

# Lake Norden

## Site Description

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### Location

Water designation number (WDN)	32-0002-00
Legal description	T113N-R53W Sec. 9, 15, 16, 17, 21
County (ies)	Hamlin
Location from nearest town	1 mile east and ½ mile north of Lake Norden, SD.

### Survey Dates and Sampling Information

Dates of current survey	August 14-15, 2007
Dates of most recent survey	September 28-October 7, 1993
Gill net sets (n)	4
Frame net sets (n)	10

### Morphometry (Figure 1)

Watershed area (acres)	75,830
Surface area (acres)	746
Maximum depth (ft)	8
Mean depth (ft)	6

### Ownership and Public Access

Lake Norden is a meandered lake owned by the State of South Dakota. The fish community is managed by the SDGFP. A single public access site is located on the southeast shore (Figure 1). The access area is located on School and Public Lands, and maintained by the SDGFP and the City of Lake Norden. The majority of lands adjacent to Lake Norden are owned by private individuals.

### Watershed and Land Use

The Lake Norden watershed is primarily comprised of agricultural lands. Lake homes and cabins are present on the southern end of the lake.

### Water Level Observations

On April 26, 2007 the water level of Lake Norden was 1656.4 fmsl (feet above mean sea level) an increase of two feet from the September 25, 2006 elevation of 1654.4 fmsl. By May 17, 2007 water levels had declined to 1655.5 fmsl. Fall water levels were similar to the spring with an elevation of 1655.2 fmsl recorded on October 30, 2007.

