Six-Mile Lake

Site Description

Location

Water designation number (WDN)	48-0028-00
Legal description	T126N-R55W-Sec.5,6,7
County (ies)	Marshall
Location from nearest town	two miles west of Lake City, SD

Survey Dates and Netting Information

Dates of current survey	June 16 – 17, 2005
Date of most recent survey	May 19 – 20, 1998
Gill net sets (n)	3
Frame net sets (n)	12

Morphometry (Figure 1)

Watershed area (acres)	---
Surface area (acres)	96
Maximum depth (ft)	11
Mean depth (ft)	---

Ownership and Public Access

Six-mile Lake is a meandered lake managed by the SDGFP. A public access site is located on the southern shore off highway 10 and is maintained by the SDGFP (Figure 1). Lands adjacent to Six-mile Lake are under mixed ownership including private individuals and SDGFP.

Watershed and Land Use

The Six-mile Lake watershed is generally comprised of agricultural uses and woodland.

Water Level Observations

Water levels remain at the historic average.

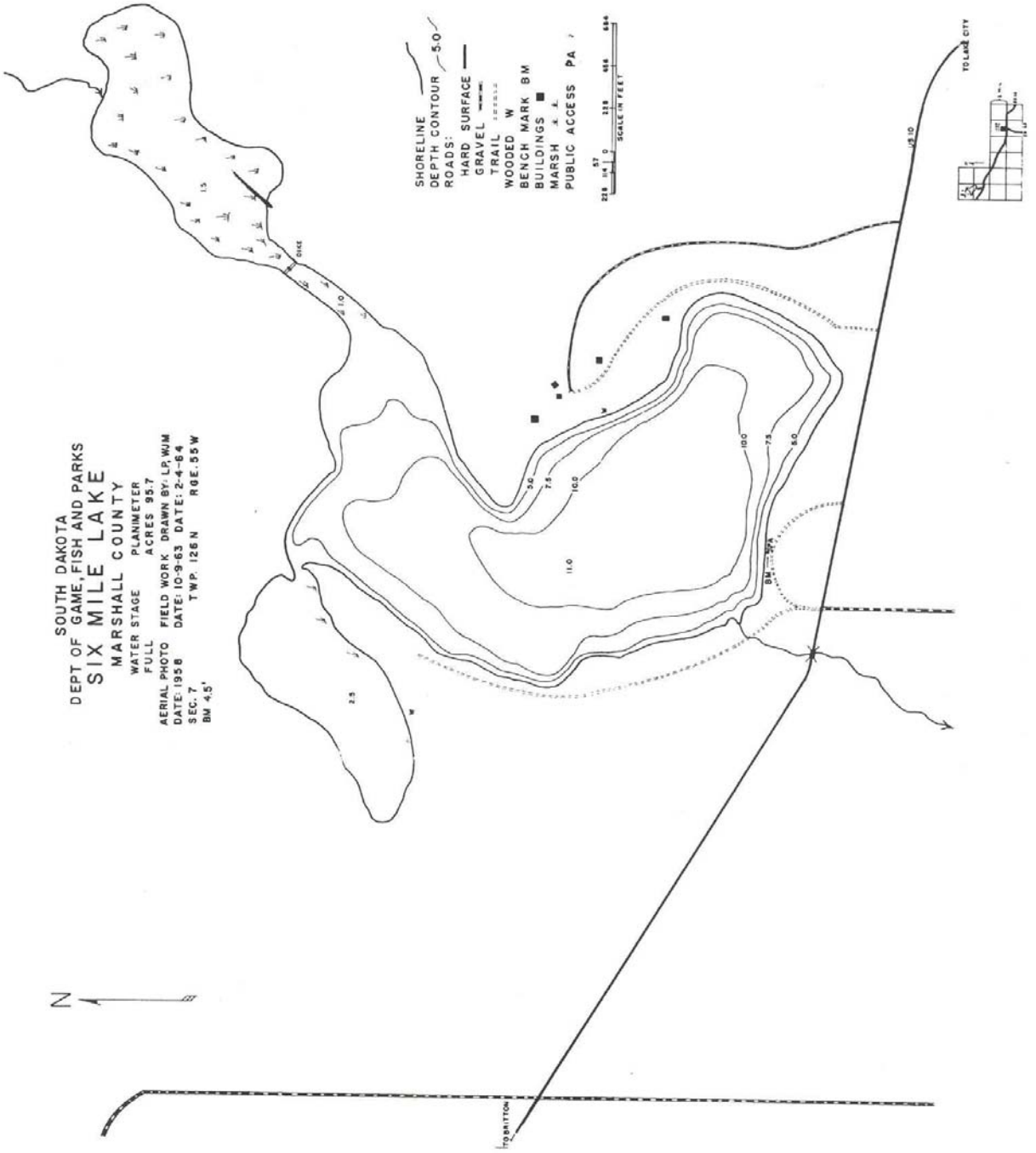
Aquatic Vegetation and Exotics

Submergent vegetation is present. Emergent vegetation is prevalent in the shallower areas. No un-naturalized exotic vegetation or wildlife was reported during this survey.

Fish Management Information

Primary species	black bullhead, northern pike, yellow perch
Other species	black crappie, bluegill, fathead minnow, Johnny darter, walleye, white sucker
Management classification	warm-water marginal
Fish Consumption Advisories	none

Figure 1. Six-mile Lake contour map.



Management Objectives

1) Maintain a mean gill net CPUE of stock length yellow perch ≥ 15 and a mean Wr > 80.

2) Maintain a mean gill net CPUE of stock length northern pike ≥ 3, a PSD of 30 – 60, an RSD-P of 5 – 20, and a mean Wr > 80.

3) Maintain a mean frame net CPUE of stock length bullhead ≤ 100, a mean Wr > 80, and encourage commercial harvest during periods of high abundance.

4) Stock walleye only when excess fish are available.

5) Monitor water levels and winterkill events.

Results and Discussion

Six-mile Lake is a small, permanent, natural lake situated in the Coteau des Prairie, a plateau formed by glacier action in northeast South Dakota. Six-mile Lake is named because it is six miles from Fort Sisseton. Six-mile Lake, along with the majority of the Coteau lakes, were formed during successive subadvances of the Late Wisconsin glaciations more than 10,000 years ago. Historically, Six-mile Lake has experienced frequent winterkill and summerkill events. Most