

ANGLER USE AND FISH HARVEST SURVEY
ON
BELLE FOURCHE RESERVOIR, SOUTH DAKOTA, 2002

by

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Completion Report

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PREFACE

Information in this report was collected from April 1, 2002 to September 30, 2002. Funding was provided through Federal Aid in Sportfish Restoration, (D-J) Project F-21-R-34, Job Number 2109. Copies of this report and reference to the data can be made with permission from the author(s) or Director of the Division of Wildlife, South Dakota Department of Game, Fish and Parks, 523 E. Capitol, Pierre, South Dakota 57501-3182.

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EXECUTIVE SUMMARY

This report summarizes angler use, harvest and preference data collected from April 2002 through September 2002 for the Belle Fourche Reservoir, Butte County, South Dakota. Annual fish population data from 1995 to 2002 and angler use and harvest data from 1989, 1995 and 1996 are also referenced in parts of this report. Results of these surveys have been used to evaluate fishing regulations at the Belle Fourche Reservoir and have helped support changes leading to the current regulations.

A total of 626 anglers were contacted by creel clerks from April 1st to September 30th, 2002. All interviews were accomplished after anglers had completed their fishing trip. Data from the completed interviews was used to determine catch, harvest, and attitudes for all Belle Fourche Reservoir anglers.

Most Belle Fourche Reservoir anglers (95.6%) were South Dakota residents and male (88.1%). Anglers spent nearly twice the number of hours fishing on the weekends as they did during the weekdays throughout the creel period. Satisfaction levels were very high with over 43% of the anglers being very satisfied and over 77% at least moderately satisfied.

Anglers spent an estimated total of 78,872 hours fishing the Belle Fourche Reservoir from April 1 to September 30, 2002, 74% of which was boat angling. The mean fishing trip ranged from 3.7 to 8.25 hours for shore anglers and from 4.3 hours to 5.4 for boat anglers. They caught an estimated 67,627 fish during the creel and harvested 17,216 (25.4%) of these fish. The reservoir's anglers primarily fished for walleye with over 95% stating they were targeting walleye. Success of anglers varied greatly as anglers reported they caught anywhere from 0 to 31 walleye per trip while fishing. Both catch and harvest were highest in June and July and lowest in April. Overall, 28% of the walleyes caught were harvested. Other fish targeted were channel catfish, smallmouth bass and white bass.

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INTRODUCTION

The Belle Fourche Reservoir is a large irrigation reservoir, approximately 3,256 hectares, on the northern edge of the Black Hills. The reservoir offers both cool and warm water angling and sustains a large portion of western South Dakota's fishing and boating. Although the reservoir is a popular destination for anglers and other outdoor enthusiasts, public facilities at the reservoir are primitive. In a cooperative effort, the Bureau of Reclamation and Game, Fish and Parks are developing plans for a state park and campground. Use of the reservoir is expected to increase substantially with the future improvements.

Walleye angling is one of the popular attractions at the reservoir. Although fishing pressure has been variable it has increased in recent years. Pressure in the late 1980's was rather high, dropped somewhat during the mid 1990's but has increased in 2002. The decline in fishing pressure during the mid 1990's was speculated to be due to low walleye catch and harvest caused by drought conditions reducing water levels at the reservoir.

The reservoir's fishery is currently managed under statewide limits and two special length restrictions; a minimum for tiger muskie and a minimum for walleye. Tiger muskie are a unique species in western South Dakota and only found in the Belle Fourche Reservoir. Restrictions on tiger muskie are 1 daily and a minimum length of 30 inches. For walleye, all fish less than 14-inches must be released immediately back into the reservoir.

In an attempt to establish a forage base for the reservoir's sportfish populations, gizzard shad were stocked during the 1980's, the last occurring in 1987. Shad disappeared and in 1997 stockings were reinitiated and continue today. Annual shoreline seining also began in 1997 to index reproduction of the gizzard shad population. Over-winter survival of adult shad is still expected to be limited and, depending on availability, approximately 100 to 200 adult shad are stocked annually in the spring to supplement the forage base.

This report summarizes a six month creel that began in April 2002 to determine angling pressure, catch and harvest rates, and angler attitudes at the reservoir. A full time creel clerk was hired to conduct instantaneous pressure counts and interviews with Belle Fourche anglers. Creels were also conducted in 1989, 1990, 1995 and 1996. Pressure data from previous creels and catch data from annual lake surveys are included for comparisons and to support conclusions on current angling statistics.

OBJECTIVES

The objective of this creel survey is to provide angler data that is statistically accurate and can be used in determining and implementing an appropriate plan for fisheries management at the Belle Fourche Reservoir. Specifically, this survey is intended to provide information and estimates of:

1. angling pressure, angling party size and mean trip length
2. angler catch, harvest and release rates by fish species
3. size structures of harvested fish
4. angler demographics and residency
5. angler preferences and satisfaction

STUDY SITE

Belle Fourche Reservoir, also known as Orman and Orman Dam, has a surface area of approximately 8,040 acres when full and a volume capacity of 192,077 acre feet. The reservoir is formed by the Belle Fourche Dam on Owl Creek, a tributary of the Belle Fourche River (Figure 1). The reservoir is an irrigation source for approximately 57,000 acres and is often drawn to extremely low levels in the fall. Refilling is accomplished by diverting water from the Belle Fourche River through the Inlet Canal. Supplemental storage of water is facilitated by Keyhole Reservoir in northeastern Wyoming.

The watershed is approximately 4,480 square miles consisting mostly of privately owned pasture land used for livestock grazing. The U.S. Bureau of Reclamation (BOR) and the Belle Fourche Irrigation District perform operation and maintenance of the dam. The South Dakota Department of Game, Fish and Parks Division of Wildlife manages 164 acres below the dam grade and the Division of Parks manages 350 acres around the boat ramp (T9N R3E, Sec. 24, 25). The BOR manages 6,617 acres around the reservoir as wildlife habitat and for public access.

Shoreline vegetation is limited to nonexistent due to water level fluctuations and wave action. During spring months as the reservoir is refilling, existing vegetation within the periphery of the reservoir is flooded and fisheries reproduction can be high if drawdowns don't occur until after fish have spawned and young have hatched. Summer and Fall months are characteristic of dropping water levels with muddy shorelines and little or no submerged or shoreline vegetation.

Developments at the reservoir are limited. Currently there are a total of 6 outhouses around the reservoir, and one boat ramp with 2 docks and gravel parking lot on the west side of the reservoir. Access to the reservoir has become a problem due to road maintenance. A single gravel road, approximately 3½ miles long, is the only access to the boat ramp. High use at the reservoir and length of the gravel road requires substantial maintenance.

Belle Fourche Reservoir is managed as a cool and warm water fishery. Walleye provide the majority of the sportfish opportunity, while smallmouth bass and channel catfish are also sought by Belle Fourche Reservoir anglers. Other fish species in the reservoir include: bluegill, common carp, freshwater drum, gizzard shad, longnose sucker, northern pike, river carpsucker, shorthead redhorse, spottail shiner, tiger muskie, white bass, and yellow perch.

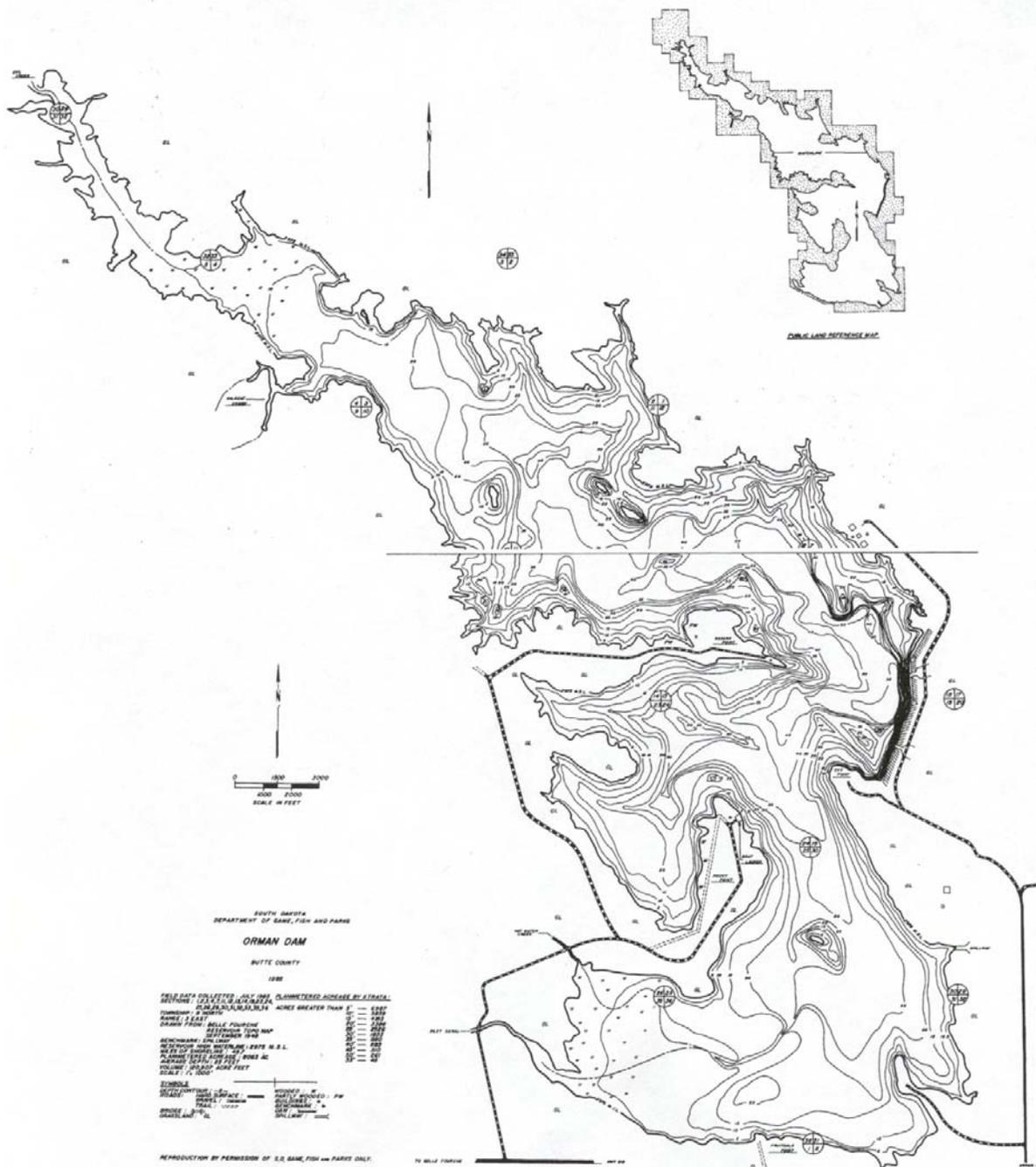


Figure 1. Belle Fourche Reservoir, Butte County, South Dakota.

METHODS

ANGLER USE AND HARVEST SURVEY

An angler use and harvest survey was conducted at Belle Fourche Reservoir in 2002. This survey provided a statistically accurate method for estimating fishing pressure and harvest at the reservoir. The survey consisted of two separate components; angler counts and angler interviews. Progressive counts were conducted by boat and vehicle to estimate fishing pressure. All shore anglers actively engaged in fishing were counted individually. All boats actively fishing were counted and the number of individuals fishing was acquired through angler interviews (see Appendix A for an example Pressure Count sheet). Interviews were conducted with as many anglers as possible. Interviews consisted of a series of questions to estimate harvest, catch and release rates (Appendix B). A list of number codes for both pressure counts and interviews was used to simplify data entry (Appendix C).