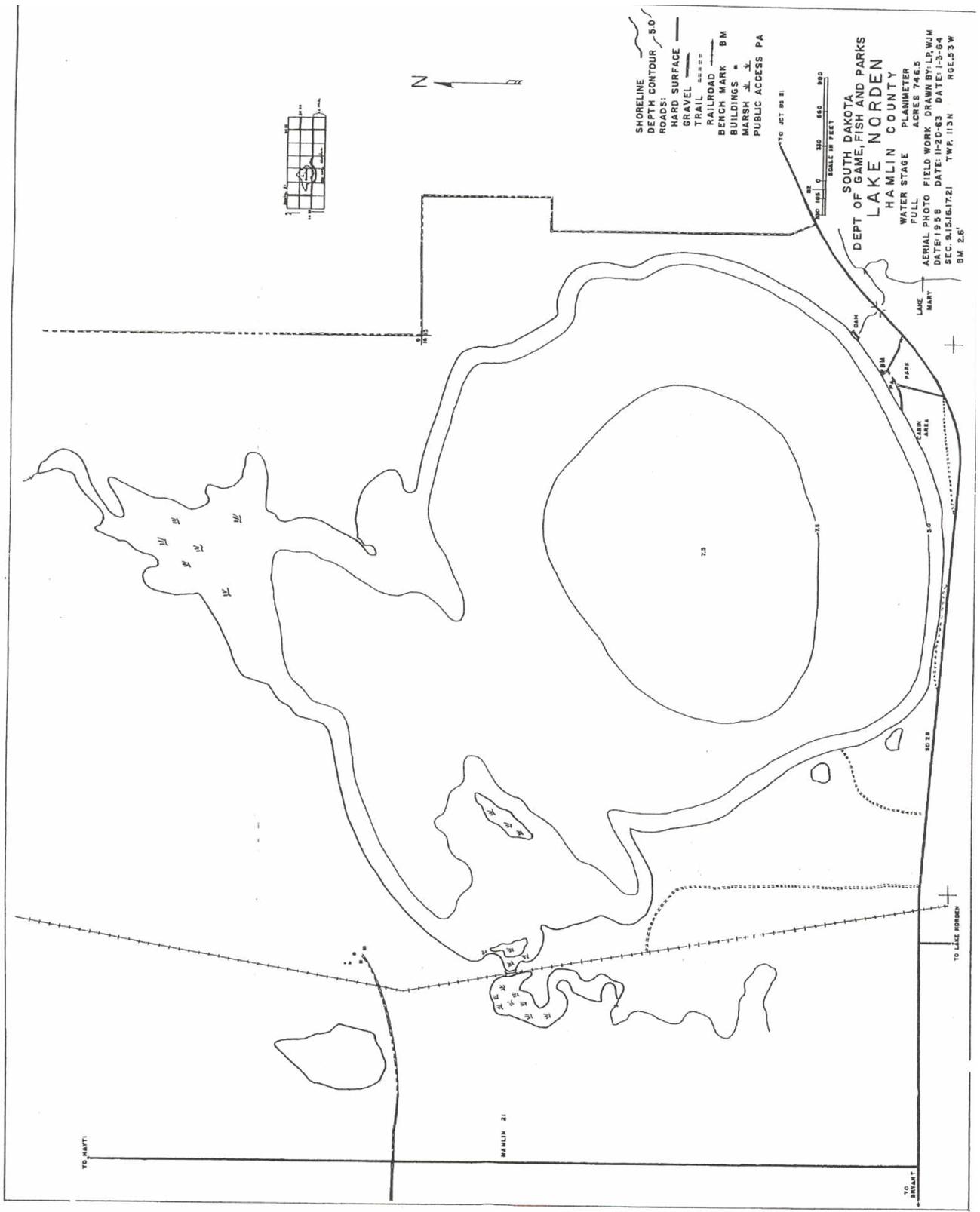
### Aquatic Vegetation and Exotics

Stueven and Stewart (1996) estimated that approximately 30% of the shoreline of Lake Norden was covered with emergent vegetation in the form of cattail (*Typha* spp.) and bulrush (*Scirpus* spp.). Submergent vegetation primarily in the form of pondweed (*Potamogeton* spp.) was identified in Lake Norden (Stueven and Stewart 1996). Common carp were the only exotic species reported during this survey.

### Fish Management Information

Primary species	northern pike, yellow perch
Other species	bigmouth buffalo, black bullhead, black crappie, channel catfish, common carp, walleye, white bass, white sucker, yellow bullhead
Management classification	warm-water marginal fish life propagation
Fish Consumption Advisories	none

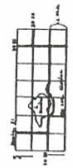
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- SHORELINE
- DEPTH CONTOUR 5.0'
- ROADS
- HARD SURFACE
- GRAVEL
- TRAIL
- RAILROAD
- BENCH MARK B.M.
- BUILDINGS
- MARSH
- PUBLIC ACCESS PA

SCALE IN FEET  
 0 100 200 300 400 500 600

SOUTH DAKOTA  
 DEPT. OF GAME, FISH AND PARKS  
 LAKE NORDEN  
 HAMLIN COUNTY  
 WATER STAGE PLAINMETER  
 FULL PLAINMETER  
 AERIAL PHOTO FIELD WORK DATE: 11-20-63  
 SEC. 9, 15, 16, 17, 21 TWP. 113N RGE. 53W  
 B.M. 2, 6'



TO HAYTI

WANKLIN 21

TO BROAD

TO LAKE NORDEN

Figure 1. Map depicting depth contours and access locations of Lake Norden, SD.

### **Management Objectives**

- 1) Maintain a mean gill net CPUE of stock-length northern pike  $\geq 3$ , a PSD of 30-60, and an RSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length yellow perch  $\geq 25$ , a PSD of 30-60, and an RSD-P of 5-10.
- 3) Maintain a mean frame net CPUE of stock-length bullhead  $\leq 100$ .

### **Results and Discussion**

Lake Norden is a shallow-natural lake located within a chain of interconnected lakes consisting of Marsh, Lake Norden, Lake Mary, Lake John, Lake Albert, and Lake Poinsett. Major surface water inlets to Lake Norden include Dolph Creek, and an unnamed stream that enters on the north. Lake Norden has a history of partial winterkills resulting in a fish community often dominated by rough fish (i.e., black bullheads, bigmouth buffalo, and common carp). Therefore, Lake Norden has primarily been managed for winterkill tolerant species such as northern pike and yellow perch.

#### *Primary Species*

Northern Pike: Northern pike relative abundance was considered moderate in 2007 with a mean gill net CPUE of 3.0, which met the minimum objective ( $\geq 3$  stock-length fish/net-night; Tables 1-3). However these values may not represent the at-large population as northern pike likely are not sampled effectively during late-summer surveys. Neumann and Willis (1995) suggested that the most reliable time to sample northern pike in eastern South Dakota's glacial lakes was in early spring following the spawn. Anecdotal reports from commercial fishermen indicate successful northern pike reproduction in 2007, as numerous small northern pike were observed in a December 2007 seine haul.

Northern pike sampled using gill nets during 2007 ranged in total length from 190 to 750 mm, had a PSD of 75, and an RSD-P of 17 (Figure 2). No growth information was collected. The mean  $W_r$  for stock-length northern pike was 95 (Table 1). Mean  $W_r$  values exceeded 90 for all length groups sampled, and no length-related trends in  $W_r$  values were apparent in 2007.

Yellow Perch: Relative abundance of yellow perch was considered low in 2007 with the mean gill net CPUE of stock-length fish being 1.8 (Tables 1-3). The 2007 gill net CPUE was below the minimum objective ( $\geq 25$  fish/net night; Table 3). Yellow perch recruitment appears to be limited; however anecdotal reports from commercial fishermen indicate successful reproduction likely in 2007, as many small yellow perch were observed in a December 2007 seine haul.

