Waubay Lake, South Dakota
Angler Use and Harvest Surveys
December 2004 – August 2006

by

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Preface

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Executive Summary

For the last decade, Waubay Lake has been an important summer and winter fishery in northeastern South Dakota. Waubay Lake has become a destination spot for many anglers fishing in South Dakota with anglers commonly pursuing walleye, yellow perch, northern pike and black crappie. Because of the popularity of the Waubay Lake fishery the South Dakota Department of Game, Fish and Parks annually monitors the fishery by sampling the fish community and conducting angler use and harvest surveys. This report summarizes the findings of angler use and harvest surveys completed between December 2004 and August 2006.

Walleye were the most targeted species during the 2005 and 2006 summers and yellow perch were the most sought species during the 2004-05 and 2005-06 winters. Fishing pressure was similar during each summer, but substantially lower than that of previous summers. Wintertime fishing pressure remained high, but was lower than that of the previous winter. Between December 2004 and August 2006 an estimated $6.4 million were added to local economies as a result of the Waubay Lake summer and winter fisheries.

Nonresident anglers outnumbered resident anglers during the 2005 and 2006 summers when nonresidents comprised 66.5% and 56.8% of anglers fishing at Waubay Lake. Resident anglers encompassed greater than 63% of the anglers at Waubay Lake during the winter months. During both winter and summer, nonresident anglers were most likely to come from Minnesota followed by Iowa. Resident anglers were typically from Day County and the surrounding counties with the exception of Minnehaha County.

Walleyes were the primary species caught and harvested by anglers during the 2005 and 2006 summers. Walleye catch rates approximated 0.9 fish per hour fished during both summers. Although this is a relatively high catch rate, it is substantially less than that of the three previous summers when anglers caught in excess of two walleyes per hour fished. Anglers harvested 0.41 walleyes per hour during the 2005 summer and 0.25 walleyes per hour during 2006 summer. The total catch of walleyes each summer was less than that recorded during each of the three previous summers. In 2005 summer, 65,164 walleyes were caught and 29,147 harvested and during the 2006 summer, 59,093 walleyes were caught with 16,392 being harvested. The average walleye in the angler harvest was approximately 385 mm (15.2 inches). Catches of other species were rare during the summer months.

Yellow perch were the most caught and harvested species during the winter months. High catch rates of quality-size yellow perch have attracted anglers to Waubay Lake during the winter months. Anglers caught in excess of 100,000 yellow perch during each of the 2004-05 and 2005-06 winters and harvested approximately 100,0000 perch each winter period. Catch rates for yellow perch averaged 0.60 perch per hour during the 2004-05 winter and 0.81 during the 2005-06 winter. Although the catch rates remain good, they represent a decrease from that observed during the previous six winters when anglers caught in excess of one yellow perch per hour fished and greater than two perch per hour during some winters. Without significant yellow perch recruitment in the near future, yellow perch fishing will experience a drastic decline. Walleyes were common in the winter catch and harvest during both the 2004-05 and 2005-06 winter, but few of other species were caught.

Waubay Lake anglers favored making the one walleye over 508 mm (20 inches) a statewide regulation. Mixed responses were obtained from anglers when asked if they favored decreasing the daily walleye limit from four to three walleyes. The majority of interviewed anglers supported the reduction in panfish limits from 25 to 10 fish of each species. A high percentage of anglers were indifferent when asked about reducing the northern pike daily limit from six to three. Anglers tended to be satisfied with their fishing experience at Waubay Lake with greater than 60% of interviewed anglers stating that they were slightly satisfied to satisfied with their fishing trip. An increase in angler dissatisfaction over that of previous surveys was observed during the 2004-05 winter and 2006 summer. Anglers indicated that relaxation and catching fish were the two most important factors in defining a successful fishing trip.

Angler catch rates have declined in recent years for northern pike, black crappies, yellow perch, and walleyes. Declines in angler catch rates are the result of limited recruitment of these species in recent years. As angler catch rates decline, angler satisfaction will likely plummet and ultimately fishing pressure will decline to low levels. An increase in water level may stimulate recruitment of many of the species that have experienced declines in recent years.

Historic fishing pressure, catch and harvest rates and numbers of fish caught and harvested at Waubay Lake can be found in the appendices of this report.

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Waubay Lake, South Dakota
Angler Use and Harvest Surveys
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Waubay Lake has become a South Dakota summer and winter fishing destination. The recreation provided by Waubay Lake has been an economic benefit to northeastern South Dakota. In an effort to maintain the recreational fishery at Waubay Lake, the South Dakota Department of Game Fish and Parks (SDGFP) Commission has implemented several fish harvest regulations since 1998 to manage the Waubay Lake fish community. A walleye minimum length restriction of 406 mm (16 inches) with one walleye over 508 mm (20 inches) was enacted by the SDGFP Commission as an "Emergency Rule" in October 1998 and the regulation became law January 1, 1999. The SDGFP Commission as part of an "Emergency Rule" in October 2001 reduced yellow perch daily limit from 25 to 10 and the regulation became law for yellow perch, bluegill/sunfish, and crappies for waters in several northeast South Dakota counties on January 1, 2002. On January 1, 2003 the Waubay Lake walleye daily limit was decreased from four to two fish and on January 1, 2004 the walleye minimum length limit was reduced from 406 mm (16 inches) to 356 mm (14 inches).

Information concerning angler use and harvest is important in the ongoing fisheries management of the Waubay Lake fishery. Previous angler use and harvest surveys have been completed for the winters and summers between December 1996 and August 2004 (Blackwell 2005 and Blackwell and Hubers 2003). This report summarizes angler use and harvest surveys completed between December 2004 and August 2006.

Study Site

Waubay Lake is a meandered lake located in Day County, South Dakota. Waubay Lake presently encompasses four previously distinct water bodies. These water bodies include – North Waubay, South Waubay, Spring Lake, and Hillebrands. Water levels in these four lakes rose dramatically through the 1990's resulting in a single water body - Waubay Lake. Maximum depth of Waubay Lake exceeds 9.1 m (30 ft) and the surface area of Waubay Lake is 6,291 ha (15,540 acres) [North Waubay 3,916 ha (9,668 acres), South Waubay 1,285 ha (3,173 acres), Hillebrands 419 ha (1,034 acres), Spring Lake 674 ha (1,665 acres)]. Hillebrands and Spring Lake are contained within the boundaries of Waubay National Wildlife Refuge. Neither boating nor fishing is allowed within the Refuge boundaries during open-water periods, but fishing within the Refuge is allowed during the winter months.

Methods

A roving angler use and harvest survey with two-stage stratification was completed during winter (December through March) and summer (May through August). The first stratification unit was between weekdays and weekend days and the second stratification was for the time periods that the clerk was present. Because weekends typically receive increased fishing pressure most weekend days were represented in the survey. Time periods were randomly assigned to available days with weekdays and weekend days being treated separately when times were assigned.

The survey utilized instantaneous angler counts combined with angler interviews. Instantaneous angler counts provided fishing pressure estimates and angler interviews provided information necessary for estimating fish species catch rates, mean angler trip length, and mean party size. Two instantaneous counts of the total number of boats fishing and all shoreline anglers present were made each day during open-water periods and during ice cover all active ice shacks and open-ice anglers were counted. When counts were not being made, anglers were contacted and interviewed. Angler use and harvest estimates were computed using the Creel Application Software (CAS; Soupir and Brown 2002).

Additional questions asked during interviews were used to obtain angler primary residence, fish species targeted, and angler opinions. Total length (TL; mm) measurements from angler caught fish were recorded during the interview process.

The potential economic value of the Waubay Lake fishery was estimated by multiplying a daily angling expenditure of $61 times the estimated number of angler days. The average daily expenditure of $61 was derived from the reported total expenses of $182,480,000 for anglers fishing South Dakota in 2001 and divided by 2,984,000, the estimated number of days spent fishing in South Dakota in 2001 (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce Bureau of Census 2001).

Results and Discussion

Angler use and harvest surveys were completed during two winter and two summer periods (December 2004 – March 2005, May 2005 – August 2005, December 2005 – March 2006, and May 2006 – August 2006).

