Montana Department of Fish, Wildlife and Parks
Fisheries Division

Job Progress Report

STATE: Montana **PROJECT:** Statewide Fisheries Management

JOB TITLE: Yellowstone River Paddlefish Investigations-3740

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ABSTRACT

The 3,000 paddlefish harvest cap shared by Montana and North Dakota will be reduced to 2,000 for the 2003 season. Yellowstone River flows in 2002, were adequate to bring good numbers of paddlefish to the Intake Fishing Access Site and approximately 1,000 fish were harvested. Paddlefish tag sales were 30% higher in 2002 than in 2001, but non-resident tag sales continued to trend downward. The percentage of female paddlefish harvested in 2002 was significantly less than in the previous three years. The average size of male paddlefish was smaller in 2002 than in 2001. The average size of female paddlefish was the smallest since 1989. Data suggests that young, maturing males are beginning to enter the fishery. Relative exploitation of the paddlefish population was higher from 1995 through 1997 after a decrease in the early 1990,s. Exploitation rates have been lower since 1997. Exploitation rates for the sexes was greater for females in the 1970's and 1980's. Since the early 1990's, the exploitation rates have been similar between the sexes.

PROCEDURES

A partial creel census was conducted during the paddlefish season at Intake in 2002. As many anglers as possible were questioned concerning amount of time spent fishing and number of fish caught. The interview total for periods requiring retention of fish was 660 or 27.3% of the estimated angler days in 2002. Anglers were counted each day of the season during daylight hours. On days with no catch and release, eight counts were made. On catch and release days, three counts were made on the catch and release portion of the day and eight counts were made on the remaining portion of the day. A 24 hour fishing day was used in calculations to estimate fishing pressure on days with no catch and release. An 18 hour day was used on catch and release days (6 hours per day of catch and release fishing). Analysis of the data was accomplished by adapting formulas 5 through 32 from Spence (1970) to the census.

Catch and release statistics were estimated by counting number of fish caught and by three angler counts made during each 6-hour catch and release day.

Angler caught and kept paddlefish were weighed to the nearest pound. Body length (front of eye to fork of caudal fin) was measured to the nearest millimeter. Sex was determined by examination of the gonads of harvested fish. For fish released, sex was assigned on the basis of length and shape. Angler released fish were not weighed. Most of the released paddlefish were jaw tagged. Monel metal bands (National Band and Tag Co., Size 16, ½ inch inside diameter) were placed around the dentary bone.

RESULTS

General Observations

The Montana-North Dakota Paddlefish Management Plan (Scarnecchia, et al. 1995), establishes the goals and objectives guiding the management of the Yellowstone River/Lake Sakakawea paddlefish population. A 3,000 fish per year harvest cap was established in 1995 to slow the harvest of this late maturing , long lived species. Montana and North Dakota are each allowed to harvest 1,500 paddlefish per year. Beginning in 2003, the harvest cap will be reduced to 2,000 paddlefish (1,000 paddlefish per state). This reduction is necessary to bring harvest in line with recruitment and has its basis in the paddlefish stock index developed by Dr. Dennis Scarnecchia as outlined in objectives 1 and 2 of the management plan. In addition to the reduced harvest cap, the State of North Dakota is shortening their season by two weeks (May 1 to May 31), eliminating night fishing and closing a 15 mile stretch of river to fishing.

Yellowstone River flows in 2002 peaked on June 6 at 42,600 c.f.s. (Figure 1). The majority of fish were caught during the first two weeks in June which corresponded to the peak flow period. By way of comparison, the long term, mean daily flow for the Yellowstone River at Sidney is 38,840 c.f.s. for the month of June (USGS, 2002).

Statewide paddlefish tag sales were up about 30 percent in 2002 from tag sales in 2001 (Table 1). The timing and duration of flows in the Yellowstone in 2002 brought good numbers of paddlefish to the Intake Fishing Access Site and anglers responded. The non-resident portion of tag sales has been trending down in recent years. In 2002, non-residents purchased 15 percent of paddlefish tags sold which is the lowest since resident and non-resident tag sales have been recorded separately.

Catch and release fishing remains popular during those periods when paddlefish are present at Intake.

Paddlefish Size and Sex Ratio

A total of 713 paddlefish were weighted, measured and sexed from the angler catch at Intake in 2002 (Table 2). This total included 128 fish (18.0%) caught at downstream locations and was 59.0% of the estimated catch.

