

Summit Lake

Site Description

Location

Water designation number (WDN)	29-0001-00
Legal description	T121N-R51W-Sec. 12,13,23
County (ies)	Grant
Location from nearest town	One mile south and 1 ½ east of Summit

Survey Dates and Netting Information

Dates of current survey	June 20-21, 2006
Dates of previous survey	June 2-3, 1999
Gill net sets (n)	3
Frame net sets (n)	12

Morphometry (Figure 1)

Watershed area (acres)	17,000
Surface area (acres)	174
Maximum depth (ft)	13
Mean depth (ft)	8

Ownership and Public Access

Summit Lake is a meandered lake managed by the SDGFP. The majority of property adjacent to the lake is owned by the State of South Dakota. A public access (including boat ramp and toilet) is located on the northwest portion of Summit Lake and is maintained by the SDGFP (Figure 1).

Watershed and Land Use

The Summit Lake watershed is comprised mostly of pasture land.

Aquatic Vegetation and Exotics

Emergent and submergent vegetation is abundant in Summit lake, however the type and extent has not been accurately documented Hubers (2002). Algal blooms are common and occur regularly. No exotic vegetation or wildlife was reported during this survey.

Fish Management Information

Primary species	northern pike, smallmouth bass, yellow perch, walleye
Other species	black bullhead, fathead minnow, johnny darter, white sucker
Management classification	warm-water semi-permanent
Fish Consumption Advisories	none