Summer

Fishing Pressure

Walleyes were the primary target species of anglers fishing at Waubay Lake during summer months (Table 1). Greater than 88% of interviewed summertime anglers targeted walleyes during summer surveys completed in 2005 and 2006 (Table 1). A high percentage of anglers have typically targeted walleyes while fishing at Waubay Lake during the summer months. Blackwell and Hubers (2003) reported that 55 to 86% of Waubay Lake summer anglers targeted walleyes during the summer months of 1997 through 2002. During the 2003 summer, 76% of anglers targeted walleyes and 97% of interviewed anglers targeted walleyes during the 2004 summer (Blackwell 2005). A small percentage of interviewed anglers indicated they were targeting anything, northern pike, black crappies, or yellow perch during both the 2005 and 2006 summers.

Summer fishing pressure was similar during 2005 (70,398 hours) and 2006 (65,029 hours; Table 2). Fishing pressure was greatest during May and June, but tapered off in July and August of each summer. The fishing pressure measured during these two summers represents a substantial decline from that of the previous seven summers when fishing pressure ranged from 111,723 hours (2001 summer) to 260,228 hours (1999 summer) (Blackwell 2005, Blackwell and Hubers 2003). Fishing pressure will likely remain at the level experienced during the 2005 and

2006 summers or possibly decrease in the next few years. The reduction in fishing pressure likely relates to a reduction in available walleye sizes and walleye abundance.

Greater than 90% of interviewed anglers fished from a boat during the 2005 and 2006 summers (Table 2). The percentage of anglers fishing from a boat has generally exceeded 90% during the last decade (Blackwell 2005, Blackwell and Hubers 2003). The average fishing party size during the summer at Waubay Lake has not deviated much in recent years. In 2005 and 2006 summers, each angling party had approximately 2.5 anglers (Table 2). This is similar to that reported for the summers 1997 through 2002 (Blackwell and Hubers 2003) and 2003 through 2004 (Blackwell 2005) when the overall average party size at Waubay Lake ranged from 2.3 to 2.5 anglers. The average trip length approximated 4 hours during the 2005 and 2006 summers (Table 2). This is similar to that reported for the 2004 summer, but is lower than that reported for the summers between 1998 and 2003 when average summertime trip lengths ranged from 4.79 hours (2003 summer; Blackwell 2005) to 5.7 hours (1999 summer; Blackwell and Hubers 2003). The reduced trip lengths may be related to the decrease in walleye daily limit to two walleyes in 2004. Anglers were able to catch and keep a daily limit of two walleyes in less time than they previously could a four walleye limit.

Although fishing pressure showed a decrease during the 2005 and 2006 summers from previous years, Waubay Lake remains an important summertime component of northeast South Dakota fisheries. The potential economic impact of the Waubay Lake fishery during the 2005 summer was $942,592 and in 2006 the potential impact was $1,012,575 (Table 2). These values were based on an average South Dakota angling expenditure of $61 per day (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce Bureau of Census 2001).

Angler Demographics

Nonresident anglers outnumbered resident anglers during the 2005 and 2006 summers (Table 2). Nonresident anglers comprised 66.5% of anglers at Waubay Lake during the 2005 summer and 56.8% during the 2006 summer. The percentage on nonresident anglers during these two summers was greater than that of previous summers. In previous summers, resident anglers have comprised from 53.7% (2004 summer; Blackwell 2005) to 89.6% (1997 summer; Blackwell and Hubers 2003) of the anglers at Waubay Lake. The highest percentage of nonresident anglers fished at Waubay Lake during the months of May and June of both the 2005 and 2006 summers when fishing pressure was the greatest.

Anglers from Minnesota and Iowa represented the majority of nonresident anglers fishing at Waubay Lake during the 2005 and 2006 summers (Table 3). In all previous summertime angler use and harvest surveys at Waubay Lake, Minnesota and Iowa have been the most common states of residency for nonresident anglers (Blackwell 2005, Blackwell and Hubers 2003).

Anglers from Day County, several surrounding counties (i.e., Brown, Codington, Grant, and Roberts), and Minnehaha County were common fishing participants at Waubay Lake during the 2005 and 2006 summers (Figure 1). Most resident anglers fishing Waubay Lake during these two summers originated from the eastern half of South Dakota.

Angler Catch and Harvest

Walleye

Walleye were the most sought fish species by anglers fishing Waubay Lake during the summer months (Table 1). Walleye catch rates were high during the 2005 and 2006 summers (Table 4), but not as high as during the 2002 through 2004 summers (Blackwell 2005). Anglers averaged catching approximately 0.9 walleyes per hour fished during the 2005 and 2006 summers. In the two prior summers (2003 and 2004), angler catch rates exceeded two walleyes per angler hour (Blackwell 2005). The number of walleyes caught was similar during the 2005 (65,164) and 2006 (59,093) summers (Table 5). Angler catch during these two summers was substantially less than that of the three previous summers when anglers caught in excess of 170,000 walleyes each summer with a peak of 313,990 during the 2003 summer (Blackwell 2005, Blackwell and Hubers 2003). The high walleye catch rates and total catch during these years were the result of the large 1999 walleye year class and a lack of available walleye prey (Blackwell and Hubers 2003).

Anglers harvested 0.41 walleyes per hour fished during the 2005 summer and 0.25 per hour during the 2006 summer (Table 4). Anglers harvested 29,147 walleyes during the 2005 summer and 16,392 during the 2005 summer (Table 5). Since the 2004 summer, walleye harvest has been higher than that during the period between 2001 and 2003. Much of the increased harvest can be attributed to a decrease in the walleye minimum length limit in 2004 and the high abundance of the 1999 year class. It appears that walleye abundance in Waubay Lake has decreased and it is likely that catch and harvest will subsequently decrease in upcoming years.

The average lengths of walleyes harvested during the 2005 and 2006 summers were 387 (15.2 inches) and 385 mm (15.2 inches), respectively (Figure 2). These values are similar to that reported for the 2004 summer when the average walleye in the angler creel was 384 mm (15.1 inches). Walleyes below the minimum length limit were observed in the angler creel during the 2006 summer, but appeared to be a minimal part of the overall harvest.

Yellow Perch

Yellow perch were rare in angler creel during the 2005 and 2006 summer. Both catch and harvest rates were less than 0.01 yellow perch per hour fished during 2005 summer and equaled 0.01 perch per hour during the 2006 summer (Table 4). Yellow perch summertime catch and harvest rates have continually decreased since the 2001 summer (Blackwell 2005 and Blackwell and Hubers 2003). Estimated total catch (177) and harvest (149) of yellow perch during the 2005 summer (Table 5) was the lowest recorded since the 1997 summer (115; Blackwell and Hubers 2003). Both estimated catch (772) and harvest (725) increased during the 2006 summer from that observed in 2005 summer, but remained well below that of the previous seven summers. The decrease in yellow perch in the angler catch is a result of limited perch recruitment since 2001.

Black Crappie

Angler catch and harvest of black crappies peaked during the 2001 and 2002 summers when anglers caught and harvested in excess of 13,000 crappies each summer (Blackwell and Hubers 2003). In the two summers that followed, anglers continued to catch and harvest moderate numbers of black crappies from Waubay Lake during the open-water periods.

However, in 2005 summer no black crappies were reported as being caught and in 2006 summer a mere 45 crappies was the estimated angler catch and harvest (Table 5). Until a black crappie year class is recruited, few crappies will be reported in the angler creel at Waubay Lake in future years.

Smallmouth Bass

Smallmouth bass were not abundant in the summertime angler creel. Waubay Lake has not been known as a smallmouth bass fishery, but it appears that the population abundance has increased. Smallmouth bass first became common in the angler catch during the 2003 summer (Blackwell 2005) and have continued to be present every summer since. Most smallmouth bass caught by anglers likely were incidental catch for anglers targeting walleyes.

Northern Pike

The presence of northern pike in the angler creel has substantially decreased during the last five years. From 1997 to 2001, anglers annually caught in excess of 11,000 northern pike from Waubay Lake (Blackwell and Hubers 2003). However, since 2001 the number of northern pike in the angler creel has declined each year, reaching an all-time low during the 2006 summer when anglers caught a meager 194 pike and harvested 102 (Table 5). In the 2005 and 2006 summers, anglers caught and harvested northern pike at a rate of 0.01 or less pike per hour (Table 4). The decrease in northern pike in the angler creel is related to the decrease in pike population abundance. Northern pike abundance prospered when Waubay Lake water levels were increasing, but their abundance subsequently declined as water levels stabilized and then began to recede. For the northern pike fishery to improve an increase in water level likely will be necessary.