Females made up 44.6% of the total fish weighed and measured for length in 2002 (Table 2). This is a decrease over the prior four years and is short of the heavily dominated female harvests of the 1970s and 80s.

The average size of male paddlefish was smaller in 2002 than seen in 2001 (Table 3). The average length and weight of female paddlefish was the smallest since 1989.

Creel Census

Results from the 2002 creel census are shown in Table 4. Results from 2002 can be compared to previous years in Table 5. In 2002 at Intake, anglers fished an estimated 2419 days with an average of 2.25 hours per day to catch an estimated 1208 paddlefish. The effort required to catch a paddlefish in 2002 was less than that required in the two previous years, both of which were low water years.

The calculated harvest at Intake in 2002 was much greater than the observed harvest. In 2002, 713 paddlefish were actually weighed and measured. This number is 59.0% of the estimated harvest. In past years, the discrepancy in the estimated harvest and the fish logged through the cleaning station has been near 20%. This discrepancy has been attributed to using daytime counts to estimate nighttime fishing pressure when less night fishing actually occurs. The large discrepancy in 2002 is not likely all due to nighttime fishing pressure error, but is in part to data quality stemming from an inexperienced creel clerk.

The angler catch rate in 2002 (0.22 fish per hour) was greater than in 2001 and 2000 (Table 5). The percentage of females harvested was considerably lower in 2002, than in the four previous years (Table 2).

Tagging, Tag Return and Exploitation Rate

Return rates of individually numbered plastic and monel metal bands placed around the dentary bone are used to infer exploitation rate. Of 7,805 paddlefish tagged in the Yellowstone River (mostly near Intake) at least 2,050 (26.3%) have been harvested by anglers (Table 6).

In 2002, 60 tags from angler harvested fish were recovered from paddlefish tagged in the Yellowstone River. Of these, 19 were caught in North Dakota, and the remainder from Intake or within a few miles downstream. Also, of the 60 returned tags, 19 were tagged in 2002. An additional 26 tags recovered at Intake were from paddlefish tagged in North Dakota.

Table 7 summarizes tag return rates for multi-year periods. Tag returns through 2002 reinforce the past conclusion of lighter exploitation in the 1960's and 1970's, heavier in the 1980's and lighter in the 1990's.

Tables 6 and 8 indicate declining exploitation for paddlefish tagged after 1997. To date the average exploitation rate of fish caught in 1998 and 1999 are 5.2 and 6.3 percent, respectively (Table 8). The average exploitation rate for fish caught in 2000 and 2001 (years when few fish were tagged) were 6.7 and 7.2 percent, respectively. Also, for fish tagged in 1997, the first year return of tags was 24.3%, the highest ever measured.

Subsequent year tag returns for 1997 have been much lower. First year tag returns for 1998 and 1999 were a more reasonable 2.4% and 12.5%, respectively. First year tag returns for paddlefish tagged in 2000 were 20%, but few (20) fish were tagged in 2000. No paddlefish tagged in 2000 were recaptured in 2001 or 2002. Again, few fish were tagged in 2001 (7) and only one tag was returned (14.3%) in 2001 and none in 2002. The apparent decrease in the last five years exploitation rate may be at least partially caused by an increase in the size of the population migrating to Intake, due to maturing paddlefish entering the fishery. Also, three of the five years have been low water years with fewer available fish at Intake.

Table 9 shows angler exploitation of paddlefish for five years after tagging. Exploitation of 1995, 1996 and 1997 tagged paddlefish shows a dramatic increase over what was seen in the early 1990's. In 1995, 1996 and 1997, more male paddlefish were tagged than females (Table10). Since male paddlefish appear to enter the run on a more regular basis than female paddlefish they may be exposed to greater angler exploitation over a short period of time.

Table 10 compares tag return rate by sex for fish tagged in the years 1977 through 2002. The heavier harvest rate for females in the earlier years is not apparent from 1990 to the present. Since the early nineties, with the exception of 1994, tag return rates for the sexes have been similar or heavier toward males. The tag return rate by sex in 1999, 2000 and 2001 indicates a heavier harvest of female paddlefish, but few fish overall were tagged in 2000 and 2001. In 2002, tag returns for male paddlefish were much greater than for female paddlefish. Young male paddlefish are recruiting to the population as confirmed by ageing and recruitment studies conducted by Dr. Dennis Scarnecchia (2002) of the University of Idaho. Later maturing young female paddlefish should begin recruiting several years into the future.

