	583	1152	58.6
1994	115	914	25.9	194	1163	60.1
1995	815	889	23.5	631	1151	59.2

Table 4. Estimate of anglers, hours fished and harvest for the 1995 paddlefish season at Intake.

Time Period	No. of angler days	Hours/ angler day	Angler hours	No. of fish caught	Fish caught/ angler Hr	Fish Caught Per Angler day
			Periods Requiring Angler Retention of Fish			
Wednesdays & Sundays	502	2.13	1069	406	0.38	0.82
Other Days	←1596	←2.03	←3229	←1251	←0.39	←0.79
Total or Mean	2098	2.10	4298	1657	0.39	0.81
			Periods Requiring Fish Release			
	334	2.51	838	351	0.42	1.05

Table 5. Comparison of paddlefish fishing pressure, harvest and success rate data at Intake from 1972 to 1995.

Year	Angler Days	Fish Caught	Fish Kept	Fish/ Angler Day	Fish/ Angler Hour	Total Weight Harvested (pounds)
1972	2118	2935	1805	1.39	0.40	61,370
1973	2449	4670	2675	1.91	0.46	88,543
1974	3363	4359	2182	1.30	0.39	70,680
1975	2784	2950	1473	1.06	0.28	77,038
1977	3524	2764	1410	0.78	0.34	67,962
1978	6130	4814	2887	0.78	0.49	124,141
1979	2904	2202	1727	0.76	0.27	87,041
1981	3982	5318	5318	1.34	0.81	248,251
1982	3535	4713	4713	1.33	0.45	212,556
1983	3142	3193	3193	0.92	0.38	160,289
1984	3978	3860	3860	0.98	0.35	169,840
1985	1745	550	550	0.34	0.09	25,960
1986	2521	1791	1791	0.73	0.15	78,267
1987	2386	2612	2612	1.13	0.28	129,816
1988	2320	2923	2923	1.25	0.34	127,151
1989	2208	2242	2242	1.00	0.19	105,374
1990	2877	2046	2046	0.65	0.15	93,298
1991	3332	4203	4203	1.19	0.30	189,135
1992	2396	762	762	0.34	0.09	37,109
1993	2818	1635	1635	0.56	0.13	60,331
1994	1037	278	278	0.27	0.08	13,177
1995	2098[a]	2008	1657[a]	0.81[a]	0.39[a]	64,789[a]

[a] Does not include fishing during catch and release periods.

Table 6. Results of the 1995 state-wide paddlefish mail creel survey for fish harvested from the Yellowstone-Sakakawea population.

Variable	Area 3[a]	Area 4[b]	Area 5[c]	Area 6[d]	Mean or Total
Angler days	143	559	3424	480	4606
Percentage of Total Angler Days	3.1	12.1	74.4	10.4	100
Harvest	24	206	1479	122	1831
Percentage of Total Harvest	1.3	11.3	80.8	6.6	100
Fish Kept Per Angler Day	0.17	0.37	0.43	0.25	0.40
Mean Number of Fish Kept Per Angler	0.31	0.63	0.76	0.60	0.72
Number of anglers reporting they fished area	41	181	1089	114	1262

[a] Missouri River between Fort Peck Dam and North Dakota Border
[b] Yellowstone River upstream of Intake Diversion Dam
[c] Yellowstone River - Intake Diversion Dam to Cottonwood Creek
[d] Yellowstone River - Cottonwood Creek to North Dakota Border

Table 7. Three year (1993, 1994, 1995) average values for statewide paddlefish mail creel survey for fish harvested from the Yellowstone-Sakakawea population in Montana.

Variable	Area 3	Area 4	Area 5	Area 6	Mean or Total
Angler days	189	658	4869	646	6362
Percentage of Total Angler Days	3.2	11.0	75.7	10.1	100
Harvest	20	134	1262	125	1541
Percentage of Total Harvest	1.3	8.7	81.9	8.1	100
Fish Kept Per Angler Day	0.11	0.21	0.26	0.20	0.24
Mean Number of Fish Kept Per Angler	0.26	0.41	0.55	0.39	0.40
Number of anglers reporting they fished area	44	191	1386	143	1764

Table 8. Paddlefish harvest estimates and indices of overall harvest for 1993-95.