Other Species

White bass, black bullheads, rock bass, bluegills, and common carp were reported as being caught by anglers during the summer months. None of these species were abundant in either 2005 or 2006 summers. White bass numbers continue to increase and it is likely that they will become an important component of the Waubay Lake fishery in future years.

Winter

Fishing Pressure

Yellow perch were the main target species for anglers fishing at Waubay Lake during the wintertime (Table 1). Yellow perch have been the primary target of ice anglers at Waubay Lake during the winter months since the 1997-98 winter (Blackwell 2005, Blackwell and Hubers 2003). Walleyes were the second most targeted species during the winter months of this survey with greater than 20% of interviewed anglers targeting walleyes (Table 1). Few anglers targeted anything, northern pike, or black crappies during the winter months (Table 1).

An estimated 184,593 hours were spent fishing at Waubay Lake during the 2004-05 winter and during the 2005-06 winter 144,060 hours were spent fishing at Waubay Lake (Table 2). Fishing pressure during the 2004-05 and 2005-06 winters was less than that observed during the 2003-04 winter (245,088 hours; Blackwell 2005), but would be classified as high. January represented the peak in winter fishing activity during both the 2004-05 and 2005-06 winters

(Table 2). Ice conditions generally become sufficient to allow vehicular traffic in January and may have resulted in the increase in fishing pressure observed during January.

Average party size for Waubay Lake winter anglers approximated two anglers per party during the 2004-05 and 2005-06 winters (Table 2). This is similar to that previously recorded for winters at Waubay Lake (Blackwell 2005, Blackwell and Hubers 2003). Mean trip length during the 2004-05 winter (4.79 hours) was the highest recorded at Waubay Lake since the 1997-98 winter (5.0 hours; Blackwell 2003) and probably relates to the observed decrease in yellow perch catch rates. In general, overall mean trip lengths have averaged slightly more than four hours in recent winters (Blackwell 2005, Blackwell and Hubers 2003). Most anglers fished from ice shacks and fishing pressure was greatest during the weekend/holiday days during the 2004-05 and 2005-06 winters (Table 2).

Waubay Lake is an important recreational and economic component of northeast South Dakota winters. In recent years, the Waubay Lake winter fishery has provided more angling hours than the summer months. The potential economic impact of the Waubay Lake fishery during the 2004-05 winter was $2,244,764 and during the 2005-06 winter the potential impact was $2,150,394 (Table 2). These values are based on an average South Dakota angling expenditure of $61 per day (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce Bureau of Census 2001).

Angler Demographics

Contrary to recent open-water periods, resident anglers comprise the majority of anglers fishing at Waubay Lake during the winter months (Table 3). Greater than 63% of interviewed anglers indicated that they were residents of South Dakota during the 2004-05 and 2005-06 winters. Resident anglers have comprised the majority of wintertime anglers at Waubay Lake during the last decade (Blackwell 2005, Blackwell and Hubers 2003). Nonresident anglers fishing Waubay Lake during the winter were most likely to come from Minnesota followed by Iowa and Nebraska (Table 3).

Most resident winter anglers fishing at Waubay Lake during the 2004-05 and 2005-06 winters originated from Day County and the adjacent counties (Figure 1). Outside of northeastern South Dakota, anglers from Minnehaha County were the most common. No anglers from western South Dakota were interviewed during the recent winter surveys.

Angler Catch and Harvest

Walleye

Walleye were common during both the 2004-05 and 2005-06 winters. Anglers averaged 0.2 walleyes per hour fished during the 2004-05 winter and 0.3 walleyes per hour during the 2005-06 winter (Table 4). Walleyes were harvested at a rate of 0.06 fish per hour during both the 2004-05 and 2005-06 winters (Table 4). The 2004-05 and 2005-06 winter catch rates were similar to those of the four previous winters (Blackwell 2005, Blackwell and Hubers 2003). Walleye wintertime catch rates peaked during the 2003-04 winter at 0.7 fish per hour and the harvest rate during the 2003-04 winter was the highest recorded at 0.2 fish per hour (Blackwell 2005). The high catch rates of the last six winters were likely the result of the large 1999 walleye year class (Blackwell and Hubers 2003).

Anglers caught an estimated 37,145 walleyes during the 2004-05 winter and 43,333 during the 2005-06 winter (Table 5). The highest numbers of walleyes were caught during January of each winter period (Table 5) when fishing pressure peaked (Table 3). Of the walleyes caught, 11,868 were estimated to be harvested during the 2004-05 winter and 9,450 were harvested during the 2005-06 winter (Table 5). The numbers of walleyes caught and harvested peaked during the 2003-04 winter when anglers caught 171,262 walleyes and harvested 49,184 walleyes (Blackwell 2005). Walleye harvest during the last three winters has been higher than during any previous winters. As was discussed for the summertime, much of the increased harvest can be attributed to a decrease in the walleye minimum length limit in 2004 and the high abundance of the 1999 year class. However, it does appear that walleye abundance in Waubay Lake has decreased and it is likely that catch and harvest will subsequently decrease in upcoming years.

The average lengths of walleyes harvested during the 2004-05 and 2005-06 winters were identical at 384 mm (15.1 inches; Figure 2). This value is similar to that reported for the 2005 and 2006 summers. Length frequency histograms of harvested walleyes were similar during these two winters and those of walleyes harvested during the 2005 and 2006 summers. Most of the walleyes harvested were between 356 and 420 mm (14 and 16.5 inches). Walleyes below the minimum length limit were observed in the angler creel during the 2004-05 winter, but harvest of sub-legal walleyes appeared to be minimal.

Yellow Perch

As in previous winters, yellow perch were the primary target of most winter anglers at Waubay Lake during the 2004-05 and 2005-06 winters (Table 1). Yellow perch catch rates remained relatively high during these two winters averaging 0.60 perch per hour during the 2004-05 winter and 0.81 perch per hour during the 2005-06 winter (Table 4). The highest catch rates were recorded during December of each winter. Yellow perch harvest rates were slightly less than observed catch rates (Table 4), but in general most perch that were caught were harvested likely because of their size. Catch rates, although good, were down from that experienced during the six previous winters when anglers caught greater than one yellow perch per hour fished and often greater than two fish per hour (Blackwell 2005, Blackwell and Hubers 2003).

Anglers caught in excess of 100,000 yellow perch during each of the 2004-05 and 2005-06 winters and harvest approximated 100,000 perch each winter (Table 5). The catch and harvest during these two winters represents a substantial decline from the previous three winters when anglers caught in excess of 200,000 yellow perch each winter and harvest exceeded 200,000 during two of the three winters (Blackwell 2005, Blackwell and Hubers 2003). Blackwell and Hubers (2003) cautioned that reductions in yellow perch catch and harvest following the 2002-03 winter should be expected because of several years of poor perch recruitment. Blackwell (2005) reaffirmed this statement and it remains relevant in that a downward trend in yellow perch fishing has occurred and further declines can be expected until perch recruitment occurs of a magnitude to provide a substantial fishery.

The majority of harvested yellow perch ranged in length from 21 to 29 cm (8.3 to 11.4 inches) during the 2004-05 and 2005-06 winters (Figure 3). The average yellow perch in the angler creel during these winters was approximately 26 cm (10.2 inches) and is similar to that observed during the 2002-03 and 2003-04 winters (Blackwell 2005).

Black Crappie

Black crappies were caught during both the 2004-05 and 2005-06 winters, but in relatively low numbers. Catch and harvest rates for black crappies average less than 0.01 fish per hour during each winter (Table 4). During the 2004-05 winter, black crappies were only recorded in the angler creel during February and only in March of the 2005-06 winter. Anglers harvested all of the estimated 1,528 black crappies that were caught during the 2004-05 winter and all of the estimated 456 crappies that were caught during the 2005-06 winter (Table 5).

Smallmouth Bass

No smallmouth bass were reported as being caught during the 2004-05 and 2005-06 winters.

Northern Pike

The abundance of northern pike in the winter angler creel has continued to decrease since peaking in the 1999-00 winter when anglers caught an estimated 21,564 pike (Blackwell and Hubers 2003). The winters of 2004-05 and 2005-06 represent the lowest northern pike catch and harvest since angler use and harvest surveys were implemented on Waubay Lake. During the 2004-05 winter, anglers caught 669 northern pike and harvested 563 pike and in the 2005-06 winter, 66 northern pike were caught and harvested by anglers fishing Waubay Lake (Table 5). Until northern pike recruitment improves, few northern pike will be part of the angler catch at Waubay Lake.