Sampling was conducted from April 1 to September 30, 2002. The conducted survey was a two-stage stratified roving survey. The first unit of stratification was between weekend/holidays and weekdays. Since increased fishing pressure typically occurs on weekend days and holidays nearly all weekend days and holidays were sampled each month. The second unit of stratification was time periods the clerks were at the reservoir. During the creel two time periods (AM: 6 AM to 3 PM; and PM: 1PM to 10 PM) were randomly assigned to randomly selected days. From April to June, pressure counts were conducted 3 times during each shift. Starting times were selected randomly in the first 2 ½ hours and run every 2 hours and 20 minutes. Due to difficulty in obtaining completed interviews from anglers, only 2 pressure counts were conducted during a shift for the remainder of the creel (July through September). Pressure count times were randomly selected on the hour for two counts within each time period (i.e. For AM periods: one randomly selected hour between 7 AM and 10 AM and one hour between 11 AM and 1 PM. For PM periods: one randomly selected hour between 2 PM and 5 PM and one hour between 6 PM and 8 PM). Pressure count and angler interview data were entered into Creel Application Software (CAS) (Soupir and Brown 2002).

RESULTS

PARTY SIZE/TRIP LENGTH

A total of 532 boat anglers and 94 shore anglers were interviewed while fishing the Belle Fourche Reservoir from April 1, 2002 to September 30, 2002 (Tables 1 and 2). Of these, 529 of the boater interviews and 69 of the shoreline interviews were completed fishing trips. On average, party size for boat anglers was a little larger while the shore anglers tended to stay longer.

Mean party size for boat anglers averaged 2 people for every month creeled, while mean party size for shoreline angling varied a little more, ranging from 1 in September to 2.5 in August. Mean trip lengths for boat anglers were also nearly the same for all 6 months, from 4.3 hours to 5.4 hours. Mean trip lengths for shore anglers varied more than boat angler trips, ranging from 3.7 hours in September to just over 8 hours in June.

Table 1. Number of boat angling parties interviewed (N), mean party size (anglers/party), number of interviewed parties that had completed their fishing trip and mean length of completed trip (hours/party/trip) on Belle Fourche Reservoir in 2002. Confidence intervals (95%; CI's) are in parentheses.

Month	N	Mean Party Size	Completed Interview	Mean length of completed trips
April	49	2.00 (0.87)	49	4.30 (2.50)
May	93	1.94 (0.69)	92	4.61 (1.86)
June	91	2.13 (0.63)	91	5.42 (1.76)
July	104	2.31 (0.55)	104	4.52 (0.86)
August	123	2.11 (0.70)	123	5.23 (1.82)
September	72	2.07 (1.26)	70	5.14 (3.27)
Totals	532	2.09 (0.33)	529	4.87 (0.87)

Table 2. Number of shore anglers interviewed (N), mean party size (anglers/party), number of interviewed parties that had completed their trip and mean length of completed trip (hours/party/trip) on Belle Fourche Reservoir in 2002. CI's (95%) are in parentheses.

Month	N	Mean Party Size	Completed Interview	Mean length of completed trips
April	66	1.70 (0.50)	49	4.72 (1.88)
May	23	1.94 (0.79)	16	5.19 (1.88)
June	3	1.33 (---)	2	8.25 (---)
July	0	2.37 (1.95)	---	6.19 (3.06)
August	0	2.49 (1.01)	---	5.21 (1.56)
September	2	1.00 (---)	2	3.67 (---)
Totals	94	1.54 (0.26)	69	5.62 (0.73)

FISHING PRESSURE

Total Pressure

Total estimated fishing pressure from April through September 2002 at the Belle Fourche Reservoir was 78,872 angling hours (Table 3). Fishing pressure increased substantially in May when pressure was at it's highest. Of the months creeled, the lowest pressure was observed in April and September at 4,896 hours and 5,374 hours, respectively. Pressure estimates during 2002 were similar to estimates from previous years. Estimates were lower in 1995, but the 1989 and 1996 estimates are close to what was observed during this creel indicating that pressure has not changed much at the reservoir (Table 4).

Weekend/Weekday Pressure

Throughout the year the estimated angling pressure during the weekends and holidays was nearly 2 times more than what was observed during the weekday periods (Table 3). Weekday and weekend/holiday pressure reflected total pressure, in that, they both increased substantially in May and remained at higher levels through July. The highest month of weekday pressure was July while the highest month of weekend/holiday fishing pressure was May.

Boat and Shore Pressure

Boat anglers made up three-fourths of the total estimated fishing pressure from April to September, 2002 (Table 5). Most of the hours spent fishing for both boat and shore anglers were on the weekend. In addition, angling types were very proportional with boat anglers making up three-fourths of the weekend and weekday pressure throughout the creel survey.

Table 3. Weekday, weekend and holiday, and total estimated fishing pressure (angler hours) for all anglers on Belle Fourche Reservoir by month from April to September, 2002. CI's (95%) are in parentheses.

Month	Weekday	Weekday (%)	Weekend/ Holiday	Weekend/ Holiday(%)	Total
April	2,194 (930)	44.8	2,702 (2,212)	55.2	4,896 (2,399)
May	5,799 (3,502)	25.0	17,393 (9,450)	75.0	23,192 (10,078)
June	6,331 (2,222)	32.3	13,289 (5,400)	67.7	19,620 (5,840)
July	7,273 (4,027)	41.6	10,229 (3,684)	58.4	17,502 (5,458)
August	3,669 (1,088)	44.3	4,618 (1,837)	55.7	8,287 (2,135)
September	1,950 (984)	36.3	3,425 (1,603)	63.7	5,374 (1,881)
<i>Totals</i>	<i>27,217 (6,036)</i>	<i>34.5</i>	<i>51,656 (11,953)</i>	<i>65.5</i>	<i>78,872 (13,391)</i>

Table 4. Total angler hours spent at the Belle Fourche Reservoir in 1989, 1995, 1996 and 2002 (Vanderbush 1996, Vanderbush 1990; 95% CI's not calculated for 1989, 1995 and 1996).

MONTH	YEAR (angler hours)			
	1989	1995	1996	2002
April	5,776	4,826	*	4,896 (2,399)
May	17,608	10,691	16,339	23,192 (10,078)
June	24,808	9,742	13,815	19,620 (5,840)
July	14,249	11,827	12,959	17,502 (5,458)
August	4,375	3,595	7,515	8,287 (2,135)
September	7,459	3,129	5,258	5,374 (1,881)
<i>Totals</i>	<i>74,275</i>	<i>43,810</i>	<i>55,886</i>	<i>78,872 (13,391)</i>

* Not creel these months.

Table 5. Estimated angler hours and percents of angling on weekdays vs weekend/holidays for boat and shore fishing at the Belle Fourche Reservoir from April 1 to September 30, 2002. (95% CI's in parentheses).

Estimate type	Boat	%	Shore	%
<i>Angler Hours</i>	58,480 (10,027)	74.1	20,393 (4,647)	25.9
<i>Weekday (hours)</i>	20,036 (4,971)	73.6	7,180 (1,513)	26.4
<i>Weekend (hours)</i>	38,444 (8,708)	74.4	13,213 (4,394)	25.6

TARGETED SPECIES

Walleye were, by far, the most sought after fish in the Belle Fourche Reservoir during 2002. Ninety-five percent of anglers interviewed indicated walleye as the sportfish they were targeting (Table 6). In addition, 38% of the anglers indicating a species other than walleye as their primary target said walleye was their secondary target. Three other species identified as primary targets are: channel catfish, smallmouth bass and white bass. Channel catfish, along with black crappie were also mentioned as a secondary target for Belle Fourche Reservoir anglers.

Table 6. Primary and secondary species targeted by anglers and number of anglers (N) indicating a primary and secondary target species in Belle Fourche Reservoir, 2002.

Species	N	Primary Species Sought (%)	N	Secondary Species Sought (%)	Total (%)
Walleye	1,274	95.72	11	37.93	94.49
Anything	30	2.25	--	---	2.21
Channel catfish	22	1.65	15	51.72	2.72
Smallmouth bass	3	0.23	--	---	0.22
White bass	2	0.15	--	---	0.15
Black Crappie	--	---	3	10.34	0.22
<i>Total</i>	<i>1,331</i>	<i>100%</i>	<i>29</i>	<i>100%</i>	<i>100%</i>

CATCH AND HARVEST

Total estimated catch from April 1 to September 30, 2002 of all fish species by anglers at the Belle Fourche Reservoir was 50,411 fish (Table 7). Thirteen species of fish were observed in the creel during the 2002 survey. The two most commonly caught species were walleye and channel catfish. Over 54,000 walleye were estimated to have been caught by anglers, while 7,300 channel catfish were caught. The large difference in walleye catch versus all other fish reaffirms the indications anglers gave about walleye being the most popular fish in the reservoir.

Walleye, predictably, were also the most commonly fish harvested during the creel (Table 7). Surprisingly, smallmouth bass were harvested at a rather high rate of 31%, while yellow perch harvest was only around 14%. Overall, nine different species were observed to be harvested in 2002 and the total harvest rate for all species was near 25.5%.

The overall catch rate for all anglers was high at 0.86 fish caught per hour (Table 8) as compared to catch in 1995 and 1996 at 0.10 and 0.13 fish per hour, respectively (Vanderbush, unpublished data). Catch rates should be considered excellent for anglers targeting smallmouth bass (2.02 fish/hour) and walleye (1.36 fish/hour).

Table 7. Summary of estimated catch, harvest and release numbers (95% CI's in parentheses) from Belle Fourche Reservoir, Butte County, April 1, 2002 to September 30, 2002 for all anglers.

Species	Caught	Catch/acre	Harvested	Harvest/acre	Released
Walleye	54,185 (9,768)	6.72 (1.21)	15,191 (2,858)	1.88 (0.35)	38,994 (7,931)
Channel catfish	7,382 (301)	0.92 (0.04)	551 (231)	0.07 (0.02)	6,832 (242)
Smallmouth bass	2,125 (758)	0.26 (0.09)	658 (435)	0.08 (0.05)	1,467 (501)
Yellow perch	1,278 (351)	0.16 (0.04)	185 (108)	0.02 (0.01)	1,093 (326)
White bass	1,072 (361)	0.13 (0.04)	222 (117)	0.03 (0.01)	850 (339)
Common carp	817 (808)	0.10 (0.10)	98 (159)	0.01 (0.02)	719 (662)
Black crappie	404 (164)	0.05 (0.02)	269 (123)	0.03 (0.02)	134 (71)
Tiger muskie	138 (113)	0.02 (0.01)	0 (NA)	0.00 (NA)	138 (113)
Freshwater drum	61 (52)	0.01 (0.01)	25 (38)	0.00 (NA)	36 (46)
Northern pike	56 (51)	0.01 (0.01)	5 (7)	0.00 (NA)	51 (51)
Rock bass	49 (96)	0.01 (0.01)	0 (NA)	0.00 (NA)	49 (96)
Shorthead redhorse	31 (66)	0.00 (NA)	0 (NA)	0.00 (NA)	31 (66)
Bluegill	30 (45)	0.00 (NA)	13 (26)	0.00 (NA)	17 (37)
<i>Total</i>	<i>67,627 (10,441)</i>	<i>8.39 (1.30)</i>	<i>17,216 (3,150)</i>	<i>2.14 (0.39)</i>	<i>50,411 (8,420)</i>

Table 8. Summary of catch rates and harvest rates (fish/hour) by all anglers and anglers targeting specific fish while fishing the Belle Fourche Reservoir, April 1 to September 30, 2002.