Paddlefish Caviar

The Glendive Chamber paddlefish caviar program is summarized in Table 11. On average, 3,022 pounds of caviar are sold for 144,205 dollars each year.

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Paddlefish exploitation rate
Paddlefish sex ratio

Figure 1. Paddlefish harvested per day at Intake, MT and mean daily flow (1000 cfs) at Sidney, MT in 2002.

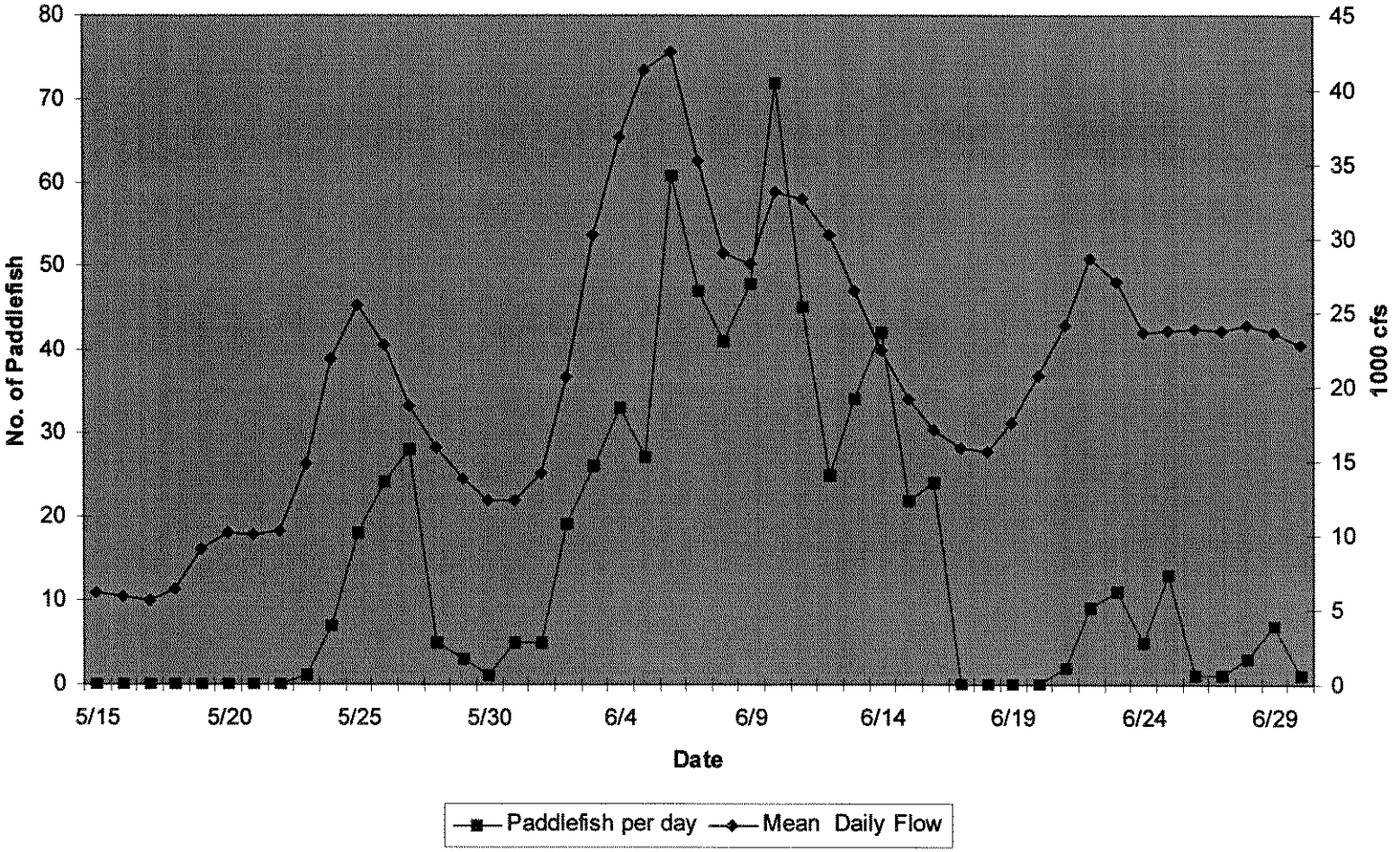

Table 1. Number of anglers purchasing paddlefish tags.