Other Species

No other species were reported as being caught during the 2004-05 and 2005-06 winters.

Angler Opinions

Waubay Lake anglers favored making the one walleye over 508 mm (20 inches) a statewide regulation (Table 6). When asked if they favored a reduction in the statewide walleye daily walleye limit from four to three fish responses were mixed (Table 7). More open-water anglers were opposed (41.1%) to a reduction in the walleye limit than were ice anglers (35.2%). When anglers were asked during the 2003-04 winter what an acceptable daily walleye limit was, a majority (56%) indicated that a four fish walleye limit was satisfactory, 14% favored three fish, and 26% believed a two walleye daily limit was acceptable (Blackwell 2005).

Most Waubay Lake anglers favored reducing the panfish daily limit from 25 to 10 fish when asked during the 2005 summer and 2005-06 winter (Table 8). A higher percentage of wintertime anglers (84%) favored the reduction than during the summer (52%) when 37% of anglers did not have an opinion. This is likely the result of most wintertime anglers at Waubay Lake targeting yellow perch. Since its inception, the 10 fish panfish limit has been popular with

northeast South Dakota anglers. During the 2002-03 winter, 78% of Waubay Lake anglers said they supported the reduction in panfish limits (Blackwell 2005).

Waubay Lake anglers tended to favor a reduction in northern pike daily limit from six to three fish (Table 9). However, a third of the anglers during the 2005 summer and almost half of the anglers during the 2005-06 winter were neutral concerning a reduction of the northern pike daily limit. This angler indifference combined with the fact that few anglers target northern pike indicate that angler interest in northern pike has diminished since the late 1990's when northern pike were a mainstay of the Waubay Lake fishery.

Relaxation and catching fish were the two most common responses during the 2004-05 winter and the 2006 summer when anglers were asked what the most important factor in defining a successful fishing trip was (Table 10). Anglers were generally satisfied (>60%) with their fishing trip at Waubay Lake during the 2004-05 winter and 2006 summer (Table 11). In past surveys, greater than 75% of interviewed anglers indicated that they were satisfied with their fishing trip at Waubay Lake (Blackwell 2005, Blackwell and Hubers 2003). Twenty-six percent of interviewed anglers indicated that they were dissatisfied with their trip during the 2004-05 winter and 16% were dissatisfied during the 2006 summer. The percent of anglers dissatisfied with their trip during this survey represents an increase from previous surveys when the percentage of dissatisfied anglers ranged from 6.2% (2004 summer) to 15.9% (2003-04 winter; Blackwell 2005). Catching fish is important to anglers when they evaluate the success of their fishing trip. Blackwell (2005) hypothesized that it was likely that the percentage of anglers dissatisfied with their angling trip at Waubay Lake would increase because of a lack of sport fish recruitment resulting in decreased angler catch rates. This statement continues to have merit and if angler catch rates continue to decline, angler satisfaction will also decline.

Table 1. Primary target species (percentage) by month and overall period (winter = December – March and summer = May – August) for anglers fishing at Waubay Lake, South Dakota from December 2004 through August 2006. Abbreviations for species are as follow northern pike (NOP), black crappie (BLC), yellow perch (YEP), walleye (WAE), and other species (Others).

		Target species (%)					
Year	Month	Any	NOP	BLC	YEP	WAE	Other
2004	December	5.9	1.0	0.0	57.4	35.6	0.0
2005	January	3.7	0.0	0.0	75.0	21.3	0.0
	February	6.4	0.8	0.8	58.7	33.3	0.0
	March	2.9	2.9	2.9	60.8	30.4	0.0
	Overall	4.7	0.8	0.6	65.6	28.3	0.0
2005	May	2.2	0.0	3.3	0.0	94.4	0.0
	June	1.1	1.1	0.0	0.0	96.6	0.0
	July	7.9	0.0	0.0	18.4	73.7	0.0
	August	9.9	0.0	0.0	0.0	90.9	0.0
	Overall	3.0	0.4	1.3	3.5	91.8	0.0
2005	December	7.4	1. 5	0.0	64.7	26.4	0.0
2006	January	3.1	0.7	0.0	64.1	32.1	0.0
	February	3.5	0.0	0.0	69.4	27.1	0.0
	March	2.8	1.4	0.4	84.5	10.6	0.0
	Overall	3.8	0.9	0.2	72.1	23.0	0.0
2006	May	14.9	0.0	3.0	0.0	80.6	1.5
	June	3.7	0.0	0.7	0.7	94.9	0.0
	July	11.1	2.2	2.2	2.2	82.2	0.0
	August	4.8	0.0	0.0	9.5	81.0	4.8
	Overall	7.8	0.4	1.5	1.5	88.1	1.1

Table 2. Monthly (May – August) and total by survey period (winter = December – March and summer = May - August), number of angler interviews (# Int), estimated open-water angling hours, estimated angler days, estimated economic value (Eco Value), estimated trip length (hours), average party size, percent of interviewed anglers that were South Dakota (SD) residents, percent of angling activity by boat (B) or ice shack (S) and percent of angling activity that occurred during weekend/holidays (WE/H) at Waubay Lake, South Dakota. One standard error is provided in parentheses when calculated.

Year	Month	# Int	Angler hours	Angler Days	Eco Value ($)	Trip Length (h)	Party Size	% SD	% B or S	% WE/H
2004	December	101	19,527 (8,239)	4,489	273,827	4.35 (1.39)	1.97 (1.61)	69.3	85.5	5.1
2005	January	218	82,971 (22,072)	16,463	1,004,213	5.04 (4.28)	1.87 (1.38)	68.1	90.3	83.2
	February	126	58,744 (15,028)	10,111	616,761	5.81 (5.67)	1.98 (2.22)	62.7	67.4	64.7
	March	69	23,350 (4,464)	5,737	349,963	4.07 (1.19)	2.54 (3.25)	39.1	70.9	49.6
	Total	514	184,593 (28,299)	36,799	2,244,764	4.79 (1.77)	2.08 (0.99)	63.1	80.1	64.8
2005	May	91	26,102 (10,086)	5,946	362,693	4.39 (0.87)	2.66 (1.98)	24.4	92.4	51.1
	June	92	27,356 (4,058)	5,973	364,348	4.58 (---)	2.56 (0.43)	29.7	94.4	36.5
	July	40	11,321 (1,561)	2,795	170,514	4.05 (---)	2.36 (0.53)	57.9	94.2	51.6
	August	11	5,619 (864)	1,886	115,020	2.98 (---)	2.18 (---)	54.6	98.3	31.8
	Total	234	70,398 (11,018)	16,600	1,012,575	4.00 (0.22)	2.44 (0.53)	33.5	93.9	44.0
2005	December	68	19,399 (6,286)	5,105	311,405	3.80 (1.10)	2.20 (1.99)	76.5	72.2	19.5
2006	January	132	54,728 (19,171)	12,135	740,224	4.51 (3.23)	2.15 (1. 76)	54.2	83.8	87.4
	February	85	31,556 (4,797)	8,071	492,306	3.91 (0.47)	1.91 (1.18)	74.1	83.6	53.0
	March	143	38,376 (8,960)	9,942	606,460	3.86 (3.58)	1.80 (2.66)	65.5	54.2	41.6
	Total	428	144,060 (22,591)	35,252	2,150,394	4.02 (1.27)	2.02 (1.00)	65.5	74.3	58.5
2006	May	68	35,376 (11,046)	8,189	499,522	4.32 (1.34)	2.62 (0.95)	35.8	84.5	70.1
	June	139	21,513 (5,635)	5,003	305,184	4.30 (0.79)	2.56 (0.53)	37.0	96.0	40.5
	July	44	3,940 (1,187)	1,251	76,298	3.15 (0.53)	2.48 (0.53)	60.5	99.3	47.8
	August	21	4,200 (1,729)	1,010	61,587	4.16 (--)	2.57 (--)	71.4	98.5	35.0
	Total	272	65,029 (12,576)	15,452	942,592	3.98 (0.41)	2.56 (0.30)	43.2	90.1	56.7

Table 3. Home state residence (percentage) of anglers fishing (winter = December – March and summer = May – August) at Waubay Lake, South Dakota from December 2004 through August 2006.