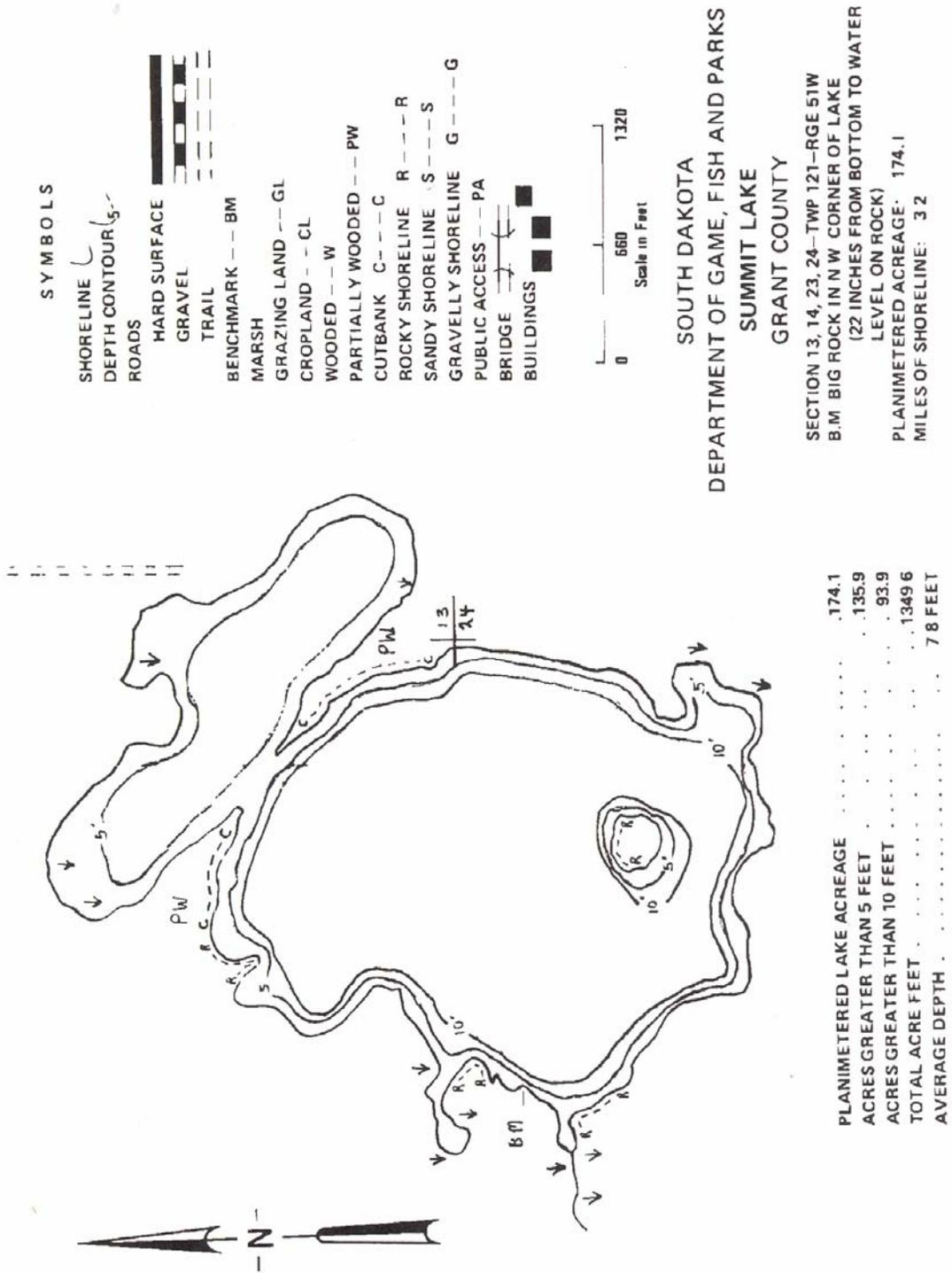


Figure 1. Summit Lake contour map.

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length northern pike ≥ 3 , a PSD of 30 – 60, and an RSD-P of 5 – 10.
- 2) Maintain a mean gill net CPUE of stock-length walleye ≥ 10 , a PSD of 30 – 60 and an RSD-P of 5-10.
- 3) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 25 and a PSD of 30-60 and an RSD-P of 5-10.

Results and Discussion

Primary Species

Northern Pike: The mean gill net CPUE of stock-length northern pike in Summit Lake during 2006 was 1.0 and below the minimum objective of (≥ 3 stock-length fish/net; Table 1-3). It appears that abundance is low, but northern pike typically are not sampled effectively using standard lake survey methods; therefore reported values may not accurately represent the at-large population. Neumann and Willis (1995) reported the most reliable time to sample northern pike with gill nets in eastern South Dakota lakes was late spring following the spawn. Sampled northern pike ranged in length 587 to 811 mm. No growth information was collected. Condition was good for sampled pike, as all mean relative weight (Wr) values were 90 or greater.

Walleye: The mean gill net CPUE of stock-length walleye during 2006 was 1.0 (Table 1) and was below the minimum objective (≥ 10 stock-length fish/net) for walleye in Summit Lake (Table 3). The mean frame net CPUE of stock-length walleye during 2006 was 1.0 (Table 1-3), with fish ranging in total length from 513 to 691 mm. The 2006 gill net CPUE indicates a low density walleye population. Walleye captured using gill nets in 2006 ranged in total length from 220 to 587 mm with approximately 75% being sub-stock (<250 mm; Figure 2).

Walleyes from three year-classes (1997, 2004, and 2005) comprised the gill net catch during the 2006 survey (Table 6). Natural reproduction appears to be limited in Summit Lake as no walleye were sampled from non-stock years (Table 6). The 2004 and 2005 year-classes represented the majority of fish sampled in 2006. These fish were likely the result of small and large fingerling (age-1+ fish from W. Stink NRP) stockings made in 2005 (Table 5; Table 6).

Limited conclusions can be made from growth data collected from Summit Lake in 2006 as the entire walleye sample consisted of 12 fish. The 2005 (age-1) year-class represented 75% of the total catch and the weighted mean length at capture was 237 mm (Table 4). Little historical growth information is available for the walleye population in Summit Lake as the entire population was lost to winterkill in 1996-97 (Hubers 2002), and has only been surveyed in 1999 and 2006. During the 1999 survey, all fish present

were from the 1997 (age-2) year-class. Growth of the 1997 (age-2) year-class was reported as rapid with mean back-calculated lengths of 381 mm at age-2 compared to 280 mm for other area lakes (Willis et al. 2001). Although sample size is small, condition of sampled walleyes appears good with mean relative weight (W_r) values ranging from 91-102.

Smallmouth Bass: Smallmouth bass were stocked into Summit Lake following the 1996-97 winterkill (Hubers and Blackwell 1999). Fall electrofishing was conducted in 1998 to assess the success of this stocking. Electrofishing CPUE was 15.7 smallmouth bass per hour indicating high survival of the 1997 (age-1) stocked year-class (Hubers and Blackwell 1999).