Seven yellow perch ranging from 170 to 200 mm were sampled using gill nets during 2007. Low sample size limits the usefulness of size structure indices. No growth information was collected during 2007; however mean  $W_r$  values exceeding 100 for all length groups sampled suggest excellent condition. The mean  $W_r$  for stock-length yellow perch was 107, and no length-related trends in  $W_r$  values were apparent (Table 1).

### *Other Species*

Black bullhead: Surveys conducted over the past 30-40 years have indicated periods of high black bullhead relative abundance. However, the mean frame net CPUE in 2007 was 2.5, and within the objective ( $\leq 100$  stock-length fish/net-night; Table 3). Length-frequency analysis suggests inconsistent recruitment generally of low magnitude in recent years resulting in the low relative abundance during 2007. Black bullheads captured in frame nets during 2007 ranged in total length from 160 to 330 mm, had a PSD of 32, and an RSD-P of 16 (Table 1; Table 3).

Walleye: Four overnight gill nets captured three stock-length walleye during 2007 resulting in a mean gill net CPUE of 0.8 (Table 1). Prior to 2007, Lake Norden had not been stocked with walleye since 1997. Both the length-frequency analysis of the 2007 walleye gill net catch, and age-structure information suggest poor natural recruitment over the past decade (Table 4; Table 6). Lake Norden was stocked with walleye fry in the Spring of 2007 (Table 5). Although recruitment is currently unknown, three age-0 walleye were sampled during the mid-August survey.

The shallow nature and susceptibility of Lake Norden to winterkill exclude walleye from being a primary management species. Therefore, future walleye stockings will be conducted when water levels are favorable (i.e., lake is full), excess walleye are available, and all other higher priority stockings have been completed.

Bigmouth buffalo and Common carp: Bigmouth buffalo and common carp are likely not effectively sampled during our standard fish community assessment surveys. However, bigmouth buffalo and common carp were the most abundant species in the 2007 frame net catch, with mean frame net CPUE values for stock-length fish of 5.4 and 3.2, respectively (Table 1). Common carp were the most abundant fish in the gill net catch with the mean gill net CPUE for stock-length fish being 7.8 (Table 1).

Commercial fish removal contracts, which allow for the harvest of rough fish (i.e., bigmouth buffalo and common carp) and white bass (if specified) by permitted commercial fishermen, exist on Lake Norden. However, no commercial fishing operations were conducted during the 2005-06 winter, 2006 summer, 2006-07 winter or the 2007 summer.

## **Management Recommendations**

- 1) Conduct fish community assessment surveys utilizing gill nets and frame nets on an every fifth year basis (next survey scheduled in summer 2012) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye, and yellow perch to assess age structure and growth rates of each population.
- 3) Stock walleye ( $\approx 1000$  fry/acre) when extra are available and all higher priority stockings have been fulfilled.
- 4) Monitor water levels and winter/summer kill events. In cases of complete winter/summerkill, stock northern pike and yellow perch to re-establish a fish community.
- 5) Encourage commercial harvest of black bullhead to limit abundance if the abundance exceeds the management objective. At the time of this survey, the abundance of black bullhead in Lake Norden did not necessitate the need for commercial harvest.
- 6) Monitor commercial harvest of bigmouth buffalo, common carp, and white bass.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, mean relative weight (Wr) of stock-length fish, proportional stock density (PSD) and relative stock density of preferred-length fish (RSD-P) of various fish species captured in experimental gill nets and frame nets in Lake Norden, 2007. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BIB= bigmouth buffalo; BLB= black bullhead; CCF= channel catfish; COC= common carp; NOP= northern pike; WAE= walleye; WHS= white sucker; YEB= yellow bullhead; YEP= yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	RSD-P	CI-90	Wr	CI-90
<i>Frame nets</i>								
BIB	5.4	3.7	91	6	19	8	87	1
BLB	2.5	1.7	32	16	16	13	91	1
COC	3.2	1.6	78	13	38	14	96	2
NOP	2.5	0.9	68	16	16	13	89	2
WHS	1.6	0.9	88	12	69	21	92	4
YEB	0.1	0.1	100	---	100	---	99	---
YEP	0.1	0.1	100	---	100	---	90	---
<i>Gill nets</i>								
BIB	0.3	0.4	100	---	0	---	96	---
BLB	3.8	2.8	13	16	7	11	105	3
CCF	0.3	0.4	100	---	100	---	91	---
COC	7.8	4.2	65	0	6	0	103	1
NOP	3.0	1.5	75	23	17	20	95	2
WAE	0.8	0.4	100	0	100	0	101	<1
WHS	3.3	1.2	77	22	15	19	101	4
YEP	1.8	1.0	29	35	0	---	107	2