	Percentage (%) of anglers			
State	2004-05	2005	2005-06	2006
South Dakota	63.1	33.5	65.5	43.2
Alaska	0.0	0.0	0.2	0.0
California	0.0	0.4	0.0	0.0
Colorado	0.0	0.9	0.0	1.1
Illinois	0.0	0.9	0.0	0.4
Iowa	5.5	17.8	5.6	19.2
Kansas	0.0	0.4	0.0	0.4
Minnesota	23.6	36.5	20.4	21.4
Missouri	0.0	0.0	0.0	0.4
Montana	0.0	0.4	0.0	0.0
Nebraska	2.2	4.4	6.6	4.1
North Dakota	1.6	3.0	0.2	4.9
Washington	0.2	0.0	0.0	0.0
Wisconsin	3.9	1.7	1.4	4.9

Table 4. Estimated angler catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for all anglers by species, month and total period (winter = December – March and summer = May – August) at Waubay Lake, South Dakota between December 2004 and August 2006. Standard errors of estimates are provided in parentheses where they could be calculated. Abbreviations for species are as follow walleye (WAE), yellow perch (YEP), black crappie (BLC), smallmouth bass (SMB), northern pike (NOP), and other species (Others).

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Month	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2004	December	0.23 (0.31)	0.09 (1.38)	1.00 (1.51)	0.80 (1.25)	0	0	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0
2005	January	0.21 (0.10)	0.06 (0.03)	0.62 (0.35)	0.55 (0.31)	0	0	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0
	February	0.16 (0.08)	0.05 (0.034)	0.45 (0.30)	0.44 (0.30)	0.03 (0.03)	0.03 (0.03)	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0
	March	0.22 (0.11)	0.11 (0.05)	0.55 (0.32)	0.47 (0.28)	0	0	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0
	Total	0.20 (0.06)	0.06 (0.02)	0.60 (0.23)	0.53 (0.21)	<0.01 (<0.01)	<0.01 (<0.01)	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0
2005	May	0.27 (0.28)	0.12 (0.13)	0	0	0	0	0	0	<0.01 (<0.01)	<0.01 (<.01)	0	0
	June	1.08 (0.80)	0.52 (0.40)	<0.01 (0.01)	<0.01 (<0.01)	0	0	0.02 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0	0
	July	2.24 (2.01)	0.96 (1.00)	<0.01 (<0.01)	<0.01 (<0.01)	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0.02 (0.02)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
	August	0.77 (0.33)	0.15 (0.14)	0	0	0	0	0	0	0.10 (0.04)	0.07 (0.02)	0	0
	Total	0.93 (0.48)	0.41 (0.23)	<0.01 (<0.01)	<0.01 (<0.01)	0	0	0.01 (<0.01)	<0.01 (<0.01)	0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
2005	December	0.63 (0.52)	0.10 (0.07)	1.32 (0.96)	1.23 (0.92)	0	0	0	0	<0.01 (0)	<0.01 (0)	0	0
2006	January	0.33 (0.21)	0.06 (0.03)	0.62 (0.38)	0.56 (0.35)	0	0	0	0	0	0	0	0
	February	0.19 (0.06)	0.05 (0.01)	0.54 (0.17)	0.47 (0.16)	0	0	0	0	0	0	0	0
	March	0.17 (.08)	0.06 (0.03)	1.05 (0.44)	0.88 (0.37)	0.01 (0.01)	0.01 (0.01)	0	0	0	0	0	0
	Total	0.30 (0.10)	0.06 (0.01)	0.81 (0.22)	0.71 (0.20)	<0.01 (<0.01)	<0.01 (<0.01)	0	0	<0.01 (<0.01)	<0.01 (<0.01)	0	0

Table 4. Continued.

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Month	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2006	May	1.06 (0.74)	0.32 (0.16)	<0.01 (<0.01)	<0.01 (<0.01)	0	0	0.02 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.04 (0.05)	0.02 (0.01)
	June	0.85 (0.51)	0.20 (0.13)	0.01 (<0.01)	0.01 (<0.01)	<0.01 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
	July	0.33 (0.36)	0.09 (0.11)	0.02 (0.02)	0.02 (0.02)	0	0	0.02 (0.02)	0	<0.01 (<0.01)	0	0.02 (0.02)	<0.01 (<0.01)
	August	0.52 (0.29)	0.07 (0.03)	0.06 (0.02)	0.06 (0.02)	0	0	0.02 (0.02)	0	0	0	0.06 (0.09)	0.04 (--)
	Total	0.91 (0.42)	0.25 (0.09)	0.01 (<0.01)	0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.02 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.03 (0.02)	<0.01 (<0.01)

Table 5. Estimated angler catch (C) and harvest (H) by month and total period (winter = December – March and summer = May – August) for walleye (WAE), yellow perch (YEP), black crappie (BLC), smallmouth bass (SMB), northern pike (NOP), and other species (Others) at Waubay Lake, South Dakota between December 2004 and August 2006. Standard errors of estimates are provided in parentheses where they could be calculated.

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Month	C	H	C	H	C	H	C	H	C	H	C	H
2004	December	4,439 (2,752)	1,777 (1,107)	19,500 (14,076)	15,716 (11,966)	0	0	0	0	132 (78)	105 (69)	0	0
2005	January	17,826 (5,454)	4,713 (1,507)	51,362 (16,626)	45,498 (15,129)	0	0	0	0	239 (89)	189 (86)	0	0
	February	9,630 (2,914)	2,792 (1,137)	26,781 (5,949)	25,771 (5,929)	1,528 (1,737)	1,528 (1.737)	0	0	157 (44)	128 (40)	0	0
	March	5,249 (1,913)	2,586 (961)	12,947 (5,233)	10,997 (4,629)	0	0	0	0	140 (120)	140 (120)	0	0
	Total	37,145 (7,034)	11,868 (2,390)	110,591 (23,180)	97,982 (20,704)	1,528 (1,737)	1,528 (1,737)	0	0	669 (174)	563 (167)	0	0
2005	May	5,921 (3,796)	3,251 (1,593)	0	0	0	0	0	0	28 (25)	28 (25)	0	0
	June	29,570 (19,791)	14,172 (9,932)	83 (81)	55 (52)	0	0	672 (27)	215 (0)	102 (59)	77 (53)	0	0
	July	25,349 (18,926)	10,899 (9,794)	93 (51)	93 (51)	0	0	97 (34)	50 (14)	280.0 (274)	47.0 (22.0)	70 (40)	23 (0)
	August	4,324 (1,120)	826 (628)	0	0	0	0	0	0	566 (180)	397 (120)	0	0
	Total	65,164 (27,668)	29,147 (14,053)	177 (95)	149 (72)	0	0	769 (43)	266 (14)	976 (334)	548 (135)	70 (40)	23 (0)
2005	December	12,389 (6,923)	2,101 (174)	25,698 (6,089)	23,907 (5,880)	0	0	0	0	66 (0)	66 (0)	0	0
2006	January	18,360 (6,887)	3,395 (1,128)	34,311 (13,471)	30,958 (11,941)	0	0	0	0	0	0	0	0
	February	6,009 (1,034)	1,596 (313)	17,176 (4,481)	14,942 (4,210)	0	0	0	0	0	0	0	0
	March	6,573 (2,350)	2,356 (898)	40,652 (9,506)	33,834 (7,832)	456 (370)	456 (370)	0	0	0	0	0	0
	Total	43,333 (10,097)	9,450 (1,486)	117,838 (18,138)	103,632 (16,008)	456 (0)	456 (0)	0	0	66 (0)	66 (0)	0	0

Table 5. Continued.

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Month	C	H	C	H	C	H	C	H	C	H	C	H
2006	May	37,384 (12,431)	11,385 (3,140)	154 (79)	154 (79)	0	0	696 (273)	96 (58)	96 (49)	58 (36)	1,436 (1,180)	566 (209)
	June	18,215 (5,368)	4,363 (1,508)	283 (194)	283 (194)	45 (44)	45 (44)	117 (49)	0	72 (33)	45 (22)	85 (66)	57 (49)
	July	1,294 (641)	347 (190)	91 (24)	66 (9)	0	0	75 (65)	0	25 (32)	0	74 (61)	8 (10)
	August	2,200 (548)	297 (86)	244 (25)	222 (0)	0	0	96 (25)	0	0	0	274 (112)	163 (--)
	Total	59,093 (13,566)	16,392 (3,489)	772 (213)	725 (210)	45 (44)	45 (44)	984 (286)	96 (58)	194 (68)	102 (42)	1,868 (1,188)	794 (214)

Table 6. Waubay Lake, South Dakota angler responses, during the 2005 summer and 2005-06 winter, to the question: "What is your opinion on making the one walleye over 20 inches a statewide restriction?" n is the number of responses.