Species	Catch rate (fish/angler hour)		Harvest rate (fish/angler hour)	
	All anglers	Target anglers	All anglers	Target anglers
Walleye	0.687 (0.212)	1.360 (0.345)	0.193 (0.062)	0.445 (0.126)
Channel catfish	0.094 (0.026)	0.114 (0.117)	0.007 (0.006)	0.109 (0.115)
Smallmouth bass	0.027 (0.013)	2.022 (NA)	0.008 (0.006)	0.757 (NA)
Yellow perch	0.016 (0.007)	NA	0.002 (0.002)	NA
White bass	0.014 (0.007)	0.000 (NA)	0.003 (0.003)	0.000 (NA)
Common carp	0.010 (0.011)	NA	0.001 (0.002)	NA
Black crappie	0.005 (0.003)	0.000 (NA)	0.003 (0.002)	0.000 (NA)
Tiger muskie	0.002 (0.002)	NA	0.000 (0.000)	NA
Freshwater drum	0.001 (0.001)	NA	0.000 (0.001)	NA
Northern pike	0.001 (0.001)	NA	0.000 (0.000)	NA
Rock bass	0.001 (0.001)	NA	0.000 (0.000)	NA
Shorthead redhorse	0.000 (0.001)	NA	0.000 (0.000)	NA
Bluegill	0.000 (0.001)	NA	0.000 (0.000)	NA
Total for all species	0.86 (0.25)	0.37 (0.31)	0.22 (0.07)	0.17 (0.31)

Black Crappie

Both catch and harvest of black crappie were low in 2002 and only 0.2% of all anglers indicated crappie were, at best, a secondary target during their visit to the reservoir (Table 6). Throughout the creel period an estimated 404 crappie were caught (Table 9). Although catch was highest in number during June, catch rates were highest for all anglers in early spring (April) and for anglers targeting crappie in early spring and mid summer (July and August). Catch rates during winter fishing are unknown as the present creel and past creels have been conducted only during the ice-free months. The harvest rate for Belle Fourche black crappie was high at 66.5%.

Size of crappies harvested was excellent with fish over 10 inches in the creel (Figure 2). In addition, RSD-P of black crappie in frame nets during 2002 sampling was 63 (Erickson, et al 2001) while nearly all crappies harvested were greater than preferred length.

Table 9. Estimated numbers of black crappie caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	13 (18)	13 (18)	0 (0)
May	0 (0)	0 (0)	0 (0)
June	166 (115)	87 (76)	79 (56)
July	67 (72)	67 (72)	0 (0)
August	67 (56)	28 (27)	39 (37)
September	90 (71)	74 (57)	16 (25)
<i>Total</i>	<i>404 (164)</i>	<i>269 (123)</i>	<i>134 (71)</i>

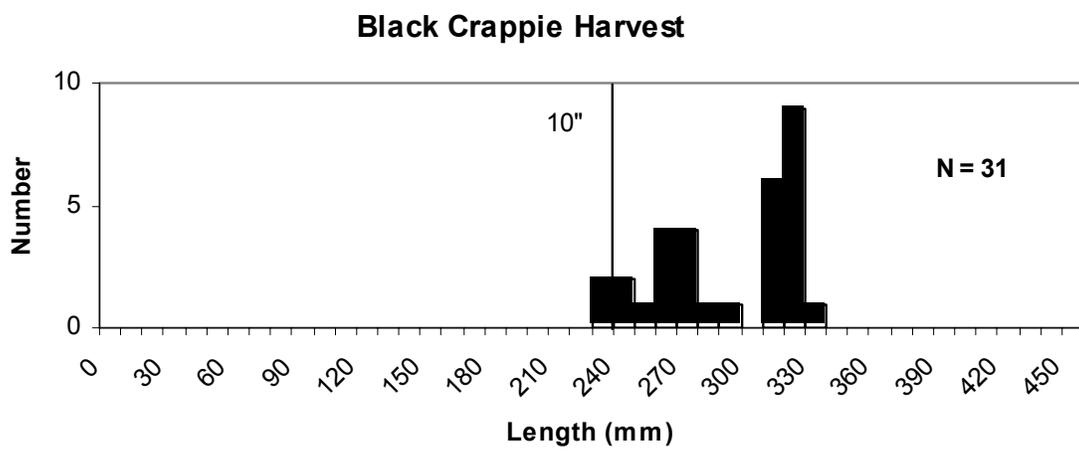


Figure 2. Length frequency of black crappie harvested from the Belle Fourche Reservoir by all anglers in 2002.

Channel Catfish

Channel catfish are one of the more numerous fish collected during annual sampling, and were the second most numerous caught by anglers (Table 7). A small portion of Belle Fourche Reservoir anglers do target catfish (Table 6). Twenty-two (1.65%) of the 1,331 anglers indicating a primary target were specifically looking for catfish. In addition, of the anglers looking to catch something else while fishing, over 51% were going after catfish.

Angler catch of catfish was at it's highest during June at 0.33 fish per hour, as compared to less than 0.04 fish per hour for every month (Table 11). Harvest rates, however, were the lowest in June at less than 1% while harvest was 30% or higher for all other months. The highest harvest occurred in April at an estimated 100% harvest. In addition, anglers really only targeted catfish in April and May, which helps explain the higher harvest rates for these two months.

Table 10. Estimated total number of channel catfish caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	216 (141)	216 (141)	0 (---)
May	343 (198)	125 (143)	218 (194)
June	6,472 (39.0)	42 (33.0)	6,431 (28.0)
July	174 (162)	67 (107)	107 (129)
August	72 (51)	21 (20)	51 (57)
September	105 (35)	80 (13)	25 (23)
<i>Total</i>	<i>7,382 (301)</i>	<i>551 (231)</i>	<i>6,831 (242)</i>

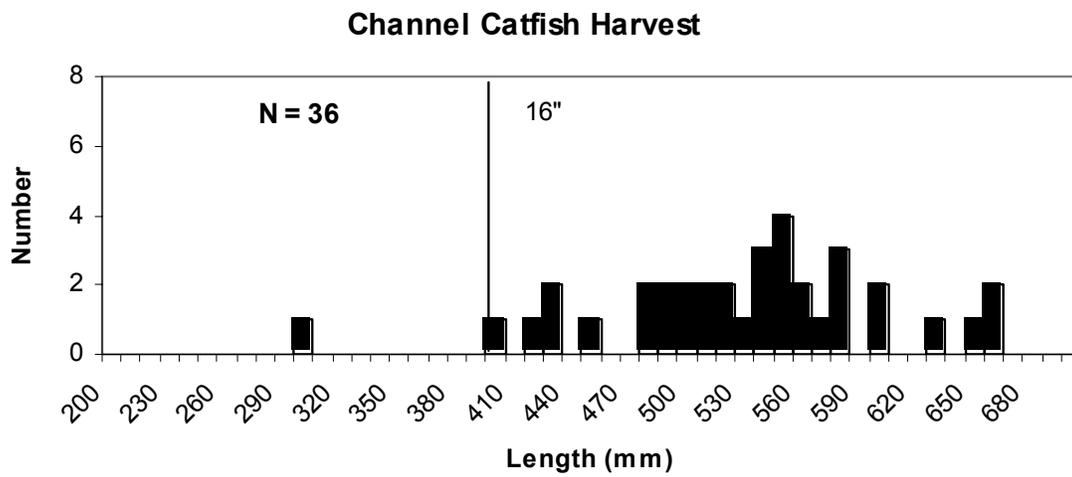


Figure 3. Length frequency of channel catfish harvested from the Belle Fourche Reservoir by all anglers in 2002.

Table 11. Angler catch, harvest and release rates for channel catfish at the Belle Fourche Reservoir, by month, in 2002 (95% CI's in parentheses).

Month	Catch rate (fish/angler hour)		Harvest rate (fish/angler hour)	
	All anglers	Targeted	All anglers	Targeted
April	0.04 (0.05)	0.09 (0.23)	0.04 (0.05)	0.09 (0.23)
May	0.01 (0.03)	0.14 (0.04)	0.01 (0.02)	0.13 (0.02)
June	0.33 (0.09)	----	0.00 (---)	----
July	0.01 (0.01)	----	0.00 (---)	----
August	0.01 (0.01)	----	0.00 (---)	----
September	0.02 (0.01)	----	0.01 (0.01)	----
<i>Total</i>	<i>0.09 (0.03)</i>	<i>0.11 (0.12)</i>	<i>0.01 (0.01)</i>	<i>0.11(0.12)</i>

Smallmouth Bass

Although a few anglers target smallmouth bass, little is known about smallmouth from sampling data. Nighttime electrofishing was conducted in 2000 and 2001 but due to low water levels during fall, boat access and shorelines are usually difficult for sampling. Anglers caught over 2,000 bass from spring to early fall and harvested 31% of these fish (Table 12). The highest months for catch and harvest were May and September.

The only month creel clerks observed anglers targeting smallmouth bass was August (Table 13). Therefore, it's easy to understand why the percentage of anglers targeting smallmouth bass was extremely small (<0.3%; Table 6). Observed catch rate by smallmouth anglers was good at 2.02 fish per hour. Catch rates for all anglers throughout the creel was low at less than 0.1 but bass were caught during every month from April to September. Sizes of smallmouth caught were good and over 88% of the bas harvested were quality length (11 inches) or greater (Figure 4).

Table 12. Estimated total number of smallmouth bass caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	37 (44)	37 (44)	0 (---)
May	539 (298)	196 (191)	343 (225)
June	329 (236)	43 (44)	287 (232)
July	401 (252)	181 (215)	221 (139)
August	275 (261)	39 (67)	236 (226)
September	544 (545)	163 (312)	381 (276)
<i>Total</i>	<i>2,125 (758)</i>	<i>658 (435)</i>	<i>1,467 (501)</i>

Table 13. Angler catch, harvest and release rates for smallmouth bass at the Belle Fourche Reservoir, by month, in 2002 (95% CI's in parentheses).

Month	Catch rate (fish/angler hour)		Harvest rate (fish/angler hour)	
	All anglers	Targeted	All anglers	Targeted
April	0.01 (0.01)	----	0.01 (0.01)	----
May	0.02 (0.03)	----	0.01 (0.01)	----
June	0.02 (0.02)	----	0.00 (---)	----
July	0.02 (0.02)	----	0.01 (0.01)	----
August	0.03 (0.04)	2.02 (---)	0.00 (---)	0.76 (---)
September	0.10 (0.08)	----	0.03 (0.04)	----
<i>Total</i>	<i>0.03 (0.01)</i>	<i>2.02 (---)</i>	<i>0.01 (0.01)</i>	<i>0.76 (---)</i>

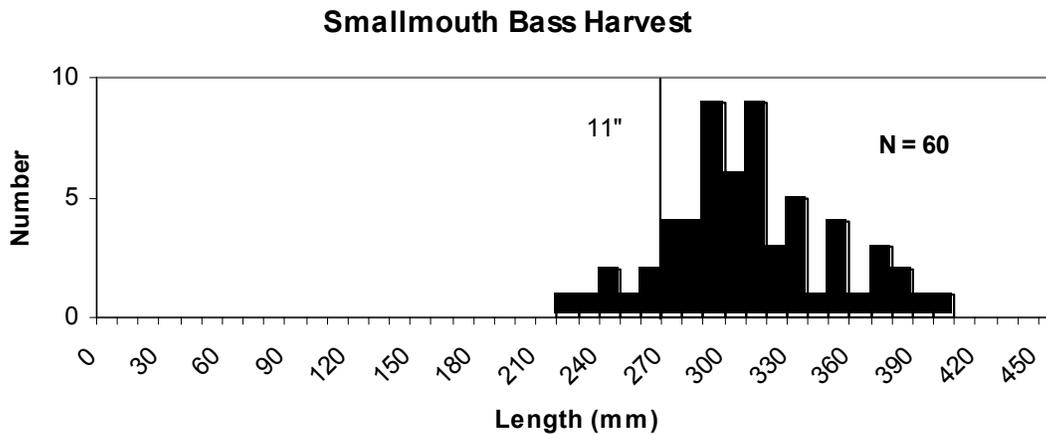


Figure 4. Length frequency of smallmouth bass harvested from the Belle Fourche Reservoir by all anglers in 2002.

Tiger Muskie

Tiger muskie have been stocked into the Belle Fourche Reservoir almost annually since 1985 (Appendix Table 5). Tiger muskie have remained at very low densities with few anglers targeting the species. Probable causes for low success of tiger muskies stockings are the high density predator (i.e. walleye) population and lack of suitable habitat. The reservoir's water level is commonly drawn to extreme low levels for annual irrigation needs. The fishery is regulated by a statewide rule that no tiger muskie under 30 inches may be harvested and only 1 may be included in an angler's daily creel.