Smallmouth bass were not collected during the 1999 netting survey (Table 2). The mean CPUE of stock-length smallmouth bass in 2006 was 1.3 and 0.9 for gill nets and frame nets, respectively (Table 1; Table 2). Frame net catch in 2006 resulted in a total catch of 20 smallmouth bass with total lengths ranging from 136 to 471 mm. Frame net PSD and RSD-P values for smallmouth in 2006 were 45 for both (Table 1). No growth information was collected. Condition of smallmouth bass in Summit Lake was good with mean relative weight (W_r) values of 100 or above for all length categories sampled.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2006 was 17.3, down from 115.0 in 1999 (Table 1-3). In 1999, the yellow perch population was classified as high density, but has declined to a low-moderate density population. Yellow perch recruitment has been limited in recent years leading to their current low population abundance. Length-frequency histograms of yellow perch captured using gill nets indicate the presence of three year-classes; however the magnitude of all year-classes is low (Figure 3). Gill net captured yellow perch ranged in total length from 134 to 260 mm (Figure 3). PSD and RSD-P values for yellow perch caught in gill nets were 60 and 8, respectively (Table 1; Table 3). The condition of yellow perch in Summit Lake was good with the mean W_r for stock-length yellow perch being 121 (Table 1). No length-related trends in W_r values were apparent during the 2006 survey.

Black Bullhead: The mean frame net CPUE of stock-length black bullhead during 2006 was 0.9, down from 298.1 in 1999 (Table 1-3). Black bullhead density in Summit Lake was classified as low in 2006. Twelve overnight frame net sets captured 13 black bullheads ranging in total length from 112 to 380 mm (Figure 4). The reason for the decline in black bullhead densities is unknown, however it is a trend witnessed in many other lakes throughout the region in recent years.

Other Species

A single white sucker was the only other species sampled in the 2006 netting survey.

Management Recommendations

- 1) Conduct fish population assessment surveys on every fourth year basis (next survey scheduled in summer 2010) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Stock walleye on a biennial basis (1,000 fry/acre) to add additional year classes to the population.
- 3) Monitor water levels and winter/summer kill events. In cases of complete winterkill events stock northern pike, yellow perch, and walleye to establish a fish population.

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 Summit Lake, 2006. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB = black bullhead; NOP = northern pike; SMB = smallmouth bass; WAE = walleye; WHS = white sucker; 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>								
BLB	0.9	0.5	64	27	55	28	111	4
NOP	0.6	0.4	86	14	14	28	94	4
SMB	0.9	0.6	45	29	45	29	122	9
WAE	1.0	0.5	100	0	100	0	96	3
WHS	0.1	0.1	100	---	100	---	107	---
YEP	1.2	1.0	57	24	---	---	110	2
<i>Gill nets</i>								
NOP	1.0	<0.1	100	0	33	67	92	5
SMB	1.3	1.7	75	25	75	25	120	---
WAE	1.0	1.0	67	33	33	67	98	11
YEP	17.3	4.4	60	11	8	6	121	<1

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 Summit Lake, 1999 - 2006.

Species	CPUE								Mean
	1999	2000	2001	2002	2003	2004	2005	2006 ¹	
<i>Frame nets</i>									
BLB	298.1	---	---	---	---	---	---	0.9	150.0
NOP	0.1	---	---	---	---	---	---	0.6	0.4
SMB	0.0	---	---	---	---	---	---	0.9	0.5
WAE	0.0	---	---	---	---	---	---	1.0	0.5
WHS	0.0	---	---	---	---	---	---	0.1	<0.1
YEP	14.1	---	---	---	---	---	---	1.2	7.7
<i>Gill nets</i>									
BLB	151.7	---	---	---	---	---	---	---	75.9
NOP	5.0	---	---	---	---	---	---	1.0	3.0
SMB	0.0	---	---	---	---	---	---	1.3	0.7
WAE	5.7	---	---	---	---	---	---	1.0	3.4
YEP	115.0	---	---	---	---	---	---	17.3	66.2

¹ Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

Table 3. Mean catch rate of stock-length fish (CPUE; catch/net night), proportional stock density (PSD), relative stock density of preferred-length fish (RSD-P), and relative weight (Wr) for selected species captured in experimental gill nets and frame nets in Summit Lake, 1999 - 2006.