	Percent (%)	
Response	2005 (n=95)	2005-06 (n=128)
Strongly oppose	4.2	2.3
Somewhat oppose	7.4	0.8
Neutral	32.6	10.2
Somewhat favor	21.1	21.1
Strongly favor	34.7	65.6

Table 7. Waubay Lake, South Dakota angler responses, during the 2005 summer and 2005-06 winter, to the question: "What is your opinion on reducing the statewide daily walleye limit from 4 to 3?" n is the number of responses.

	Percent (%)	
Response	2005 (n=95)	2005-06 (n=128)
Strongly oppose	13.7	22.7
Somewhat oppose	27.4	12.5
Neutral	22.1	17.2
Somewhat favor	19.0	18.8
Strongly favor	17.9	28.9

Table 8. Waubay Lake, South Dakota angler responses, during the 2005 summer and 2005-06 winter, to the question: "What is your opinion on reducing the panfish limit from 25 to 10?" n is the number of responses.

	Percent (%)	
Response	2005 (n=65)	2005-06 (n=205)
Strongly oppose	4.6	4.4
Somewhat oppose	6.2	2.4
Neutral	36.9	8.8
Somewhat favor	16.9	21.0
Strongly favor	35.4	63.4

Table 9. Waubay Lake, South Dakota angler responses, during the 2005 summer and 2005-06 winter, to the question: "What is your opinion on reducing the statewide daily northern pike limit from 6 to 3?" n is the number of responses.

	Percent (%)	
Response	2005 (n=65)	2005-06 (n=205)
Strongly oppose	4.6	11.2
Somewhat oppose	10.8	3.4
Neutral	33.9	45.4
Somewhat favor	15.4	18.1
Strongly favor	35.4	22.0

Table 10. Waubay Lake, South Dakota angler responses, during the 2004-05 winter and 2006 summer, to the question: "What is the most important factor to you in defining a successful fishing trip?" n is the number of responses.

	Percent (%) by survey period	
Response	2004-05 (n=381)	2006 (n=267)
Relaxation	30.2	35.6
Harvesting fish	13.4	2.6
Participating	17.3	8.6
Catching fish	35.7	29.2
Being with others	3.2	13.5
Other	0.3	10.5

Table 11. Waubay Lake, South Dakota angler responses, during the 2004-05 winter and 2006 summer, to the question: "Considering all factors, how satisfied are you with your fishing trip today?" n is the number of responses.

	Percent (%)	
Response	2004-05 (n=389)	2006 (n=266)
Satisfied	52.4	47.8
Slightly satisfied	10.8	19.9
Neutral	10.5	16.5
Slightly dissatisfied	12.6	7.9
Dissatisfied	13.6	7.9

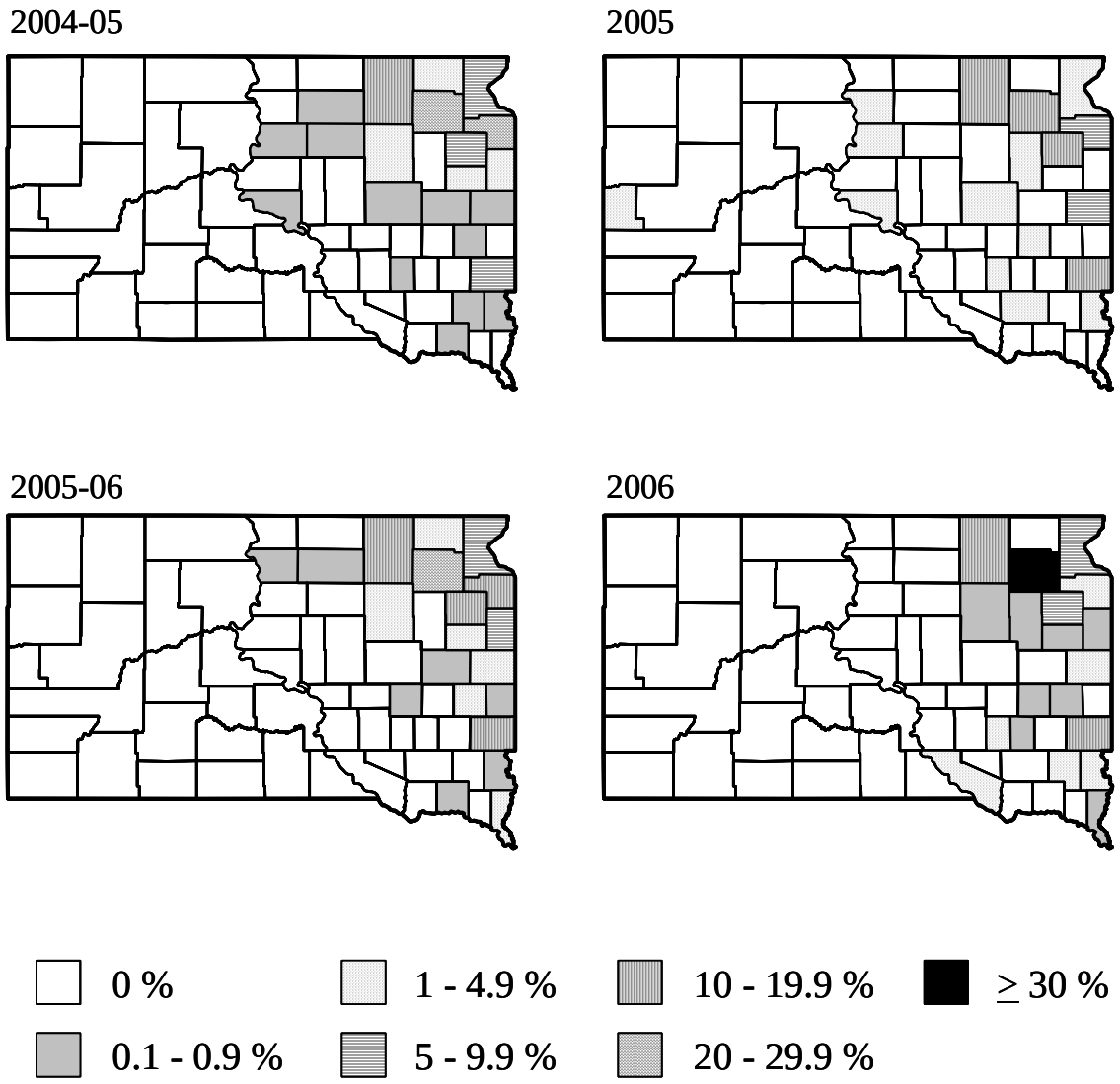

Figure 1. South Dakota county of residence for winter (December –March) and summer (May – August) resident anglers fishing Waubay Lake, South Dakota between December 2004 and August 2006.