During 2002, an estimated 138 were caught from April through September (Table 14). No harvest recorded during the creel suggests anglers catch few larger, legal size tiger muskie. None of the interviewed anglers indicated tiger muskie were a primary or secondary target (Table 6).

Table 14. Estimated total number of tiger muskie caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	0 (0)	0 (0)	0 (0)
May	68 (93)	0 (0)	68 (93)
June	22 (39)	0 (0)	22 (39)
July	43 (50)	0 (0)	43 (50)
August	4 (9)	0 (0)	4 (9)
September	0 (0)	0 (0)	0 (0)
<i>Total</i>	<i>138 (113)</i>	<i>0 (0)</i>	<i>138 (113)</i>

Walleye

Walleye were the most popular fish sought by Belle Fourche anglers. Over ninety-five percent of all interviewed anglers said they were primarily targeting walleye (Table 6). In addition, 37% of the anglers who indicated targeting a secondary species said walleye was their second target.

Interviewed anglers were very successful throughout the creel with catch rates increasing in June and remaining high through September. The fishery is managed under a 14-inch minimum-length-limit, 4 fish daily. Estimated catch of walleye for the year was 54,184 fish and harvest of the caught walleye was around 28% (Table 15). Harvest focused on walleye between 15 and 19 inches (Figure 5). While nearly half of the interviewed anglers did not harvest a single walleye, just over 10% did take their limit (Table 16).

Catch rates of walleye for all anglers was 0.69 fish per hour while catch rates for anglers specifically targeting walleye was 1.36 walleye per hour (Table 17). Harvest rates remained about the same throughout the creel, most likely due to the daily and special restrictions on walleye anglers at the reservoir.

Table 15. Estimated total number of walleye caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	1,084 (715)	984 (584)	100 (175)
May	6,969 (3,131)	3,079 (1,854)	3,891 (2,665)
June	18,615 (5,764)	4,416 (1,171)	14,199 (4,869)
July	17,728 (6,466)	3,686 (1,490)	14,042 (5,140)
August	3,871 (1,604)	1,139 (527)	2,732 (1,137)
September	5,917 (2,735)	1,887 (724)	4,030 (2,085)
<i>Total</i>	<i>54,184 (9,768)</i>	<i>15,191 (2,858)</i>	<i>38,994 (7,931)</i>

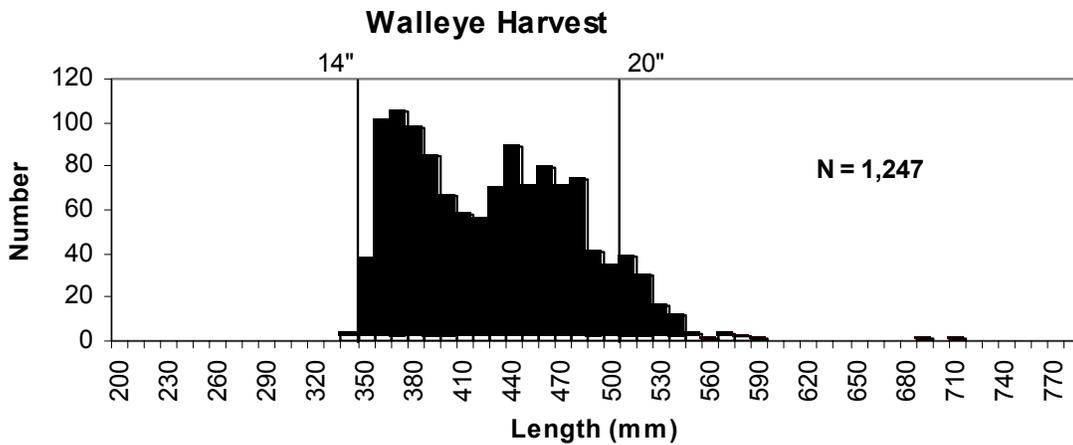


Figure 5. Length frequency of walleye harvested from the Belle Fourche Reservoir by all anglers during 2002.

Table 16. Number of parties or anglers interviewed that harvested a specified number of walleye while fishing at the Belle Fourche Reservoir, April through September, 2002.

Number kept per angler	Frequency	Percent of Total Anglers
0	292	46.6
Between 0 and 1	79	12.6
1	56	8.9
Between 1 and 2	46	7.3
2	38	6.1
Between 2 and 3	23	3.7
3	22	3.5
Between 3 and 4	6	1.0
4	64	10.2
<i>Totals</i>	626	100

Table 17. Angler catch, harvest and release rates for walleye at the Belle Fourche Reservoir, by month, in 2002 (95% CI's in parentheses).

Month	Catch rate (fish/angler hour)		Harvest rate (fish/angler hour)	
	All anglers	Targeted	All anglers	Targeted
April	0.22 (0.25)	0.37 (0.18)	0.20 (0.21)	0.33 (0.17)
May	0.30 (0.24)	0.72 (0.29)	0.13 (0.12)	0.28 (0.13)
June	0.95 (0.54)	2.83 (0.84)	0.23 (0.12)	0.63 (0.24)
July	1.01 (0.63)	2.64 (2.54)	0.21 (0.14)	0.57 (0.55)
August	0.47 (0.26)	1.14 (1.22)	0.14 (0.08)	0.30 (0.35)
September	1.10 (0.68)	2.61 (1.67)	0.35 (0.21)	0.84 (0.71)
<i>Total</i>	<i>0.69 (0.21)</i>	<i>1.36 (0.35)</i>	<i>0.19 (0.06)</i>	<i>0.45 (0.13)</i>

White Bass

Although the white bass population at the Belle Fourche River is low in density, a small portion of anglers (0.2%) do target white bass while fishing (Table 6). In addition, white bass were reportedly caught in every month of the creel except April (Table 18). The highest numbers caught and harvested occurred in June and estimated totals caught and harvested during the entire creel was 1,072 and 222, respectively. Sizes of harvested white bass were good. Quality length for white bass is 9 inches and all harvested white bass measured during the creel were over 10 inches (Figure 6).

Table 18. Estimated total number of white bass caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	0 (0)	0 (0)	0 (0)
May	270 (233)	68 (93)	202 (220)
June	380 (178)	100 (52)	280 (157)
July	193 (176)	0 (0)	193 (176)
August	127 (49)	29 (34)	98 (55)
September	101 (89)	25 (36)	76 (88)
<i>Total</i>	<i>1,072 (361)</i>	<i>222 (117)</i>	<i>850 (339)</i>

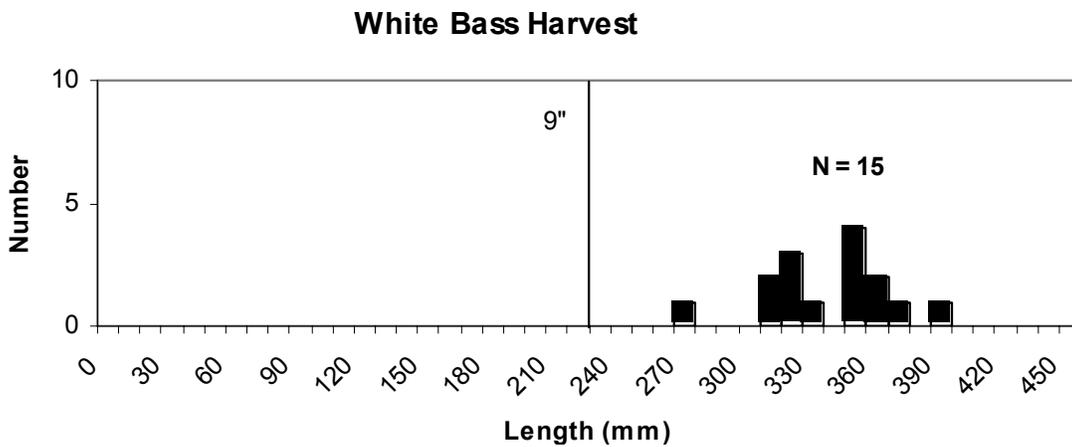


Figure 6. Length frequency of white bass harvested from the Belle Fourche Reservoir by all anglers in 2002.

Yellow Perch

Although seining usually shows high numbers of age-0 yellow perch, the perch population remains at a low density (Appendix Table 4 and Appendix Table 11). In addition, no interviewed anglers during the 2002 creel targeted perch. Not surprisingly, few perch (N = 1,278) were caught during the creel and very few (N = 185) were harvested (Table 10). Only 13 yellow perch were measured during the creel, ranging from 8 inches to 12.5 inches in length (Figure 7).

Table 19. Estimated total number of yellow perch caught, harvested and released by month at the Belle Fourche Reservoir in 2002 (95% CI's in parentheses).

Month	Catch	Harvest	Release
April	0 (0)	0 (0)	0 (0)

May	48 (47)	0 (0)	48 (47)
June	447 (197)	119 (92)	328 (175)
July	443 (245)	43 (50)	400 (230)
August	211 (127)	15 (22)	22 (121)
September	130 (78)	7 (12)	123 (78)
<i>Total</i>	<i>1,278 (351)</i>	<i>185 (108)</i>	<i>1,093 (326)</i>

Yellow Perch Harvest

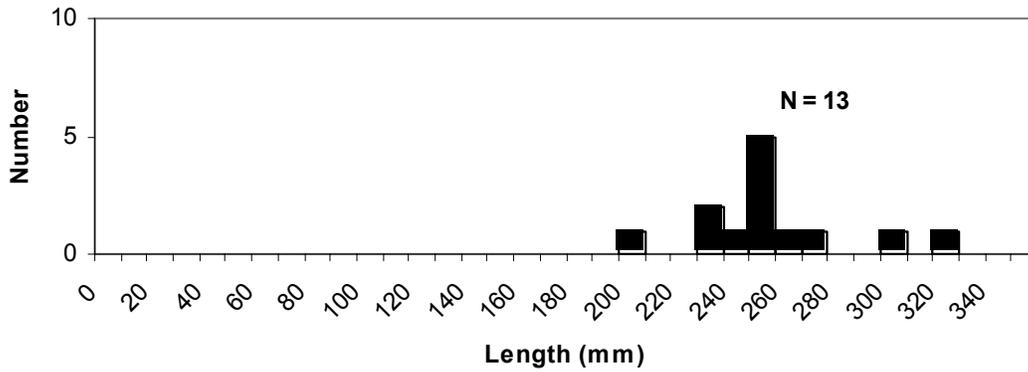


Figure 7. Length frequency of yellow perch harvested from the Belle Fourche Reservoir by all anglers in 2002.

DEMOGRAPHICS

Residency

The angling population at the Belle Fourche Reservoir is dominated by South Dakotans. Over 95% of the anglers who fished the Belle Fourche Reservoir in 2002 were residents of South Dakota, while Wyoming residents made up 2.9% (Figure 8). Eleven other states were also represented by anglers but were a very small part of the angling component (Appendix Table 13).

State of Residence

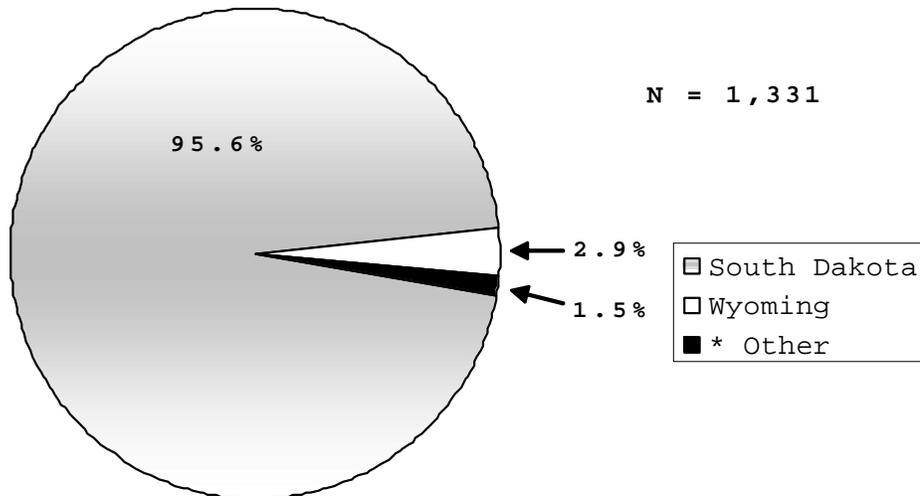


Figure 8. Percents of anglers, by state, creelied at the Belle Fourche Reservoir, Butte County, during 2002. *Alabama, Alaska, Arizona, Colorado, Idaho, Kansas, Nebraska, North Dakota, Texas, Washington ($\leq 0.3\%$ each).