Year	Total	Resident	Nonresident	% Nonresident
2002	5901	5002	899	15
2001	4524	3770	754	17
2000	6056	4859	1197	20
1999	6785	5522	1263	19
1998	6051	5004	1047	17
1997	6169	4930	1239	20
1996	6787	5495	1292	19
1995	6544	5495	1049	16
1994	4065	3237	828	20
1993	5577	4194	1383	25
1992	4779	3503	1276	27
1991	4438	3021	1417	32
1990	3960	2826	1134	29
1989	4255	3081	1174	28
1988	3526	2620	906	26
1987	2877	2182	695	24
1986	3696	2661	1035	28
1985	3593			
1984	5063			
1983	4636			
1982	4834			
1981	4166			

Notes: Tags were free in 1981.
Resident and nonresident tag sales were calculated separately beginning in 1986.
Previous to 1992 tags were required only for Yellowstone River paddlefish snagging.
Beginning in 1992 tags were required statewide.

Table 2. Summary of Paddlefish measurements obtained from the angler catch at Intake, Yellowstone River, 1963-2002.

Year	No. of fish Measured	Average Total Length (Inches)	Average Eye-fork Length (mm)	Average Weight (Pounds)	Percentage of Females
1963	46	43.4		29.6	0.0
1964	920	48.8		21.0	2.8
1965	453	50.6		21.3	2.9
1966	28	49.2		21.2	0.0
1967	123	50.9		21.8	0.0
1968	149	52.6		25.0	4.3
1969	499	51.9		23.4	3.7
1970	700	52		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		50.4	67.5
1980		58.3*		49.1**	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
1996	1120		1002	40.1	42.1
1997	797		1007	38.2	38.7
1998	580		1046	41.0	47.9
1999	1345		1049	43.0	54.0
2000	541		1053	44.4	55.3
2001	344		1064	43.0	52.9
2002	713		1025	38.5	44.6

* Based on 62 measurements.

** Based on 131 measurements.

Table 3. Summary of paddlefish average length and weight, by sex, obtained from the angler catch at Intake, Yellowstone River, 1963-2002.

	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	117	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
1996	649	882	24.0	471	1168	62.3
1997	488	912	24.8	309	1158	59.5
1998	300	933	24.0	278	1173	59.5
1999	619	926	24.9	726	1154	58.5
2000	242	919	25.2	299	1161	60.0
2001	162	960	27.2	182	1156	57.0
2002	395	932	24.2	318	1146	56.4

Table 4. Estimate of anglers, hours fished and harvest for the 2002 paddlefish season at Intake.

Time Period	Number of Angler Days	Hours per Angler Day	Angler Hours	Number of Fish Caught	Fish Caught per Angler Hour	Fish Caught per Angler Day
			Periods Requiring Angler Retention of Fish			
Wed. & Sun.	528	2.17	1147	315	0.27	0.60
Other Days	1891	2.27	4299	893	0.20	0.47
Total or Mean	2419	2.25	5446	1208	0.22	0.50
			Periods Requiring Anglers to Release Fish			
			398	122	0.31	

Table 5. Comparison of paddlefish fishing pressure, harvest and success rate data at Intake from 1972 to 2002.

Year	Angler Days	Fish Caught	Fish Kept	Fish per Angler Day	Fish per 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	204	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*	2008	1657*	0.81*	0.39*	64,789*
1996	2062*	1328	1199*	0.58*	0.19*	48,080*
1997	2217*	1149	1075*	0.48*	0.17*	41,065*
1998	1766*	857	717*	0.41*	0.16*	29,397*
1999	2608*	2091	1706*	0.65*	0.28*	73,358*
2000	1599*	692	666*	0.42*	0.15*	29,570*
2001	1005*	410	360*	0.36*	0.15*	15,480*
2002	2419*	1330	1208*	0.50*	0.22*	46,508*

* Does not include catch and release periods.

Table 6. Summary of paddlefish tagging and tag returns 1964-2002.

Year	Number Tagged	Number Returned In 2002	Total Number Returned	Percentage Returned
1964-1970	1703	0	279	16.4
1971-1980	3242	1	809	25.0
1984	551	2	249	45.2
1985	2	0	2	100.0
1986	153	0	47	30.7
1988	156	2	67	42.9
1989	10	0	4	40.0
1990	153	0	49	32.0
1991	20	0	8	40.0
1992	221	3	79	35.7
1993	268	5	54	20.1
1994	180	6	56	31.1
1995	442	6	162	36.7
1996	139	2	59	42.4
1997	70	1	27	38.6
1998	42	2	10	23.8
1999	281	11	65	23.1
2000	20	0	4	20.0
2001	7	0	1	14.3
2002	145	19	19	13.1
Totals	7805	60	2050	26.3

Note: Most fish tagged at Intake or within a few miles downstream of Intake.