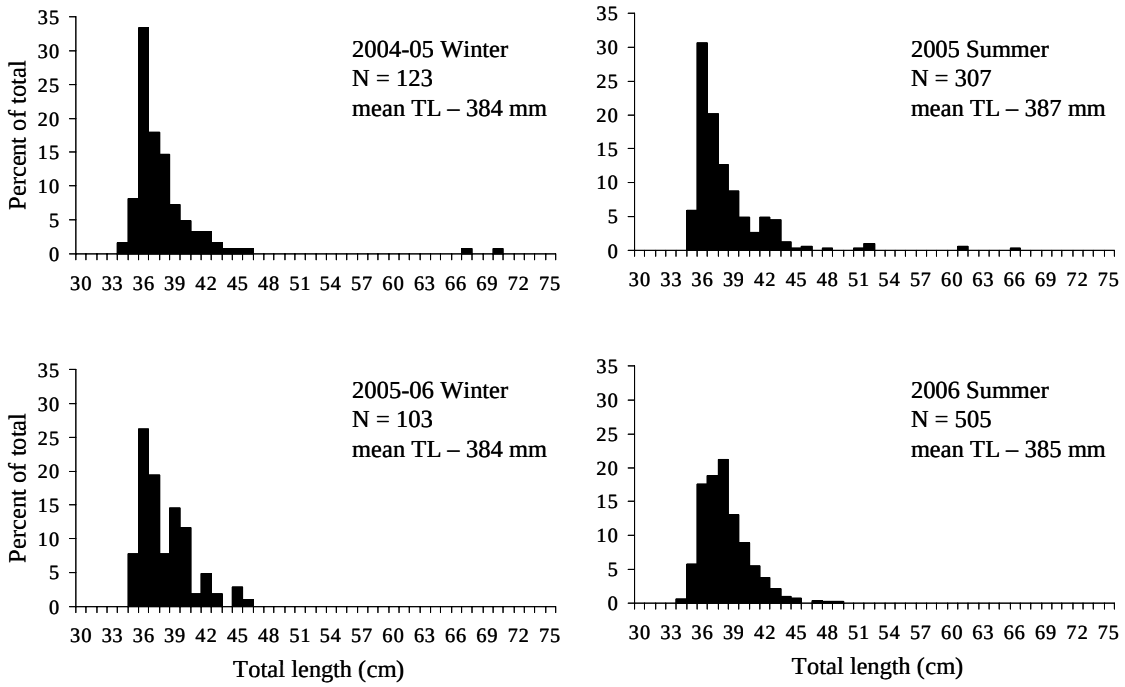

Figure 2. Length frequency histograms of walleyes harvested by anglers fishing Waubay Lake, South Dakota during winter (December –March) and summer (May –August) periods between December 2004 and August 2005, N is the total number of fish measured and the mean total length (TL; mm) is provided for each survey period.

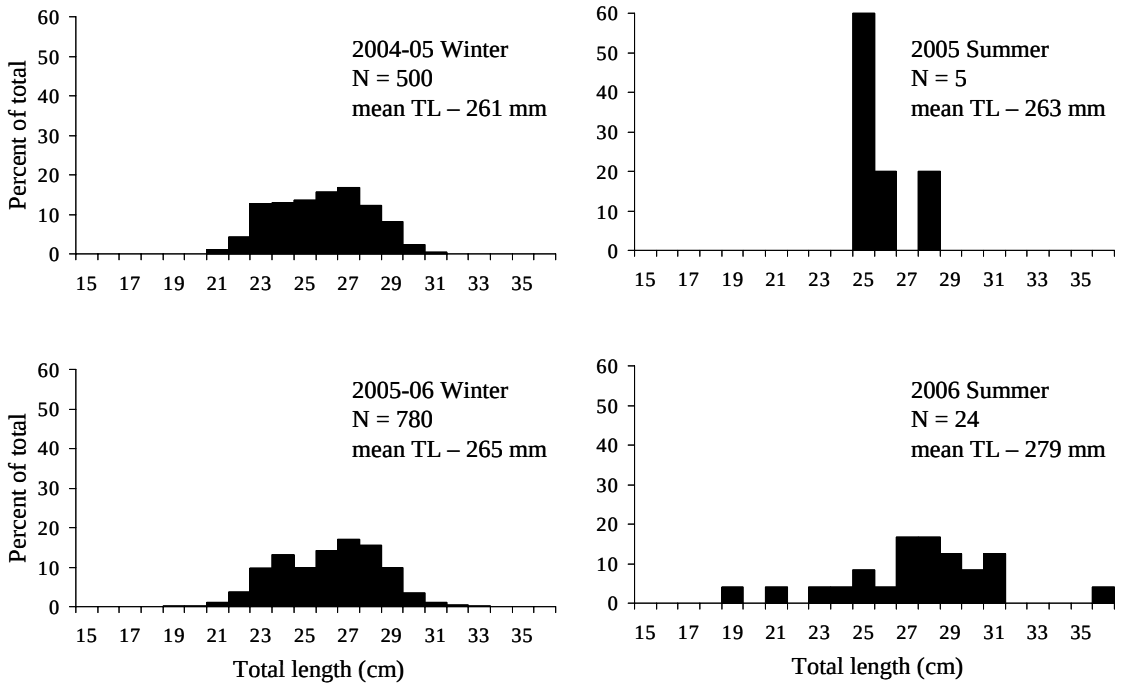

Figure 3. Length frequency histograms of yellow perch harvested by anglers fishing Waubay Lake, South Dakota during winter (December –March) and summer (May –August) periods between December 2004 and August 2006, N is the total number of fish measured and the mean total length (TL; mm) is provided for each survey period.

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Appendix A. Common and scientific names of fishes mentioned in this report.

Common name	Scientific name
Black crappie	*Pomoxis nigromaculatus*
Common carp	*Cyprinus carpio*
Northern pike	*Esox lucius*
Smallmouth bass	*Micropterus dolomieu*
Walleye	*Sander vitreus*
White bass	*Morone chrysops*
Yellow perch	*Perca flavescens*

Appendix B. Winter (December – March) and summer (May – August) number of angler interviews (# Int), estimated angling hours, estimated angler days, estimated trip length (h), average party size, percent of interviewed anglers that were South Dakota residents (% SD), percent of angling activity by boat or ice shack (%B or S) and percent of angling activity that occurred during weekend/holidays (%WE/H) at Waubay Lake, South Dakota. One standard error is provided in parentheses when calculated.

Year	Season	# Int	Angler hours	Angler Days	Trip Length (h)	Party Size	% SD	% B or S	% WE/H
1996-97 [a]	Winter	212	5,890	1,294	5.2	2.4	95.3	27.1	59.6
1997-98 [a]	Winter	688	19,935	4,150	5.0	1.0	88.1	20.0	54.5
1998-99 [a]	Winter	1,141	91,058	22,542	4.2	1.9	88.7	61.1	69.0
1999-00 [a]	Winter	792	82,172	19,497	4.4	2.5	77.6	57.9	58.1
2000-01 [a]	Winter	786	81,169	17,822	4.6	2.3	62.6	74.6	52.8
2001-02 [a]	Winter	768	115,486	34,990	3.8	2.0	68.6	66.3	57.0
2002-03 [b]	Winter	797	158,167 (13,176)	36,536	4.15 (0.85)	2.11 (0.91)	73.5	73.9	56.6
2003-04 [b]	Winter	778	245,088 (43,192)	54,088	4.33 (0.93)	2.05 (0.99)	71.4	76.8	73.1
2004-05 [c]	Winter	514	184,593 (28,299)	36,799	4.79 (1.77)	2.08 (0.99)	63.1	80.1	64.8
2005-06 [c]	Winter	428	144,060 (22,591)	35,252	4.02 (1.27)	2.02 (1.00)	65.5	74.3	58.5
1997 [a]	Summer	240	26,959	6,059	4.3	2.4	89.6	97.5	68.0
1998 [a]	Summer	660	117,764	21,675	5.4	2.4	85.3	97.9	43.1
1999 [a]	Summer	1,101	260,228	45,950	5.7	2.5	82.8	96.8	49.9
2000 [a]	Summer	657	174,526	32,944	5.3	2.5	65.0	86.7	41.5
2001 [a]	Summer	503	111,723	18,859	5.4	2.3	63.3	89.5	38.0
2002 [a]	Summer	629	139,769 (16,502)	26,238	5.22 (0.54)	2.51 (0.54)	59.5	91.9	54.2
2003 [b]	Summer	414	143,826 (9,809)	31,743	4.79 (0.37)	2.42 (0.79)	54.7	91.3	56.9
2004 [b]	Summer	647	121,922 (12,526)	29,585	4.15 (0.36)	2.48 (0.49)	53.7	93.4	46.8
2005 [c]	Summer	234	70,398 (11,018)	16,600	4.00 (0.22)	2.44 (0.53)	33.5	93.9	44.0
2006 [c]	Summer	272	65,029 (12,576)	15,452	3.98 (0.41)	2.56 (0.30)	43.2	90.1	56.7

a – Blackwell and Hubers (2003), b – Blackwell (2005), c – current report

Appendix C. Estimated winter (December – March) and summer (May – August) angler catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) of northern pike (NOP), yellow perch (YEP), walleye (WAE), and other species (Others) at Waubay Lake, South Dakota. One standard error is provided in parentheses when calculated.