Distance Traveled

Distances traveled to reach the reservoir varied from 4 miles to over 3,000 (Tables 20 and 21). The mean distance traveled was just over 55 miles, further identifying Belle Fourche Reservoir anglers as residents living close to the reservoir.

Table 20. Distance anglers indicated they traveled from their residence to the Belle Fourche Reservoir.

Distance (miles)	Count (N)	Percent (%)
0 - 24	391	29.55
25 - 49	397	30.01
50 - 74	472	35.68
75 - 99	23	1.74
100 - 149	10	0.75
150 - 199	2	0.15
200 - 249	1	0.08
250 - 299	4	0.30
300 - 349	1	0.08
350 - 399	2	0.15
400 - 449	4	0.30
450 - 499	0	---
500 - 599	2	0.15
600 - 699	0	---
700 - 799	2	0.15
800 - 899	0	---
900 - 999	2	0.15
1,000 - 1,500	8	0.61
≥ 3,000	2	0.15
<i>TOTALS</i>	<i>1,323</i>	<i>100.00</i>

Table 21. Mean travel statistics from angler interview data for the Belle Fourche Reservoir, April 1 through September 30, 2002.

Distance Description	Distance Traveled
Minimum	4 miles
Maximum	3,000 miles
Mean	55.02 miles
Standard Error	4.39
80% CI	5.63
95% CI	8.61

Gender and Age

Eighty-three percent of the anglers interviewed throughout 2001 were male (Figure 9). In addition, the largest age group was anglers 40 to 59 years old (Figure 10). This age group alone represented nearly half (47.9%) of the anglers interviewed at the reservoir.

Anglers - Male vs Female

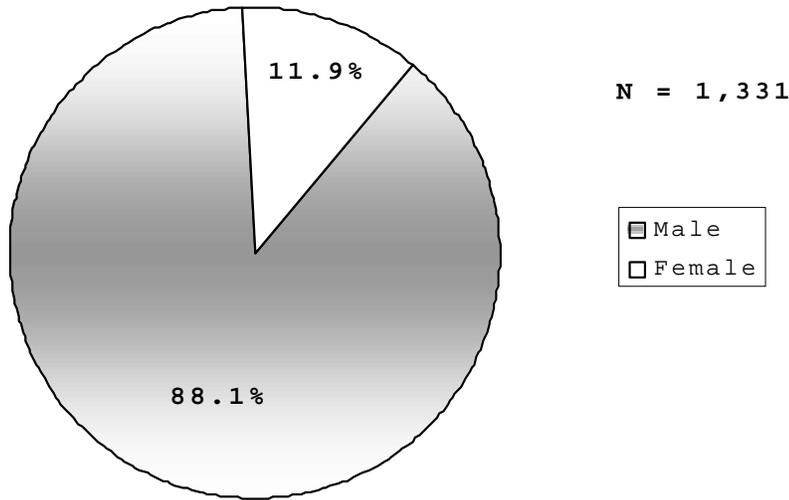


Figure 9. Percent of male anglers versus female anglers interviewed while fishing at the Belle Fourche Reservoir, Butte County, 2002.

Angler Age Group Frequency

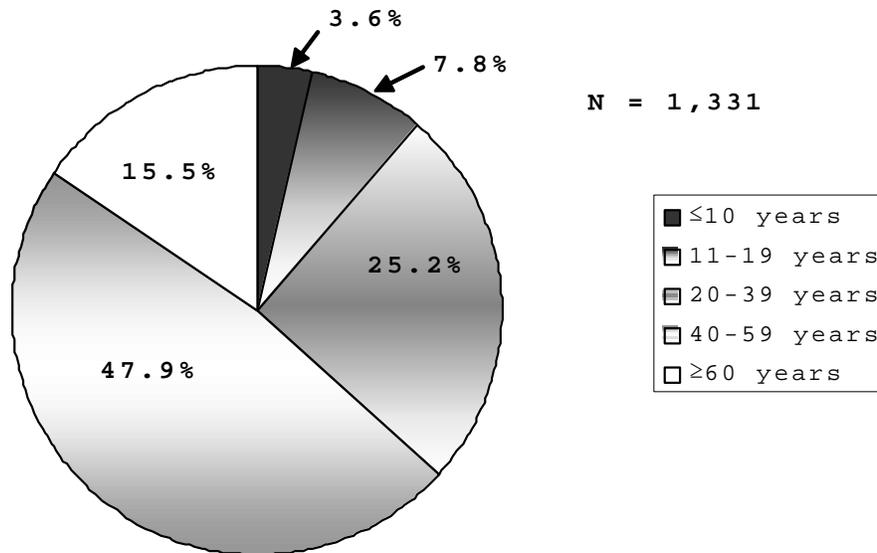


Figure 10. Percent of anglers by age group interviewed while fishing at the Belle Fourche Reservoir, Butte County, 2002.

ANGLER SATISFACTION

All Anglers

Overall, anglers fishing at the Belle Fourche Reservoir were satisfied with their daily fishing trips (Figure 9; Appendix Table 12). Anglers were asked to consider all aspects of their fishing trip then given 6 choices to rate their trip for the day. Over 77% were at least moderately satisfied while 8.5% felt dissatisfied. Thirteen percent claimed the day was average or neutral while less than 1% provided no opinion.

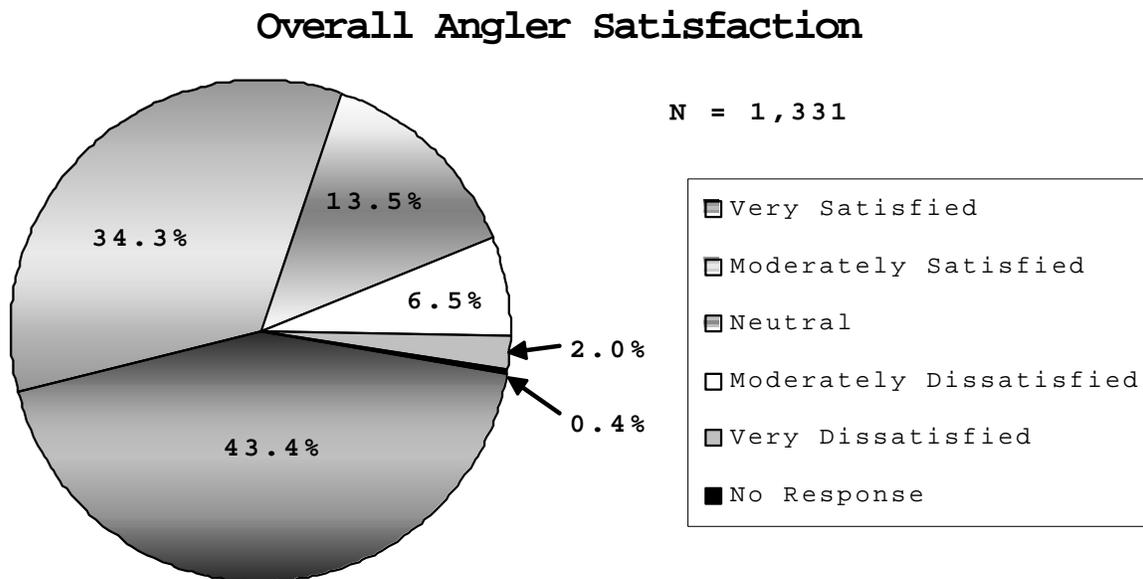


Figure 11. Total angler responses to the question “Considering all factors, how satisfied are you with your fishing trip today?” Anglers were given 6 answer choices: very satisfied, moderately satisfied, neutral, moderately dissatisfied, very dissatisfied and no opinion.

Boat vs Shore Anglers

Both boat and shore anglers appeared to be satisfied with their fishing at Belle Fourche (Table 22; Appendix Table 12). Boat anglers were the most satisfied with over 80% indicating they were at least moderately satisfied, while almost 60% of the shore anglers were also at least moderately satisfied. Shore fishing can, at times, be difficult at this reservoir due to the extreme drawdowns brought about by irrigation needs. Although not specifically asked during this creel, a good portion of the dissatisfied feelings are due to lack of shore access and fishery habitat around the reservoir when the water levels are low.

Table 22. Responses, by angling type, to the question “Considering all factors, how satisfied are you with your fishing trip today?” Anglers were given 5 answer choices: very satisfied, moderately satisfied, neutral, moderately dissatisfied, and very dissatisfied.

Answer Code	Answer Description	Boat		Shore	
		Count	%*	Count	%*
1	Very Satisfied	545	47.3	32	17.9
2	Moderately Satisfied	381	33.1	75	41.9
3	Neutral	118	10.2	62	34.6
4	Moderately Dissatisfied	77	6.7	10	5.6
5	Very Dissatisfied	26	2.3	0	---
13	No Answer	5	0.4	0	---
TOTALS		1,152	100.0	179	100.0

*Percents are only of those anglers who supplied an answer

RECOMMENDATIONS

1. Revise and update the 1998 Belle Fourche Reservoir Fisheries Management Plan with a specific goal, species objectives, strategies to assist in accomplishing the objectives, and a 5 Year Operational Plan.
2. Continue to conduct annual fishery surveys and publish the results in report form as part of the Statewide Fishery Surveys Annual Report.
3. Conduct angler surveys every 5 to 10 years to assess angler attitudes and preferences towards the Belle Fourche fishery and publish the results as required by federal aid funding.
4. Use information from the angler creel surveys and strive to maintain the 77% satisfaction rate to above or equal to the 1999 resident and nonresident statewide satisfaction rate of 73% (Gigliotti 2000).
5. Determine to what extent gizzard shad and other forage fish contribute to the Belle Fourche fishery as a forage base for sportfish, specifically walleye.
6. Provide public education efforts that focus on increasing angler awareness of fishing regulations, status of the Belle Fourche fishery and the responsible use and harvest of the resource.

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APPENDICES



South Dakota Department of Game, Fish and Parks
Orman Reservoir Creel Survey Fishing Pressure Report

Form Pressure/Aerial or Roving or Fixed	
Pressure ID	Office Space Only
Data Entry into Creel Database	
Date	
Entered/Initials	

Pressure Count #1

Water Body	Date			Survey Time (Military)		Access Area	Creel Clerk	Air Temp	Cloud Cover	Wind Speed	Wind Dir	Precip	Water Temp		Op Water (x)	Starting Location	Travel Direction
	Month	Day	2001	Arrival	Departure												

Type Of Fishing	Total	Running Tally
Fishing Boats		
Bank/Shore		

Pressure Count #2

Water Body	Date			Survey Time (Military)		Access Area	Creel Clerk	Air Temp	Cloud Cover	Wind Speed	Wind Dir	Precip	Water Temp		Op Water (x)	Starting Location	Travel Direction
	Month	Day	2001	Arrival	Departure												

Type Of Fishing	Total	Running Tally
Fishing Boats		
Bank/Shore		

Pressure Count #3

Water Body	Date			Survey Time (Military)		Access Area	Creel Clerk	Air Temp	Cloud Cover	Wind Speed	Wind Dir	Precip	Water Temp		Op Water (x)	Starting Location	Travel Direction
	Month	Day	2001	Arrival	Departure												

Type Of Fishing	Total	Running Tally
Fishing Boats		
Bank/Shore		

Appendix Figure 1. Example Creel Survey Pressure Report form for the Belle Fourche, 2002.