likely, the low oxygen levels encountered in Six-mile Lake are due to its shallow and windswept nature in addition to likely inputs of organic matter from agricultural practices, which contributes to oxygen fluctuation by causing algae blooms. Consequently, the oxygen problems persistent in Six-mile Lake have limited fisheries management options to that of maintaining a fish assemblage of oxygen tolerant species such as northern pike and yellow perch.

Primary Species

Black bullhead: The mean frame net CPUE of stock length black bullhead during 2005 was 42.8 (Table 1) and within the objective range (≤ 100) in Six-mile Lake (Table 2; Table 3). Hubers and Blackwell (1999) reported high abundance of black bullhead with a mean frame net CPUE for all black bullhead sizes over 600 fish/net night. Therefore, the abundance of black bullhead in 2005 was much lower than that reported in 1998 and the black bullhead population is considered moderate-low density (Table 3).

Black bullhead captured in frame nets during 2005 ranged in total length from 70 to 330 mm (Figure 2). The PSD of black bullhead captured in frame nets during 2005 was 9 and the RSD-P was 0 (Table 1; Table 3). The low PSD indicated the presence of a large percentage of sub-quality length (≥ 230 mm) black bullhead. In fact, roughly 95 percent of the black bullhead captured in

frame nets during 2005 were less than quality length (230 mm), and a total of nearly 40 percent were less than stock length (150 mm), which indicates a large 2004 year class which may not have fully recruited to the sampling gear. Recruitment of black bullhead is likely moderate-high, but sporadic depending on environmental factors during spawning. Based on the consistent recruitment observed on the length frequency graph (Figure 2) conditions have been favorable for black bullhead reproduction during recent years. No growth information is available for black bullhead in Six-mile Lake; however, the condition of black bullhead during 2005 was above the objective of 80 with a mean Wr of 84 (Table 1; Table 3).

Northern Pike: Northern pike typically are not sampled consistently using standard lake survey methods; however, northern pike in Six-mile Lake have generally been considered high density with a 1998 CPUE of all length fish of 18.5 (Hubers and Blackwell 1999). The gill net CPUE of stock length northern pike in Six-mile Lake during 2005 was 8.0 (Table 1) indicating a high density population that exceeds the objective range (≥ 3).