Harvest measure	Year			3 year Mean
	1993	1994	1995	
Creel census at Intake	1634	278	1657	
Fish cleaned by Glendive Chamber	1877	355	1462	
Area 5 (Intake to Cottonwood Ck*)	1949	359	1479	
All fishing areas*	2334	470	1831	
Fish weighed, sexed and measured	1659	309	1448	
Fish cleaned by Glendive Chamber As percentage of all areas	80.1	75.5	79.8	78.5
Fish weighed and measured as percentage of all areas	71.4	65.7	79.1	72.1

* From mail creel census

Table 9. Mean number of paddlefish per angler hour, mean angler hours per day and mean fish per angler day at Intake, 1972 to 1995.

Year	Fish per hour	Period Mean	Hrs/ Angler Day	Period Mean	Fish Per day	Period Mean	Mean May 15- June 30 River Flow (cfs)
1972	0.40		3.50		1.39		
1973	0.46		4.14		1.91		
1974	0.39	0.38	3.32	3.07	1.30	1.17	29,831
1975	0.28		3.82		1.06		
1977	0.34		2.27		0.78		
1978	0.49		1.60		0.78		
1979	0.27		2.87		0.76		
1981	0.81		1.60		1.34		
1982	0.45	0.42	2.90	2.63	1.33	0.98	26,262
1983	0.38		2.40		0.92		
1984	0.35		2.87		0.98		
1985	0.09		3.37		0.34		
1986	0.15		4.70		0.73		
1987	0.28	0.22	4.00	4.52	1.13		
1988	0.34		3.90		1.25	0.95	22,320
1989	0.19		5.61		1.00		
1990	0.15		4.40		0.65		
1991	0.30		4.07		1.19		
1992	0.09	0.20	3.82	3.66	0.34	0.63	30,250
1993	0.13		4.56		0.56		
1994	0.08		3.74		0.27		
1995	0.39		2.10		0.81		

Table 10. Summary of paddlefish tagging at Intake and tag returns 1964-1995.

Year	Number Tagged	# Returned in 1995	Total # Returned	Percentage Returned
1964-1970	1703	0	278	16.3
1971-1980	3242	2	804	24.8
1984	551	6	237	43.0
1985	2	0	2	100.0
1986	153	2	43	28.1
1988	156	0	56	35.9
1989	10[a]	1	3	40.0
1990	153[a]	3	37	24.2
1991	20	0	4	20.0
1992	221[a]	8	48	21.8
1993	268[a]	7	21	7.8
1994	180[a]	2	13	7.2
1995	442[b]	68	68	15.4
Totals	7101	99	1614	22.7

[a] Some fish tagged at downstream point as far as Crittenden Island. Most tagged in the first 5 miles immediately downstream of Intake Diversion Dam.

[b] Includes 19 fish tagged between Sidney and the Fairview Bridge.

Table 11. Tag return rate averages for multi-year periods.

Period	Number Tagged	# Returned through 1995	Percentage returned
1964-1970	1703	278	16.3
1971-1980	3242	804	24.8
1981-1990	1025	378	36.9
1991-1995	1131	154	13.6

Table 12. Annual angler exploitation rates (percent) of Yellowstone-Sakakawea paddlefish as indicated by returns of angler caught fish.

Number (Percentage)[1] Returned In	Year tagged and (number of fish tagged)				
	1988(156)	1990(153)	1992(221)	1993(268)	1994(180)
1988	22(14.1)				
1989	3(2.2)				
1990	8(6.1)	6(39)			
1991	14(11.4)	4(2.7)			
1992	1(0.9)	10(7.0)	23(10.4)		
1993	3(2.8)	11(8.3)	8(4.0)	14(5.2)	
1994		2(1.6)	9(4.7)	0(0.0)	11(6.1)
1995		3(2.5)	8(4.4)	7(2.8)	2(1.2)
Average Annual Percentage	(6.3)	(4.3)	(5.9)	(2.7)	(3.7)

[1] Percentage $= \frac{\text{number caught that year x100}}{\text{number tagged-number caught previous years}}$

Table 13. Average annual angler exploitation rates of paddlefish for five years following tagging.

Year tagged	Number fish tagged	Average exploitation rate(%)
1984	581	6.35
1986	153	4.18
1988	156	6.25
1990	153	4.33

Table 14. Comparison of male and female tag return rates.