South Dakota Department of Game, Fish and Parks
Orman Reservoir Creel Survey Interview Report

Page _____ of _____

Water Body	Date		Time (Military)		Access Area	Creel Clerk
	Month	Day	Arrival	Departure		

Form Interview- 01	
Interview ID	Office Space Only
Data Entry into Creel Database	
Date	
Entered/Initials	

Given Postcard (X)	
Returned Postcard (X)	

Refused Interview (X)	Time (Military)			Time Not Fished (Minutes)	Completed (X)	Type Of Fishing	Fish Species Sought		Party Size
	Interview Time	Started Fishing	Stopped Fishing				1	2	

Angler	Gender	Age	Distance Traveled	Zip Code	State	Question Series	Question 1
1						0 1	
2						0 1	
3						0 1	
4						0 1	
5						0 1	

Series 01 Preference Questions:

1) Considering all factors, how satisfied are you with your fishing trip today?
 01=Very satisfied
 02=Moderately satisfied
 03=Neutral
 04=Moderately Dissatisfied
 05=Very Dissatisfied
 06=No Opinion

Species	Number			Species	Length (mm)						
	Kept	Release	Illegal								
1				1		11		21		31	
2				2		12		22		32	
3				3		13		23		33	
4				4		14		24		34	
5				5		15		25		35	
6				6		16		26		36	
7				7		17		27		37	
8				8		18		28		38	
9				9		19		29		39	
10				10		20		30		40	

Interview Continued (✓)	
-------------------------	--

Comments: _____

Appendix Figure 2. Example Creel Survey Interview Report form for the Belle Fourche Reservoir, 2002.



South Dakota Department of Game, Fish and Parks
 Belle Fourche (Orman) Reservoir Creel Survey Code Key

<p>Fish Species: 001-Anything</p> <p>Lamprey 012-Chestnut Lamprey 014-Silver Lamprey</p> <p>Sturgeon 024-Lake Sturgeon 026-Pallid Sturgeon 028-Shovelnose Sturgeon</p> <p>032-Paddlefish</p> <p>Gar 042-Longnose Gar 044-Shortnose Gar</p> <p>052-Bowfin</p> <p>Mooneye 062-Goldeye 064-Mooneye</p> <p>072-American Eel</p> <p>Herring 082-Skipjack Herring 084-Alewife 086-Gizzard Shad 088-Threadfin Shad</p>	<p>Carp/Minnnow 102-Central Stoneroller 104-Lake Chub 106-Speckled Chub 108-Sturgeon Chub 110-Sicklefin Chub 112-Silver Chub 114-Hornyhead Chub 116-Flathead Chub 118-Creek Chub 120-Red Shiner 122-Spotfin Shiner 126-Common Shiner 128-Golden Shiner 130-Emerald Shiner 132-River Shiner 134-Bigmouth Shiner 136-Blacknose Shiner 138-Spottail Shiner 144-Sand Shiner 146-Silverband Shiner 148-Topeka Shiner 150-Western Silvery Minnow 152-Brassy Minnow 154-Mississippi Silvery Minnow 156-Plains Minnow 158-Suckermouth Minnow 160-Bluntnose Minnow 162-Flathead Minnow 164-Pearl Dace 166-Northern Redbelly Dace 168-Finescale Dace 170-Blacknose Dace</p>	<p>172-Longnose Dace 174-Goldfish 176-Grass Carp 178-Common Carp 180-Silver Carp 182-Bighead Carp 184-Rudd</p> <p>Sucker 212-River Carpsucker 214-Quillback 222-Longnose Sucker 230-Blue Sucker 240-Lake Chubsucker 252-Smallmouth Buffalo 254-Bigmouth Buffalo 256-Blue Buffalo 262-Shorthead Redhorse</p> <p>Bullhead/Catfish 310-Black Bullhead 320-Yellow Bullhead 330-Brown Bullhead 350-Blue Catfish 360-Channel Catfish 370-Flathead Catfish 380-Stonecat 390-Tadpole Madtom</p> <p>Pike 410-Grass Pickerel 420-Northern Pike 430-Muskellunge</p>	<p>435-Tiger Muskellunge 452-Central Mudminnow</p> <p>461-Rainbow Smelt</p> <p>Trout 505-Cutthroat Trout 510-Coho Salmon 520-Rainbow Trout 550-Kokanee Salmon 555-Chinook Salmon 560-Brown Trout 565-Brook Trout</p> <p>577-Burbot</p> <p>Killifish 582-Plains Topminnow 584-Plains Killifish</p> <p>587-Western Mosquitofish 592-Brook Silverside 597-Brook Stickleback</p> <p>Temperate Bass 610-White Perch 620-White Bass 630-Yellow Bass 640-Striped Bass 645-Striped Bass Hybrid 650-Sunshine Bass 655-Palmetto Bass</p>	<p>Sunfish/Crappie/Rock Bass 714-Rock Bass 722-Green Sunfish 716-Sacramento Perch 722-Green Sunfish 724-Pumpkinseed 726-Orangespotted Sunfish 728-Orangespotted X Green 730-Bluegill 735-Bluegill X Green 740-Redear Sunfish 745-Bluegill X Redear 750-Smallmouth Bass 760-Spotted Bass 770-Largemouth Bass 775-Black Bass Micropterus 780-White Crappie 790-Black Crappie</p> <p>Perch 810-Iowa Darter 814-Johnny Darter 816-Orangethroat Darter 818-Blackside Darter 830-Yellow Perch 840-Sauger 850-Walleye</p> <p>Drum 862-Freshwater Drum</p>
<p>Waterbody: 1501-Orman Dam</p> <p>Access Area: 101-Gadens Point 102-Rocky Point 103-Cannel & South 104-East Shore 105-East shore Dam North</p>	<p>Creel Clerk: 01- Barry Young 02- Gene Galinat 03- Lynn Culver</p> <p>Air & Water Temperature: 01- <-20 02- -10's 03- -10 to 0 04- 0 to 10 05- 10's 06- 20's 07- 30's 08- 40's 09- 50's 10- 60's 11- 70's 12- 80's 13- 90's 14- >100</p> <p>Cloud Cover: 01-None 02-Fog 03-Partly Cloudy 04-Mostly Cloudy 05-Cloudy 06-Storms Approaching 07-Storms Present</p> <p>Zone:</p>	<p>Wind Speed: 01-None 02-0 to 5 mph 03-5 to 10 mph 04-10 to 15 mph 05-15 to 20 mph 06-20 to 25 mph 07->25 mph</p> <p>Wind Direction: 01-None 02-N 03-NE 04-E 05-SE 06-S 07-SW 08-W 09-NW</p> <p>Precipitation: 01-None 02-Passing Showers 03-Constant Light Rain 04-Constant Heavy Rain 05-Severe Storm 06-Light Snow 07-Heavy Snow 08-Blizzard</p> <p>Type Of Fishing: 01- Boat 02- Shore 03- Spearing</p>	<p>Ice Thickness: 01- 0 to 3 inches 02- 4 to 6 inches 03- 7 to 9 inches 04- 10 to 12 inches 05- >12 inches</p> <p>Gender: 01-Male 02-Female 03-Unknown</p> <p>Age: 01-Child (0 to 9) 02-Teen (10 to 19) 03-Young Adult (20 to 39) 04-Middle Age (40 to 59) 05-Senior (60+)</p>	<p>State: 01-Alabama 02-Alaska 03-Arizona 04-Arkansas 05-California 06-Colorado 07-Connecticut 08-Delaware 09-Florida 10-Georgia 11-Hawaii 12-Idaho 13-Illinois 14-Indiana 15-Iowa 16-Kansas 17-Kentucky 18-Louisiana 19-Maine 20-Maryland 21-Massachusetts 22-Michigan 23-Minnesota 24-Mississippi 25-Missouri 26-Montana 27-Nebraska 28-Nevada 29-New Hampshire 30-New Jersey 31-New Mexico 32-New York 33-North Carolina 34-North Dakota 35-Ohio 36-Oklahoma 37-Oregon 38-Pennsylvania 39-Rhode Island 40-South Carolina 41-South Dakota 42-Tennessee 43-Texas 44-Utah 45-Vermont 46-Virginia 47-Washington 48-West Virginia 49-Wisconsin 50-Wyoming</p>

N:common/Fish/Lake Survey (Warm Water Fish)/Orman Creel 2002/Creel Codes Form.doc

Appendix Figure 3. Creel Survey Code Key form for the Belle Fourche Reservoir, 2002.

Appendix Table 1. Table Series 2: Party Size and Completed Trip Length by month and day type (CAS Program Output).

Table 2.07 Summary report--number of fishing parties interviewed (n), mean fishing party size (anglers/fishing party), number of fishing parties interviewed that had completed fishing trips (n), mean completed fishing trip length (hours/party fishing trip), standard error (SE) and confidence intervals (+/- % CI) totaled over selected strata.

Waterbody										
1,501 Orman Reservoir										
Work Period										
4 April										
Day Type										
1 Weekend/Holiday										
Type of Fishing										
Totalled Over: 1,2,3 -- Boat, Shore, Spearing										
n	Mean	SE	Party Size		n	Mean	Completed Trip Length			
			80% CI	95% CI			SE	80% CI	95% CI	
64	2.20	3.06	3.93	6.01	55	5.31	7.51	9.62	14.71	
Work Period										
4 April										
Day Type										
2 Weekday										
Type of Fishing										
Totalled Over: 1,2,3 -- Boat, Shore, Spearing										
n	Mean	SE	Party Size		n	Mean	Completed Trip Length			
			80% CI	95% CI			SE	80% CI	95% CI	
51	1.67	2.33	2.99	4.57	43	4.12	4.09	5.24	8.01	
Work Period										
5 May										
Day Type										
1 Weekend/Holiday										
Type of Fishing										
Totalled Over: 1,2,3 -- Boat, Shore, Spearing										
n	Mean	SE	Party Size		n	Mean	Completed Trip Length			
			80% CI	95% CI			SE	80% CI	95% CI	
78	2.24	2.45	3.14	4.80	73	5.99	4.26	5.46	8.35	
Work Period										
5 May										
Day Type										
2 Weekday										
Type of Fishing										
Totalled Over: 1,2,3 -- Boat, Shore, Spearing										
n	Mean	SE	Party Size		n	Mean	Completed Trip Length			
			80% CI	95% CI			SE	80% CI	95% CI	
38	1.79	1.39	1.79	2.73	35	4.23	3.18	4.08	6.24	

Appendix Table 1. Continued. Table Series 2: Party Size and Completed Trip Length by month and day type (CAS Program Output).

Work Period	6 June								
Day Type	1 Weekend/Holiday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Sparring								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
55	2.31	---	---	---	55	5.33	---	---	---

Work Period	6 June								
Day Type	2 Weekday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Sparring								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
39	2.00	0.40	0.52	0.79	38	5.57	1.20	1.54	2.35

Work Period	7 July								
Day Type	1 Weekend/Holiday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Sparring								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
49	2.43	---	---	---	49	4.70	---	---	---

Work Period	7 July								
Day Type	2 Weekday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Sparring								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
55	2.25	---	---	---	55	4.45	---	---	---

Work Period	8 August								
Day Type	1 Weekend/Holiday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Sparring								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
53	2.28	---	---	---	53	5.52	---	---	---

Appendix Table 1. Continued. Table Series 2: Party Size and Completed Trip Length by month and day type (CAS Program Output).