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in experimental gill nets and frame nets in Lake Norden, 2000 – 2007. ). BIB= bigmouth buffalo; BLB= black bullhead; CCF= channel catfish; COC= common carp; NOP= northern pike; WAE= walleye; WHS= white sucker; YEB= yellow bullhead; YEP= yellow perch

Species	CPUE								Mean
	2000	2001	2002	2003	2004	2005	2006	2007	
<i>Frame nets</i>									
BIB	---	---	---	---	---	---	---	5.4	5.4
BLB	---	---	---	---	---	---	---	2.5	2.5
COC	---	---	---	---	---	---	---	3.2	3.2
NOP	---	---	---	---	---	---	---	2.5	2.5
WHS	---	---	---	---	---	---	---	1.6	1.6
YEB	---	---	---	---	---	---	---	0.1	0.1
YEP	---	---	---	---	---	---	---	0.1	0.1
<i>Gill nets</i>									
BIB	---	---	---	---	---	---	---	0.3	0.3
BLB	---	---	---	---	---	---	---	3.8	3.8
CCF	---	---	---	---	---	---	---	0.3	0.3
COC	---	---	---	---	---	---	---	7.8	7.8
NOP	---	---	---	---	---	---	---	3.0	3.0
WAE	---	---	---	---	---	---	---	0.8	0.8
WHS	---	---	---	---	---	---	---	3.3	3.3
YEP	---	---	---	---	---	---	---	1.8	1.8

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional stock density (PSD), relative stock density of preferred-length fish (RSD-P), and relative weight (Wr) for selected species captured in frame nets and experimental gill nets in Lake Norden, 2000 - 2007. BLB= black bullhead; NOP= northern pike; YEP= yellow perch

Species	2000	2001	2002	2003	2004	2005	2006	2007	Average	Objective
<i>Frame nets</i>										
BLB										
CPUE	---	---	---	---	---	---	---	3	3	< 100
PSD	---	---	---	---	---	---	---	32	32	---
RSD-P	---	---	---	---	---	---	---	16	16	---
Wr	---	---	---	---	---	---	---	91	91	---
<i>Gill nets</i>										
NOP										
CPUE	---	---	---	---	---	---	---	3	3	≥ 3
PSD	---	---	---	---	---	---	---	75	75	30-60
RSD-P	---	---	---	---	---	---	---	17	17	5-10
Wr	---	---	---	---	---	---	---	95	95	---
YEP										
CPUE	---	---	---	---	---	---	---	2	2	≥25
PSD	---	---	---	---	---	---	---	29	29	30-60
RSD-P	---	---	---	---	---	---	---	0	0	5-10
Wr	---	---	---	---	---	---	---	107	107	---

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill nets in Lake Norden, 2007.

Year	N	Age										
		0	1	2	3	4	5	6	7	8	9	10
2007	6	182	---	---	---	---	---	595	---	---	---	---

Table 5. Stocking history including size and number for fishes stocked into Lake Norden, 2000-2007. WAE= walleye

Year	Species	Size	Number
2007	WAE	fry	800,000

Table 6. Numbers of walleye sampled (n) by year class and recent associated stocking history (Number stocked x 1,000) for walleye captured in Lake Norden, 2007.

Survey Year	Year class													
	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1999	1998	1997	
2007	3						3							
Number stocked														
fry	800													
small fingerling														
large fingerling														

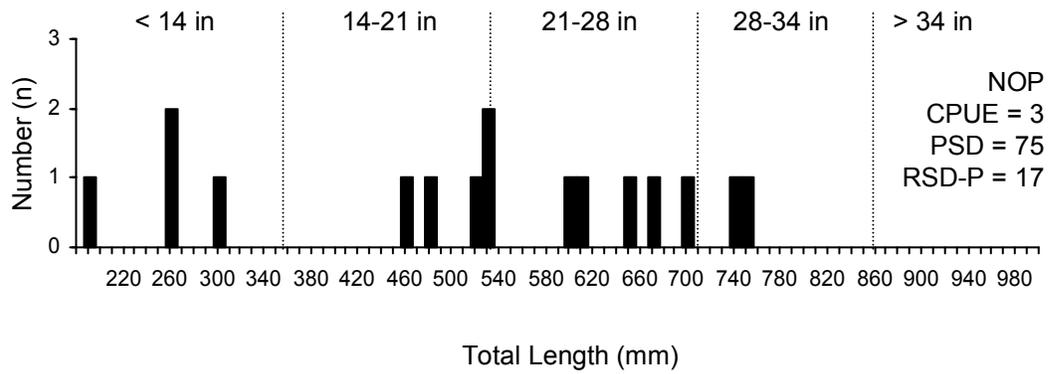


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for northern pike captured in gill nets in Lake Norden, 2007.