Year Tagged	Number Tagged		Number Returned		Percentage Returned	
	Female	Male	Female	Male	Female	Male
1977	123	223	44	43	35.8	19.3
1978	158	451	52	76	32.9	16.9
1984	313	238	147	74	47.0	31.1
1986	88	65	25	16	28.4	24.7
1988	98	59	40	16	40.8	27.1
1990	77	77	15	8	19.5	10.4
1992	108	110	21	24	19.4	21.8
1993	63	204	6	15	9.5	7.4
1994	109	74	8	3	7.3	4.1
1995	185	257	36	32	19.5	12.5
					26.0	17.5

Table 15. Paddlefish catch per unit effort for gill nets drifted in May and June 1993 and 1994 and May 1995 between Intake Diversion Dam and Cottonwood Creek.

Year	Drift Time (Hours)	Number of Paddlefish Caught	Paddlefish Caught per Hour
1993	17.47	182	10.4
1994	33.67	165	4.9
1995	3.10	45	14.5

Table 16. Summary of comments on a questionnaire by 159 catch and release anglers at Intake in 1995.

	Comment	Number of individuals making comment
	Positive Comments	
1.	Please keep C&R. It's a great idea.	54
2.	I like opportunity to catch more than one fish.	98
3.	C&R allows added fishing without added harvest.	11
4.	I can now paddlefish without killing one.	10
5.	C&R is good for future of paddlefish (recreation without killing fish).	11
6.	C&R makes travel from a distance worthwhile.	10
7.	C&R is a good opportunity for department to tag fish.	8
	Negative Comments	
1.	I don't like mandatory release - I can't keep a big fish.	46
2.	Too few days or too few hours for C&R.	34
3.	C&R restricts the opportunity to catch and keep a fish.	10
4.	Must buy a tag even if I fish only C&R.	4
	Suggested Rule Changes	
1.	Make C&R voluntary (implicit idea - I want to release small fish and keep a big fish).	40
2.	Allow more days or hours for C&R.	44
3.	Allow choice of keeping or releasing for whole season.	17
4.	Allow morning or night C&R.	11
5.	Require keeping of fish if wound is severe.	3
	Concerns Related to Catch & Release	
1.	Will some released fish die later.	13
2.	Please protect future of paddlefish and paddlefishing.	3
3.	Short C&R hours cause crowding.	3

Table 17. Summary of comments by paddlefish anglers from the mail creel census of paddlefish anglers in 1995.

	Comment	Number of individuals making comment
	Comments related to catch and release	
1.	I like the increased fishing opportunity that C&R gives.	46
2.	Would like more times or locations for C&R.	25
3.	Make C&R legal for the whole season.	17
4.	C&R should not be allowed because of fish injuries.	10
5.	Would prefer Saturday to Sunday for C&R.	3
6.	Need better publicity on times for C&R.	3
7.	All large fish should be released.	19
8.	All small fish should be released.	13
9.	Allow keeping of a fish during C&R.	7
	Comments related to regulations	
1.	C&R cuts into my catch and keep time.	5
2.	Too many paddlefish regulations.	11
3.	Prefer the one fish limit at Intake.	12
4.	Prefer a two fish limit at Intake.	60
5.	Will fish in N.D. as long as Intake has a one fish limit.	5
6.	Favor a Yellowstone River quota.	5
7.	Do not favor a quota.	4
8.	Department is changing regulations too frequently.	5
9.	Enlarge area for roe donation.	4
	Other comments	
1.	Hard to find place to buy tags.	4
2.	Department doing good job with paddlefish management.	59
3.	Enjoyed or appreciated department staff.	32
4.	Had fun paddlefishing.	115

Table 17. Continued.

	Comment	Number of individuals making comment
	Other comments continued	
5.	Disappointed at not catching a fish.	15
6.	Seemed to be plenty of fish in river.	5
7.	Should be more paddlefish in river.	4
8.	Licenses to expensive.	4
9.	Not catching fish as big as 10 years ago.	2
10.	Continue paddlefishing opportunities.	2
11.	Continue caviar program.	3
12.	Too many department surveys.	4
13.	Need more or better facilities at Intake.	6
14.	Need phone number to check river or fishing conditions.	2