Species	1999	2000	2001	2002	2003	2004	2005	2006 ¹	Average	Objective
<i>Frame nets</i>										
BLB										
CPUE	298	---	---	---	---	---	---	1	150	---
PSD	12	---	---	---	---	---	---	64	38	---
RSD-P	0	---	---	---	---	---	---	55	28	---
Wr	87	---	---	---	---	---	---	---	---	---
<i>Gill nets</i>										
NOP										
CPUE	5	---	---	---	---	---	---	1	3	≥ 3
PSD	93	---	---	---	---	---	---	100	97	30-60
RSD-P	20	---	---	---	---	---	---	33	27	5-10
Wr	85	---	---	---	---	---	---	92	89	---
WAE										
CPUE	6	---	---	---	---	---	---	1	4	≥ 10
PSD	82	---	---	---	---	---	---	67	75	30-60
RSD-P	0	---	---	---	---	---	---	33	17	5-10
Wr	100	---	---	---	---	---	---	98	99	---
YEP										
CPUE	115	---	---	---	---	---	---	17	66	≥ 25
PSD	12	---	---	---	---	---	---	60	36	30-60
RSD-P	4	---	---	---	---	---	---	8	6	5-10
Wr	86	---	---	---	---	---	---	97	92	---

¹ Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill net sets in Summit Lake, 1999 – 2006. Note: sampling was conducted 18 days later in 2006.

Year	N	Age								
		1	2	3	4	5	6	7	8	9
2006 ¹	11	237	251	---	---	---	---	---	---	---
1999	17	---	394	---	---	---	---	---	---	---

¹ Age assignments made using otoliths; scales were used in previous years

Table 5. Stocking history including size and number for fishes stocked into Summit Lake, 1997 - 2006. (Smallmouth bass = SMB; Walleye = WAE)

Year	Species	Size	Number
1997	SMB	fingerling	24,000
1997	WAE	fry	384,000
2000	WAE	fry	160,000
2005	WAE	fingerling	23,800
2005	WAE	fingerling (Age-1)	1,643

Table 6. Numbers of walleye sampled (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Summit Lake, 1999-2006.

Survey Year	Year Class									
	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
2006 [†]		8	2							1
1999										17
Number stocked										
fry							160			384
small fingerling		23.8								
large fingerling		1.6								

[†]Age assignments made using otoliths; scales were used in previous years

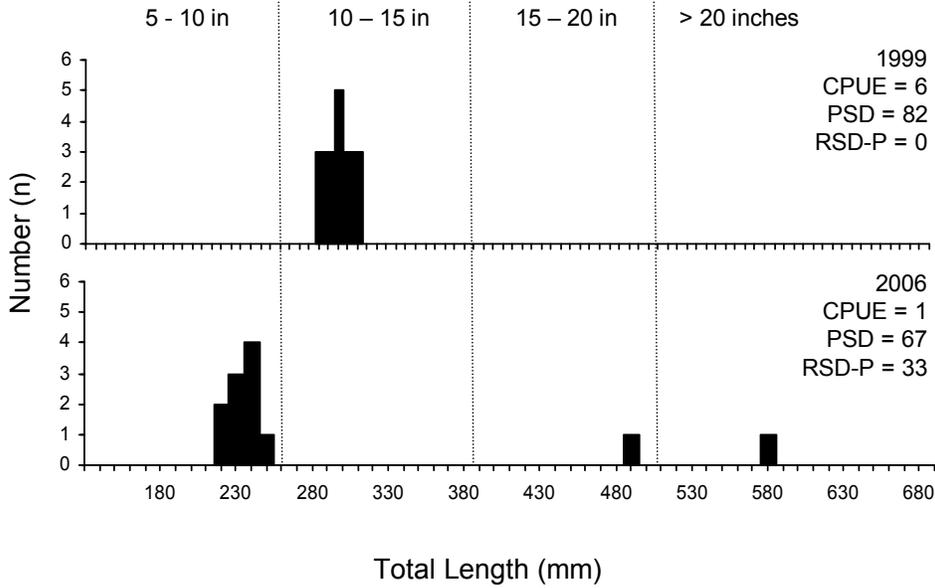


Figure 2. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for walleye captured in gill net sets in Summit Lake, 1999 and 2006.