Northern pike were collected from Six-mile Lake that ranged in length from 380 to 890 mm (Figure 2). The PSD was 38 and within the objective range; however, the RSD-P was 4 for northern pike captured in gill nets and slightly below the objective range (Table 3). No growth information was available; however, the condition of northern pike was within the objective range (≥ 80) with a mean Wr of 94 for pike captured in gill nets (Table 1). Northern pike depend on flooded vegetation during the spring for spawning and conditions have not been favorable during recent years for successful northern pike reproduction. However, the northern pike population in Six-mile Lake is characterized as having high-density, good size structure, and obtaining moderately consistent recruitment.

Yellow Perch: The mean gill net CPUE of stock length (200 mm) yellow perch in 2005 was 16 and within the objective range (≥ 15 fish/net night) for a moderate density population (Tables 1 – 3). Hubers and Blackwell (1999) reported that yellow perch abundance in Six-mile Lake had declined from 1995 to 1998. The CPUE of stock length fish continued to decline from 28 in 1998 to 16 during 2005. Perch populations throughout northeastern South Dakota have steadily decline from levels seen during the high water years of the 1990's. The lack of rising water levels and spring snowmelt in recent years is likely the cause of reduced perch reproduction.

During 2005, yellow perch ranged in total length from 90 to 220 mm (Figure 2), had a PSD of 6, and an RSD-P of 0 (Tables 1 – 3). Yellow perch commonly obtain 90 mm at age 1 and 150 mm at age 2. Inspection of the length frequency histogram indicates consecutive year classes of yellow perch in 2003 and 2004 (Figure 2). At the time of this survey most yellow perch in Six-mile Lake were below quality length (200 mm). However, the presence of

consecutive yellow perch year classes should provide adequate opportunity for anglers to catch yellow perch in the short-term future. The condition of yellow perch in Six-mile Lake was within the objective (≥ 80) with a mean Wr of 95.

Other Species

Black crappie: The frame net CPUE of stock length black crappie in Six-mile Lake during 2005 was 0.3 (Table 1). Overall, the historic abundance of black crappie in Six-mile Lake has been non-existent to low density. During 2005, black crappie were captured in frame nets that ranged in length from 110 to 250 mm, had a PSD of 75, an RSD-P of 50, and a mean Wr of 108 (Table 1).

Other: White sucker were the only other fish species captured during the 2005 survey; however, the abundance of white sucker was considered low density (Table 1, Table 2). The contribution of species other than black bullhead, northern pike, and yellow perch to the fishery at the time of this survey was likely minimal.

Walleye were stocked into Six-mile Lake in 1996, 2001, and 2004 in attempts to establish a walleye population; however the stockings were apparently unsuccessful because no walleye were captured during the 2005 survey. In November 2005, a total of 6,400 excess large fingerling walleye were stocked into Six-mile Lake (Table 2). The success of the 2005 stocking was unknown at the time of this report. It is currently recommended that walleye be stocking into Six-mile Lake only when excess fish are available and all other stocking requests have been fulfilled.

Summary

Six-mile Lake is managed as a northern pike and yellow perch fishery due to the lakes frequent winter and summer kills. In addition, walleye have been stocked into Six-mile Lake on three occasions since 1996 with limited or no success. Black bullhead are monitored closely to determine abundance. During 2005, black bullhead abundance was within the objective range for frame net CPUE (≤ 100 stock length fish/net night). Roughly 40 percent of the black bullhead captured in frame nets were less than stock length (150 mm) and a large 2004 year class was present. Apparently, conditions have been favorable for black bullhead reproduction during recent years in Six-mile Lake based on the consistent recruitment observed from year to year. Commercial harvest of black bullhead should be encouraged to minimize the impact of high bullhead abundance on sport fish in Six-mile Lake. For example, extremely high black bullhead abundance may negatively effect other sport fish through competition for similar food resources and habitat.

During 2005, the abundance of stock length (130 mm) yellow perch in Six-mile Lake based on gill net CPUE indicated that the yellow perch population was

moderate density and above the objective range of ≥15 stock length fish/net. The abundance of stock length (350 mm) northern pike in Six-mile Lake based on gill net CPUE was indicative of a high density population and above the objective range of ≥ 3 stock length fish/net. The PSD of 38 for northern pike in Six-mile Lake during 2005 was within the objective of 30 – 60. The condition of northern pike in the Six-mile Lake meets the objective range (Wr ≥ 80). Overall, Six-mile Lake should provided anglers with good northern pike fishing with a wide range of fish lengths and the opportunity to capture quality (≥ 530 mm) length fish.