Work Period	8 August								
Day Type	2 Weekday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Spearing								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
70	2.04	---	---	---	70	5.11	---	---	---

Work Period	9 September								
Day Type	1 Weekend/Holiday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Spearing								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
40	2.15	---	---	---	39	4.70	---	---	---

Work Period	9 September								
Day Type	2 Weekday								
Type of Fishing	Totalled Over: 1,2,3 -- Boat, Shore, Spearing								
n	Mean	SE	Party Size 80% CI	95% CI	n	Mean	Completed Trip Length		
							SE	80% CI	95% CI
34	1.97	---	---	---	33	5.25	---	---	---

Appendix Table 2. Table Series 3: Fishing Pressure (CAS Program Output)

Table 3.07 Summary report--observed and total fishing pressure (P, h), standard error (SE) and confidence intervals (+/- % CI) totaled over selected stratum.

Waterbody 1501 Belle Fourche Reservoir
 Work Period Totalled Over: 1, 4, 5, 6, 7, 8, 9 -- January, April, May, June, July, August, September
 Day Type Totalled Over: 1,2,3 -- Weekend/Holiday, Weekday, Weekend/Holiday or Weekday (1 or 2)
 Zone 1 Belle Fourche Reservoir

Type of Fishing	P	Observed			P	Total		
		SE	80% CI	95% CI		SE	80% CI	95% CI
1 Boat	26,651.07	2,346.18	3,007.80	4,598.51	58,479.83	5,115.88	6,558.56	10,027.12
2 Shore	20,392.81	2,371.02	3,039.64	4,647.19	20,392.81	2,371.02	3,039.64	4,647.19

Appendix Table 3. Table Series 5: Catch/Harvest/Release Numbers (CAS Program Output) by angler type.

Table 5.07 Summary report-- catch, harvest or release (N), standard error (SE) and confidence intervals (+/- % CI) totaled over selected strata. "Estimate Types" include: all anglers interviewed (All Anglers) and over all species (Overall).

Waterbody		1501 Belle Fourche Reservoir											
Work Period		Totaled Over: March, April, May, June, July, August, September											
Day Type		Totaled Over: Weekend/Holiday, Weekday, Weekend/Holiday or Weekday (1 or 2)											
Type of Fishing	1	Boat				Harvest				Release			
Estimate Type Species	N	Catch SE	80% CI	95% CI	N	SE	80% CI	95% CI	N	SE	80% CI	95% CI	
All Anglers	178	271.74	67.20	86.15	131.71	29.65	19.12	24.51	37.48	242.09	58.40	74.87	114.47
All Anglers	262	31.45	33.86	43.41	66.36	0.00	0.00	0.00	0.00	31.45	33.86	43.41	66.36
All Anglers	360	341.88	93.73	120.16	183.71	128.91	60.86	78.02	119.28	212.97	75.76	97.13	148.50
All Anglers	420	55.57	26.01	33.35	50.98	4.53	3.32	4.26	6.51	51.03	25.80	33.07	50.57
All Anglers	435	103.77	42.09	53.96	82.50	0.00	0.00	0.00	0.00	103.77	42.09	53.96	82.50
All Anglers	620	839.77	156.49	200.62	306.72	162.48	44.90	57.57	88.01	677.29	145.33	186.31	284.85
All Anglers	714	48.90	49.04	62.87	96.12	0.00	0.00	0.00	0.00	48.90	49.04	62.87	96.12
All Anglers	730	29.76	22.91	29.38	44.91	12.64	13.17	16.88	25.80	17.11	18.75	24.04	36.76
All Anglers	750	1,982.64	376.45	482.61	737.84	558.78	214.05	274.41	419.53	1,423.87	252.69	323.94	495.26
All Anglers	790	395.90	83.42	106.94	163.50	261.83	62.34	79.92	122.19	134.07	36.32	46.56	71.19
All Anglers	830	1,243.73	177.84	227.99	348.57	184.55	54.84	70.31	107.50	1,059.19	164.79	211.26	322.99
All Anglers	850	49,959.83	4,941.86	6,335.46	9,686.04	12,192.60	1,245.56	1,596.81	2,441.30	37,767.23	4,052.81	5,195.71	7,943.51
All Anglers	862	61.33	26.48	33.94	51.89	25.12	19.33	24.79	37.89	36.21	23.50	30.13	46.07
Overall		55,366.28	5,293.90	6,786.77	10,376.03	13,561.09	1,370.66	1,757.19	2,686.50	41,805.19	4,315.77	5,532.82	8,458.91
Type of Fishing	2	Shore				Harvest				Release			
Estimate Type Species	N	Catch SE	80% CI	95% CI	N	SE	80% CI	95% CI	N	SE	80% CI	95% CI	
All Anglers	178	545.14	406.74	521.44	797.21	67.88	78.85	101.09	154.55	477.26	332.67	426.48	652.03
All Anglers	360	7,040.78	121.71	156.03	238.55	422.08	100.98	129.46	197.93	6,618.70	97.68	125.23	191.46
All Anglers	435	33.94	39.42	50.54	77.27	0.00	0.00	0.00	0.00	33.94	39.42	50.54	77.27
All Anglers	620	232.00	97.48	124.97	191.06	59.71	39.42	50.54	77.27	172.28	93.76	120.20	183.76
All Anglers	750	142.37	89.21	114.37	174.85	98.98	57.93	74.27	113.55	43.40	39.17	50.21	76.77
All Anglers	790	7.64	7.99	10.24	15.65	7.64	7.99	10.24	15.65	0.00	0.00	0.00	0.00
All Anglers	830	33.94	21.98	28.18	43.08	0.00	0.00	0.00	0.00	33.94	21.98	28.18	43.08
All Anglers	850	4,224.77	745.75	956.05	1,461.67	2,998.32	721.82	925.38	1,414.78	1,226.45	116.20	148.96	227.74
Overall		12,260.59	1,159.72	1,486.76	2,273.06	3,654.62	887.84	1,138.21	1,740.17	8,605.97	387.73	497.07	759.95

Appendix Table 4. Example field form depicting total catch by station for quarter arc seine pulls. Field form has actual data from Orman Reservoir, July 31, 2002.

1/4 Arc Seine Field Form

Lake: Orman Reservoir

County: Butte River

Date: 7-31-02

Collected By: Galinat, Miller, Culver

Seine Measurements;

Length: 100 ft

Depth: 6 ft

Mesh Size: 1/4 inch square

	Station Number			
	1	2	3	4
Total area covered (acres)	0.8	0.8	0.8	0.8
Water depth (ft)	6	6	≥ 6	3 - 6
Bottom soil type	Sand	Shale/gravel	Shale/gravel	mud
Wind Speed (mph; direction)	1 - 5	1 - 5	1 - 5	1 - 5
Time of collection	9:40 - 10:50AM	11:15 - 12:20AM	12:30 - 1:30PM	1:45 - 3:30PM

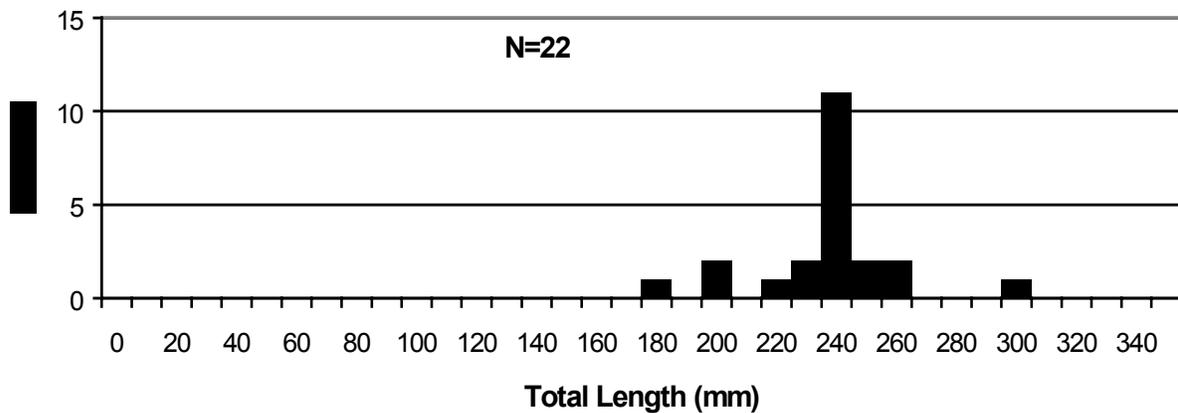
Spp.	Station 1		Station 2		Station 3		Station 4		TOTAL		All
	Age-0	1+	Age-0	1+	Age-0	1+	Age-0	1+	Age-0	1+	
BLC			3				1		4		4
CAP		1		4						5	5
CCF	1								1		1
FRD	15		5				8		28		28
GZD	211		501		69		3161		3942		3942
RIC					4			1	4	1	5
SMB			5		1		5		11		11
SPS		8		260		118		40		426	426
WAE	6		16		15		15	1	52	1	53
WHB	4		1		37		29		71		71
WHS	1		9						10		10
YEP	9	1	228	22	3		18	2	258	25	283
Total									4381	458	4839

Appendix Table 5. Stocking record for the Belle Fourche Reservoir, Butte County, 1992-2001.

Year	Number	Species	Size
1992	3,179	Cutthroat trout	Fingerling
	13,500	Tiger muskie	Fingerling
	9,600,000	Walleye	Fry
1993	21,000	Tiger muskie	Fingerling
	250,000	Walleye	Fingerling
1994	6,700	Brown trout	Fingerling
	21,000	Tiger muskie	Fingerling
	250,000	Walleye	Fingerling
1995	5,500	Brown trout	Fingerling
	25,400	Tiger muskie	Fingerling
	253,440	Walleye	Fingerling
1996	7,414	Rainbow trout	Fingerling
	25,000	Tiger muskie	Fingerling
1997	95	Gizzard shad	Adult
	1,969	Rainbow trout	Catchable
	239,503	Walleye	Fingerling
1998	516	Gizzard shad	Adult
	22,819	Rainbow trout (S)	Fingerling
	37,130	Tiger muskie	Fingerling
	250,000	Walleye	Fingerling
1999	522	Gizzard shad	Adult
	640	Muskellunge	Large fingerling
	2,000	Tiger muskie	Large fingerling
2000	493	Gizzard shad	Adult
	14,867	Rainbow trout (C)	Fingerling
	39,162	Rainbow trout (M)	Fingerling
	40,000	Rainbow trout (S)	Fingerling
	2,600	Tiger muskie	Large fingerling
2001	48	Gizzard shad	Adult
	1,900	Tiger muskie	Large fingerling
2002	2,000	Tiger muskie	Large fingerling
	23	Gizzard shad	Adult

Appendix Table 6. Composite listing of sample data for black crappies collected by trap nets in the Belle Fourche Reservoir, 2000-2002.

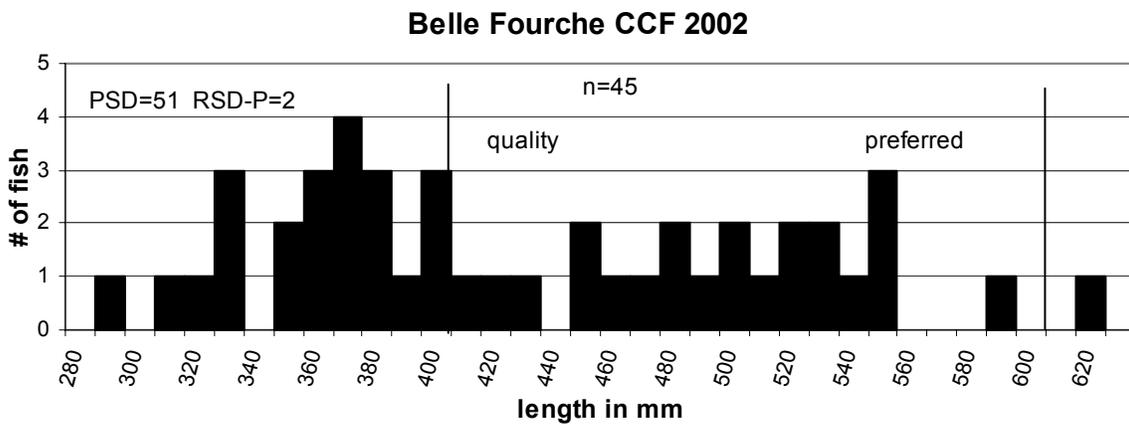
Year	N	CPUE	CPUE-S	PSD	RSD-P
2000	81	8.2 (6.9)	6.3 (5.4)	44 (11)	33 (10)
2001	47	5.9 (3.0)	5.8 (2.9)	87 (8)	9 (7)
2002	22	2.8 (1.9)	2.8 (1.9)	95 (7)	23 (15)



Appendix Figure 4. Length histogram of black crappies collected in trap nets from the Belle Fourche Reservoir, 2002.