Table 7. Tag return rate averages for multi-year periods.

Period Tagged	Number Tagged	Number Returned through 2002	Percentage Returned
1964-1970	1703	279	16.4
1971-1980	3242	809	25.0
1981-1990	1025	418	40.8
1991-1995	1131	359	31.7
1996-2000	552	165	29.9
2001-2002	152	20	13.2

Table 8. Annual angler exploitation rates in percent for Yellowstone - Sakakawea paddlefish as indicated by returns of angler caught fish.

	Year tagged and (number of fish tagged).											
	1996 (139)		1997 (70)		1998 (42)		1999 (281)		2000 (20)		2001 (7)	
	Tag Returns		Tag Returns		Tag Returns		Tag Returns		Tag Returns		Tag Returns	
Year	%*	#	%*	#	%*	#	%*	#	%*	#	%*	#
1996	14.4	20										
1997	3.4	4	24.3	17								
1998	9.6	11	0.0	0	2.4	1						
1999	13.5	14	11.3	6	0.0	0	12.5	35				
2000	5.6	5	4.3	2	12.2	5	2.4	6	20	4		
2001	3.5	3	2.2	1	5.6	2	5.4	13	0	0	14.3	1
2002	2.4	2	2.3	1	5.9	2	4.8	11	0	0	0	0
Mean Annual Percentage	7.5		7.4		5.2		6.3		6.7		7.2	

* Percentage = $\frac{\text{Current Year tag returns x 100}}{\text{\# tagged - \# of previous years tag returns}}$

Table 9. Average annual angler exploitation rates of paddlefish for five years following tagging.

Year tagged	Number fish tagged	Average exploitation rate (%)
1984	551	6.35
1986	153	4.18
1988	156	6.25
1990	153	4.33
1992	221	4.80
1994	180	4.27
1995	442	6.82
1996	139	8.33
1997	70	7.40

Table 10. 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	54	76	34.2	16.9
1984	313	238	158	75	50.5	31.5
1986	88	65	29	16	33.0	24.7
1988	98	59	49	18	50.0	30.5
1990	77	77	26	9	33.8	11.7
1992	108	110	37	39	34.3	35.5
1993	63	204	11	41	17.5	20.1
1994	109	74	39	15	35.8	20.3
1995	185	257	70	91	37.8	35.4
1996	47	92	20	38	43.0	41.3
1997	26	44	8	18	30.8	40.9
1998	12	36	1	10	8.3	27.8
1999	127	154	33	32	26.0	20.8
2000	11	9	3	1	27.3	11.1
2001	4	3	1	0	25.0	0.0
2002	66	79	6	13	9.1	16.5

Table 11. Glendive Chamber of Commerce and Agriculture caviar production and income summary.

Year	Pounds of Caviar	Number of Paddlefish	Income (gross)	Income (net)	Administration Expenses	FWP Share (dollars)	(percent)
1990	4,000	1,600	110,000	68,452	41,548	34,226	50
1991	10,000	3,000	292,000	232,428	59,572	116,214	50
1992	2,200	781	63,000	36,634	26,366	18,317	50
1993	3,592	1,933	68,810	39,667	29,143	19,833	50
1994	1,166	355	48,137	20,114	33,770	15,036*	40
1995	4,162	1,462	240,056	173,701	66,355	69,481	40
1996	3,090	1,145	231,910	177,839	76,381	71,136	40
1997	1,211	797	118,377	58,756	47,009	23,502	40
1998	2,016	553	45,767	13,892	31,875	5,557	40
1999	3,691	1,333	166,831	72,425	94,405	28,970	40
2000	1,587	527	249,328	180,615	77,064	72,246	40
2001	966	335	173,764	126,116	69,623	50,446	40
2002	1611	688	66,687	15,266	23,951	6,106	40
Totals	**39,292**	**14,509**	**1,874,667**	**1,215,905**	**677,062**	**531,070**	
Averages	**3,022**	**1,116**	**144,205**	**93,532**	**52,082**	**40,852**	

* Includes prior year revenue of $9,290 as a result of underpayment from the program audit of 1994.