Management Recommendations

1) Conduct fish population assessment surveys on an every-four-year basis (next survey scheduled in summer 2009) to monitor fish abundance, fish population size structures, fish growth, and stocking success.

2) Stock walleye only when excess fish are available and all other stocking requests have been fulfilled. Stock northern pike and yellow perch in cases of complete winterkill or summerkill events to establish a fish population. Monitor water levels and fish kill events to assess stocking strategies.

3) Encourage commercial harvest of black bullhead to limit abundance.

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 net sets or frame net sets in Six-mile Lake, 2005. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90).

Survey Year	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	RSD-P	CI-90	Wr	CI-90
2005								
Gill nets								
BLB	1.0	1.1	33	67	0	---	96.0	14.0
BLC	0.0	0.0	0	---	0	---	---	---
NOP	8.0	2.9	38	17	4	7	94.0	5.0
WHS	5.7	1.7	100	0	100	0	105.0	2.0
YEP	16.0	1.9	6	6	0	---	95.0	1.0
Frame nets								
BLB	42.8	17.7	9	2	0	1	84.0	3.0
BLC	0.3	0.4	75	25	50	50	108.0	3.0
NOP	1.1	0.8	8	13	0	---	87.0	2.0
WHS	0.1	0.1	100	---	100	---	---	---
YEP	1.1	0.6	8	13	0	---	88.0	2.0

Table 2. Historic mean catch rate (CPUE; Catch/net night) of stock length fish for various fish species captured in experimental gill net sets, frame net sets, or electrofishing in Six-mile Lake, 1999 - 2005.

	CPUE							
Species	1999	2000	2001	2002	2003	2004	2005	Mean
Gill nets								
BLB	---	---	---	---	---	---	1.0	1.0
BLC	---	---	---	---	---	---	0.0	0.0
NOP	---	---	---	---	---	---	8.0	8.0
WHS	---	---	---	---	---	---	5.7	5.7
YEP	---	---	---	---	---	---	16.0	16.0
Frame nets								
BLB	---	---	---	---	---	---	42.8	42.8
BLC	---	---	---	---	---	---	0.3	0.3
NOP	---	---	---	---	---	---	1.1	1.1
WHS	---	---	---	---	---	---	0.1	0.1
YEP	---	---	---	---	---	---	1.1	1.1

Table 3. Mean catch rate (CPUE; catch/net night), proportional stock density (PSD), relative stock density of preferred length fish (RSD-P), and relative weight (Wr) for primary management species captured in experimental gill net sets, frame net sets, or electrofishing in Six-mile Lake, 1999 - 2005.

Species	1999	2000	2001	2002	2003	2004	2005	Average	Objective
Frame nets									
BLB									
CPUE	---	---	---	---	---	---	43	43	≤ 100
PSD	---	---	---	---	---	---	9	9	---
RSD-P	---	---	---	---	---	---	0	0	---
Wr	---	---	---	---	---	---	84	84	≥ 80
Gill nets									
NOP									
CPUE	---	---	---	---	---	---	8	8	≥ 3
PSD	---	---	---	---	---	---	38	38	30 – 60
RSD-P	---	---	---	---	---	---	4	4	5 – 10
Wr	---	---	---	---	---	---	94	94	≥ 80
YEP									
CPUE	---	---	---	---	---	---	16	16	≥ 15
PSD	---	---	---	---	---	---	6	6	---
RSD-P	--	--	--	--	--	--	0	0	---
Wr	---	---	---	---	---	---	95	95	≥ 80

[1] Historic data from all surveys conducted since 1999.

Table 4. Stocking history (10-year) including size and number for fishes stocked into Six-mile Lake, 1996 - 2005.

Year	Species	Size	Number
1996	WAE	fry	60,000
2001	WAE	fry	100,000
2004	WAE	fry	100,000
2005	WAE	large fingerlings	6,400

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 various fish species captured in frame net or gill net sets in Six-mile Lake, 2005.