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Season	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
1996-97 [a]	Winter	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.33	0.33	0.0	0.0
1997-98 [a]	Winter	0.17	0.11	0.42	0.39	0.0	0.0	0.0	0.0	0.17	0.15	0.0	0.0
1998-99 [a]	Winter	0.09	0.06	2.44	0.94	0.0	0.0	0.0	0.0	0.11	0.07	0.0	0.0
1999-00 [a]	Winter	0.12	0.04	2.43	1.47	0.0	0.0	0.0	0.0	0.26	0.15	0.0	0.0
2000-01 [a]	Winter	0.33	0.01	1.35	1.06	0.01	0.01	0.0	0.0	0.20	0.12	0.0	0.0
2001-02 [a]	Winter	0.42	0.02	1.76	1.28	<0.01	<0.01	0.0	0.0	0.06	0.05	0.0	0.0
2002-03 [b]	Winter	0.32 (0.07)	0.02 (<0.01)	1.86 (0.50)	1.36 (0.39)	0.0	0.0	0.0	0.0	0.04 (0.02)	0.02 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
2003-04 [b]	Winter	0.70 (0.31)	0.20 (0.10)	1.18 (0.55)	0.91 (0.42)	0.02 (0.02)	0.02 (0.01)	0.0	0.0	0.01 (<0.01)	0.01 (<0.01)	0.0	0.0
2004-05 [c]	Winter	0.20 (0.06)	0.06 (0.02)	0.60 (0.23)	0.53 (0.21)	<0.01 (<0.01)	<0.01 (<0.01)	0.0	0.0	<0.01 (<0.01)	<0.01 (<0.01)	0.0	0.0
2005-06 [c]	Winter	0.30 (0.10)	0.06 (0.01)	0.81 (0.22)	0.71 (0.20)	<0.01 (<0.01)	<0.01 (<0.01)	0.0	0.0	<0.01 (<0.01)	<0.01 (<0.01)	0.0	0.0
								0.0	0.0			0.0	0.0
1997 [a]	Summer	0.31	0.14	<0.01	<0.01	0.0	0.0	0.0	0.0	0.44	0.12	0.0	0.0
1998 [a]	Summer	0.52	0.35	0.44	0.17	0.0	0.0	0.0	0.0	0.24	0.04	0.0	0.0
1999 [a]	Summer	0.48	0.31	1.25	0.28	<0.01	<0.01	0.0	0.0	0.29	0.05	<0.01	0.0
2000 [a]	Summer	0.43	0.11	0.69	0.43	0.03	0.03	0.0	0.0	0.22	0.04	0.01	<0.01
2001 [a]	Summer	0.62 (0.51)	0.07 (0.07)	0.69 (0.46)	0.43 (0.26)	0.17 (0.13)	0.12 (0.10)	<0.01	<0.01	0.10 (0.10)	0.03 (0.03)	<0.01	<0.01
2002 [a]	Summer	1.22 (0.50)	0.06 (0.03)	0.34 (0.07)	0.25 (0.05)	0.15 (0.03)	0.14 (0.03)	<0.01	<0.01	0.05 (0.02)	0.01 (<0.01)	<0.01	<0.01
2003 [b]	Summer	2.18 (0.52)	0.05 (0.01)	0.13 (0.03)	0.10 (0.03)	0.05 (0.02)	0.05 (0.02)	0.02 (0.01)	<0.01 (<0.01)	0.02 (0.01)	0.01 (<0.01)	0.02 (0.01)	0.01 (0.01)
2004 [b]	Summer	2.30 (0.51)	0.38 (0.08)	0.07 (0.01)	0.06 (0.01)	0.03 (0.01)	0.03 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.01 (<0.01)	<0.01 (<0.01)	0.01 (0.01)	0.01 (0.01)
2005 [c]	Summer	0.93 (0.48)	0.41 (0.23)	<0.01 (<0.01)	<0.01 (<0.01)	0.0	0.0	0.01 (<0.01)	<0.01 (<0.01)	0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)
2006 [c]	Summer	0.91 (0.42)	0.25 (0.09)	0.01 (<0.01)	0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.02 (0.01)	<0.01 (<0.01)	<0.01 (<0.01)	<0.01 (<0.01)	0.03 (--)	<0.01 (<0.01)

a – Blackwell and Hubers (2003), b – Blackwell (2005), c – current report

Appendix D. Estimated winter (December – March) and summer (May – August) angler catch (C) and harvest (H) of northern pike (NOP), yellow perch (YEP), walleye (WAE), and other species (Others) at Waubay Lake, South Dakota. One standard error is provided in parentheses when calculated.

		WAE		YEP		BLC		SMB		NOP		Others	
Year	Season	C	H	C	H	C	H	C	H	C	H	C	H
1996-97 [a]	Winter	95	80	2	2	0	0	0	0	1,948	1,929	0	0
1997-98 [a]	Winter	3,451	2,100	8,326	7,688	0	0	0	0	7,342	6,775	0	0
1998-99 [a]	Winter	8,438	5,735	211,835	92,128	0	0	0	0	10,095	6,181	0	0
1999-00 [a]	Winter	9,738	3,501	199,795	121,152	0	0	0	0	21,564	12,596	0	0
2000-01 [a]	Winter	27,004	1,213	91,827	86,367	537	508	0	0	15,856	9,725	0	0
2001-02 [a]	Winter	48,344	1,805	203,815 (75,941)	148,062 (63,303)	94	94	0	0	9,771	5,438	0	0
2002-03 [b]	Winter	49,867 (7,862)	2,494 (497)	293,475 (45,972)	214,927 (38,808)	0	0	0	0	5,829 (886)	3,799 (562)	680 (757)	654 (757)
2003-04 [b]	Winter	171,262 (57,094)	49,184 (19,802)	288,838 (74,569)	222,323 (54,837)	4,745 (3,580)	4,429 (3,247)	0	0	2,665 (740)	1,830 (590)	0	0
2004-05 [c]	Winter	37,145 (7,034)	11,868 (2,390)	110,591 (23,180)	97,982 (20,704)	1,528 (1,737)	1,528 (1,737)	0	0	669 (174)	563 (167)	0	0
2005-06 [c]	Winter	43,333 (10,097)	9,450 (1,486)	117,838 (18,138)	103,632 (16,008)	456 (0)	456 (0)	0	0	66 (0)	66 (0)	0	0
1997 [a]	Summer	8,320	3,840	115	93	0	0	0	0	11,690	3,296	0	0
1998 [a]	Summer	61,643	41,172	51,435	19,797	0	0	0	0	28,689	4,800	0	0
1999 [a]	Summer	125,429	81,759	325,403	72,336	1,019	816	0	0	75,094	13,282	0	0
2000 [a]	Summer	75,067	19,961	149,669	68,035	5,891	5,136	0	0	24,075	4,916	0	0
2001 [a]	Summer	69,723 (31,625)	8,366 (5,122)	77,291 (34,128)	47,561 (17,971)	18,368 (11,929)	13,933 (8.924)	0	0	11,060 (6,896)	3,321 (2,176)	0	0
2002 [a]	Summer	170,116 (44,588)	8,404 (3,953)	47,722 (6,299)	34,932 (4,472)	20,542 (4,326)	19,892 (4,221)	0	0	6,407 (2,126)	1,569 (613)	0	0
2003 [b]	Summer	313,990 (54,955)	7,162 (1,253)	18,993 (4,104)	15,126 (3,309)	7,655 (2,855)	7,005 (2,513)	2,241 (898)	543 (292)	2,620 (561)	1,029 (410)	3,193 (1,163)	1,263 (691)
2004 [b]	Summer	280,553 (42,582)	45,964 (5,319)	8,369 (1,312)	7,364 (1,216)	3,604 (1,311)	3,471 (1,193)	461 (121)	209 (74)	1,101 (377)	341 (71)	1,627 (793)	1,105 (715)
2005 [c]	Summer	65,164 (27,668)	29,147 (14,053)	177 (95)	149 (72)	0	0	769 (43)	266 (14)	976 (334)	548 (135)	70 (40)	23 (0)
2006 [c]	Summer	59,093 (13,566)	16,392 (3,489)	772 (213)	725 (210)	45 (44)	45 (44)	984 (286)	96 (58)	194 (68)	102 (42)	1,868 (--)	794 (--)

a – Blackwell and Hubers (2003), b – Blackwell (2005), c – current report