Appendix Table 7. Composite listing of sample data for channel catfish collected by gill nets in the Belle Fourche Reservoir, 1999-2002.

Year	N	CPUE	CPUE-S	PSD	RSD-P
1999	34	5.7 (2.0)	NA	78 (12)	0 (na)
2000	54	13.5 (9.9)	11.3 (8.8)	69 (12)	2 (4)
2001	107	26.8 (10.3)	25.8 (9.6)	56 (8)	3 (3)
2002	45	22.5 (41.6)	22.5 (41.6)	51 (2)	2 (4)



Appendix Figure 5. Length histogram of channel catfish collected in gill nets from the Belle Fourche Reservoir, Butte County, 2002.

Appendix Table 8. Catch data for smallmouth bass collected by electrofishing from the Belle Fourche Reservoir, 2001 and 2002.

Year	N	CPUE	CPUE-S	PSD	RSD-P
2000	88	28.1 (28.1)	22.7 (23.8)	13 (8)	2 (4)
2001	120	69.7 (91.6)	56.8 (73.5)	18 (6)	2 (2)

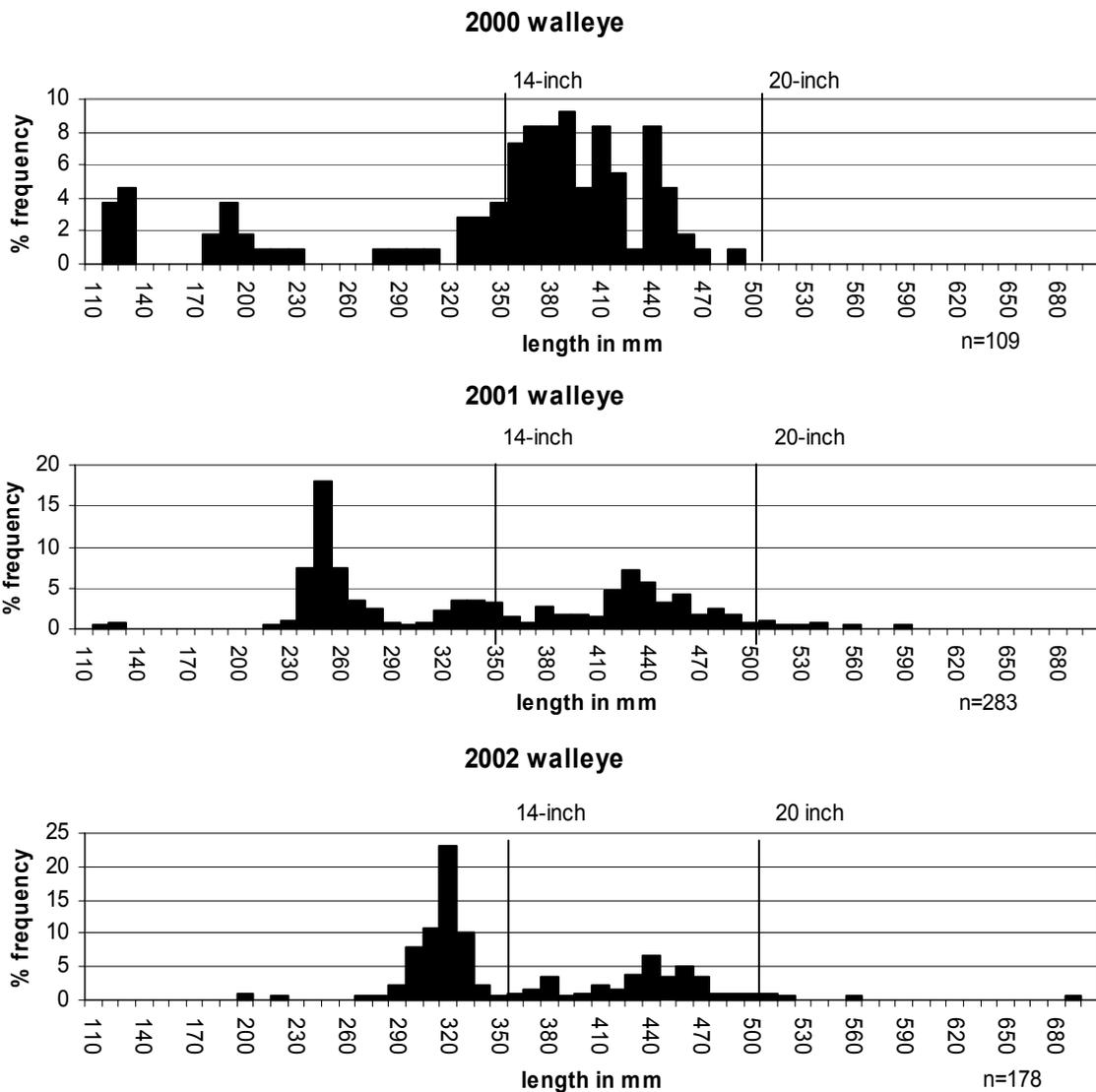
Appendix Table 9. Composite listing of sample data for walleye collected by gill nets in the Belle Fourche Reservoir, 1998-2002. Confidence intervals (80%) are given in parentheses.

Year	N	CPUE	CPUE-S	PSD	RSD-P
1998	87	9.6	NA	2	0

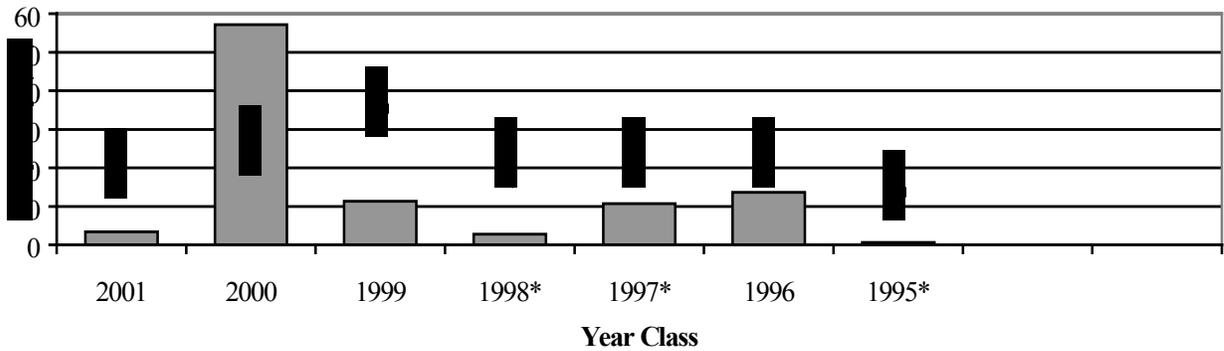
1999	133	22.2	NA	21 (6)	0
2000	109	27.3 (17.6)	22.3 (11.1)	65 (9)	0 (na)
2001	283	70.8 (33.2)	63.8 (31.3)	47 (5)	4 (2)
2002	178	89.0 (40.0)	87.5 (41.6)	38 (6)	3 (2)

Appendix Table 10. Orman Reservoir walleye year class, age in 2002, sample size (N), mean back-calculated total length at age, population standard error (SE), the Region 1 and South Dakota walleye mean length at ages (Willis et al. 2001).

Year Class	Age	N	Age						
			1	2	3	4	5	6	
2001	1	5	204						
2000	2	29	181	295					
1999	3	18	148	292	382				
1998	4	4	160	271	354	417			
1997	5	14	125	263	335	392	440		
1996	6	15	133	241	331	371	413	449	
Mean (SE)			159(12)	272(10)	351(12)	393(13)	426(14)	449(0)	
Region 1			164 (17)	260 (22)	332 (27)	385 (32)	444 (42)		
S.D. Mean			168 (3)	279 (6)	360 (7)	425 (8)	490 (9)		



Appendix Figure 6. Length frequency histogram for gillnet walleye from the Belle Fourche Reservoir, Butte County, 2000-2002.



Appendix Figure 7. Age frequency histogram by year class of walleye collected by gill net in Orman Reservoir, 2002. An “*” indicates years when walleye were stocked.

Appendix Table 11. Composite listing of sample data for yellow perch collected by 300-ft experimental gill nets in the Belle Fourche Reservoir, 1998-2002. (80% CI's in parentheses.)

Year	N	CPUE	CPUE-S	PSD	RSD-P
1998	31	3.4 (NA)			
1999	39	6.5 (1.3)			
2000	134	33.5 (17.4)	5.5 (2.5)	68 (17)	18 (14)
2001	37	9.3 (4.4)	2.3 (2.7)	46 (16)	25 (14)
2002	2	1.0 (3.1)	1.0 (3.1)	NA	NA

Appendix Table 12. Table Series 10: Preferences, Angler Satisfaction (CAS Program Output).

Table 10.03 Summary report--preference question responses totaled over selected strata.

Waterbody 1501 Belle Fourche Reservoir
 Work Period Totalled Over: 4, 5, 6, 7, 8, 9 -- April, May, June, July, August, September
 Day Type Totalled Over: 1,2 -- Weekend/Holiday, Weekday
 Type of Fishing Totalled Over: 1,2 -- Boat, Shore
 Question Considering all factors, how satisfied are you with your fishing trip today?
 Responses (n) 1,331

Answer Code	Answer Description	Count	Percent of Total (%)
1	Very Satisfied	577	43.35
2	Moderately Satisfied	456	34.26
3	Neutral	180	13.52
4	Moderately Dissatisfied	87	6.54
5	Very Dissatisfied	26	1.95
7	No Answer Recorded	5	0.38

Work Period Totalled Over: 4, 5, 6, 7, 8, 9 -- April, May, June, July, August, September
 Day Type Totalled Over: 1,2 -- Weekend/Holiday, Weekday
 Type of Fishing 1 Boat
 Question Considering all factors, how satisfied are you with your fishing trip today?
 Responses (n) 1,152

Answer Code	Answer Description	Count	Percent of Total (%)
1	Very Satisfied	545	47.31
2	Moderately Satisfied	381	33.07
3	Neutral	118	10.24
4	Moderately Dissatisfied	77	6.68
5	Very Dissatisfied	26	2.26
7	No Answer Recorded	5	0.43

Work Period Totalled Over: 4, 5, 6, 7, 8, 9 -- April, May, June, July, August, eptember
 Day Type Totalled Over: 1,2,3 -- Weekend/Holiday, Weekday
 Type of Fishing 2 Shore
 Question Considering all factors, how satisfied are you with your fishing trip today?
 Responses (n) 179

Answer Code	Answer Description	Count	Percent of Total (%)
1	Very Satisfied	32	17.88
2	Moderately Satisfied	75	41.90
3	Neutral	62	34.64
4	Moderately Dissatisfied	10	5.59

Appendix Table 13. Total number and percentage of resident and non-resident anglers by state at the Belle Fourche Reservoir, Butte County from April – September, 2002.

State	Count	Percent of Total	Percent of Non-residents
Alabama	2	0.15	3.39
Alaska	2	0.15	3.39
Arizona	4	0.30	6.78
Colorado	1	0.08	1.69
Idaho	4	0.30	6.78
Kansas	2	0.15	3.39
Nebraska	1	0.08	1.69
North Dakota	2	0.15	3.39
South Dakota	1,272	95.57	----
Texas	1	0.08	1.69
Washington	1	0.08	1.69
Wyoming	39	2.93	66.10
<i>Total</i>	<i>1,331</i>		