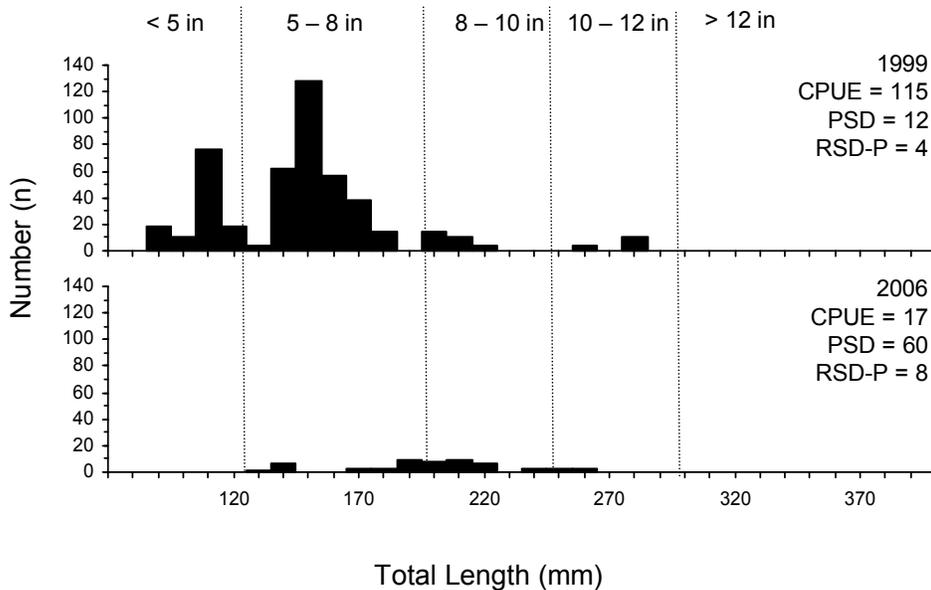


Figure 3. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for yellow perch captured in gill nets in Summit Lake, 1999 and 2006.

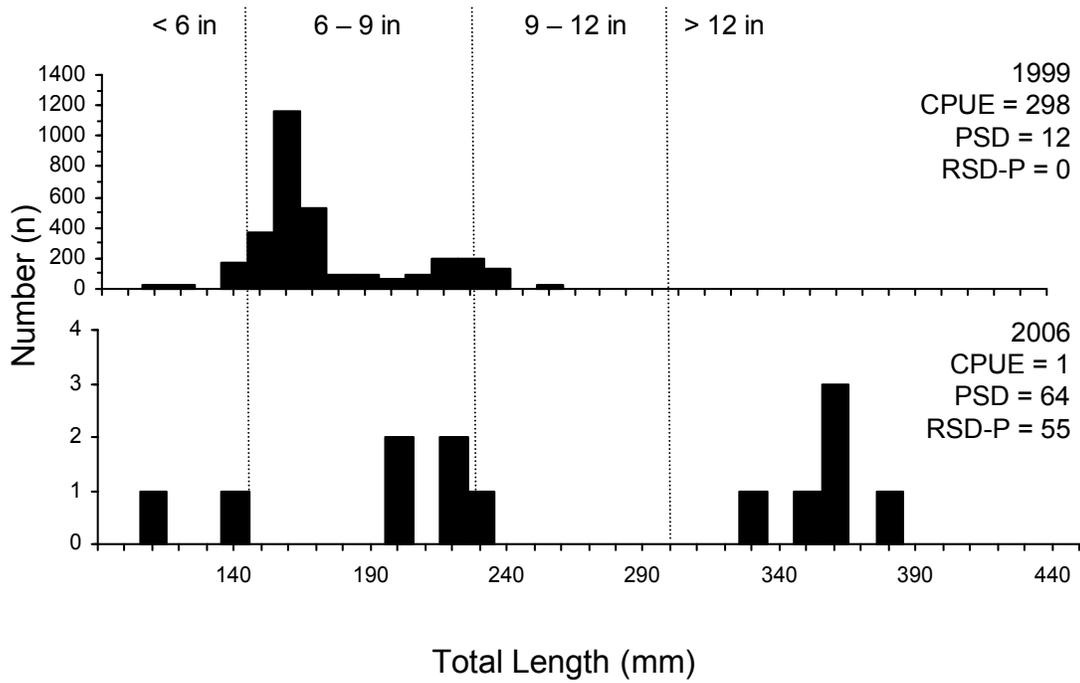


Figure 4. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for black bullhead captured in gill nets in Summit Lake 1999 and 2006.