

# Four-Mile Lake

## Site Description

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### Location

Water designation number (WDN)	48-0013-00
Legal description	T126N-R55W-Sec. 18,19 T126N-R56W-Sec. 13,14,23,24
County (ies)	Marshall
Location from nearest town	3 miles west and 1.5 miles south of Lake City, SD

### Survey Dates and Sampling Information

Survey dates	June 4-5, 2009 (FN, GN)
Frame net sets (n)	14
Gill net sets (n)	3

### Morphometry (Figure 1)

Watershed area (acres)	5,460
Surface area (acres)	356
Maximum depth (ft)	11
Mean depth (ft)	unknown

### Ownership and Public Access

Four-Mile Lake is a meandered lake owned and managed by the SDGFP. Property adjacent to Four-Mile Lake is primarily under State of South Dakota and private ownership. A public access (including boat ramp) is located on the east shore of Four-Mile Lake and is maintained by the SDGFP (Figure 2). Much of the shoreline of Four-Mile Lake is undeveloped, as only a few homes and cabins are present (Figure 2).

### Watershed and Land Use

Land-use within the 5,460 acre Four-Mile Lake watershed is primarily agricultural including pasture and cropland.

### Water Level Observations

No Ordinary High Water Mark has been established by the South Dakota Water Management Board on Four-Mile Lake. The elevation of Four-Mile Lake on April 28, 2009 was 1798.4 fmsl and indicated only a slight increase from the fall 2007 elevation of 1798.0 fmsl. By September 23, 2009 the water level had declined to an elevation of 1798.0 fmsl.

### Aquatic Nuisance Species Monitoring

#### Plant Survey

Scattered beds of submerged vegetation were present in shallow-protected areas of the main lake and were common throughout much of the west arm. No aquatic nuisance plant species were encountered. Coontail was the only plant species identified during the survey.

#### Macro-Invertebrate/Mussel Survey

No aquatic nuisance macro-invertebrate or mussel species were sampled in 2009.

#### Fish Community Survey

Common carp was the only aquatic nuisance fish species captured during the 2009 survey.

### Fish Management Information

Primary species	northern pike, yellow perch
Other species	black bullhead, black crappie, bluegill, common carp, walleye, white sucker
Lake-Specific regulations	NE Panfish Management Area: 10 daily; 50 possession
Management classification	warm-water marginal
Fish consumption advisories	none

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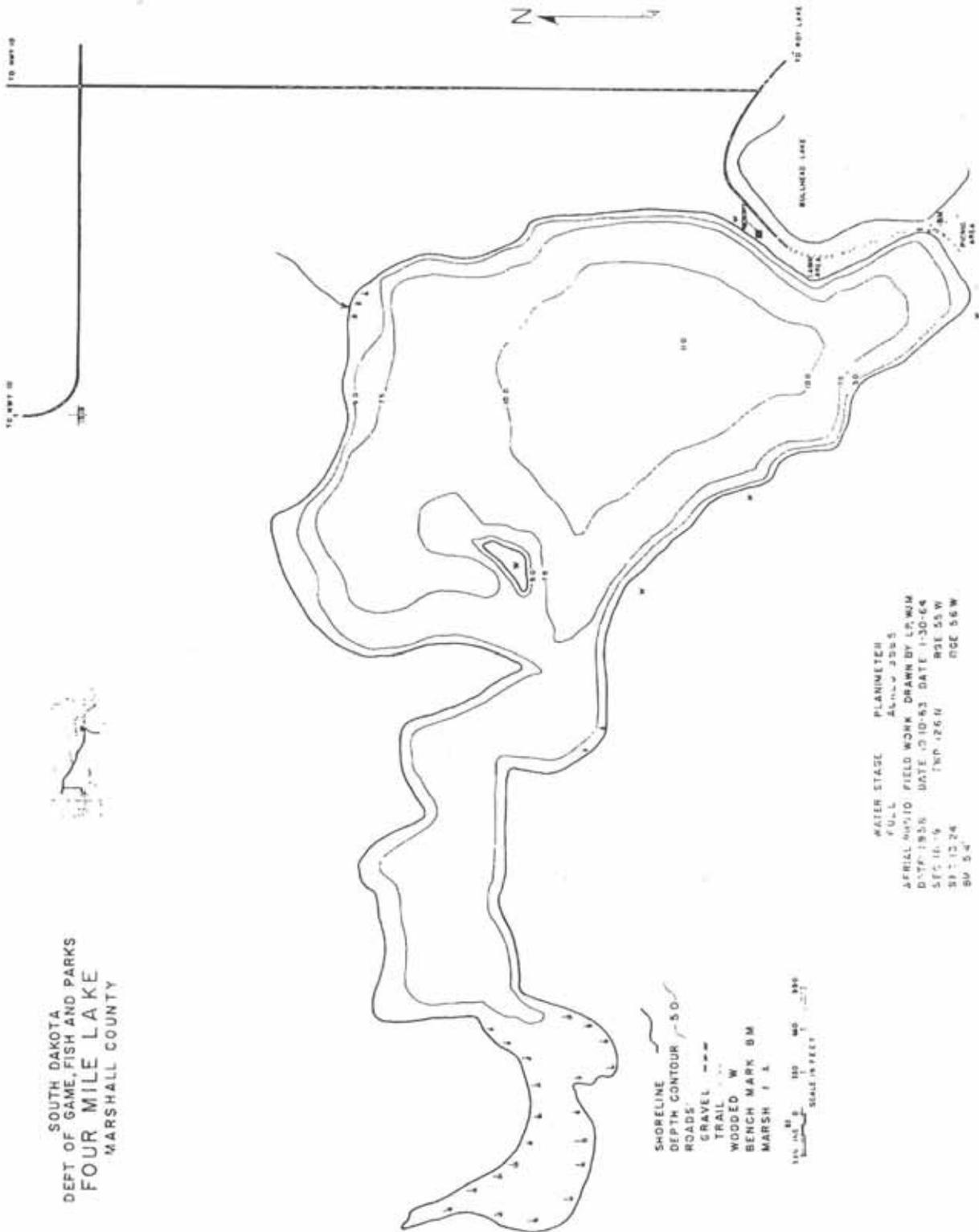


Figure 1. Four-Mile Lake contour map.

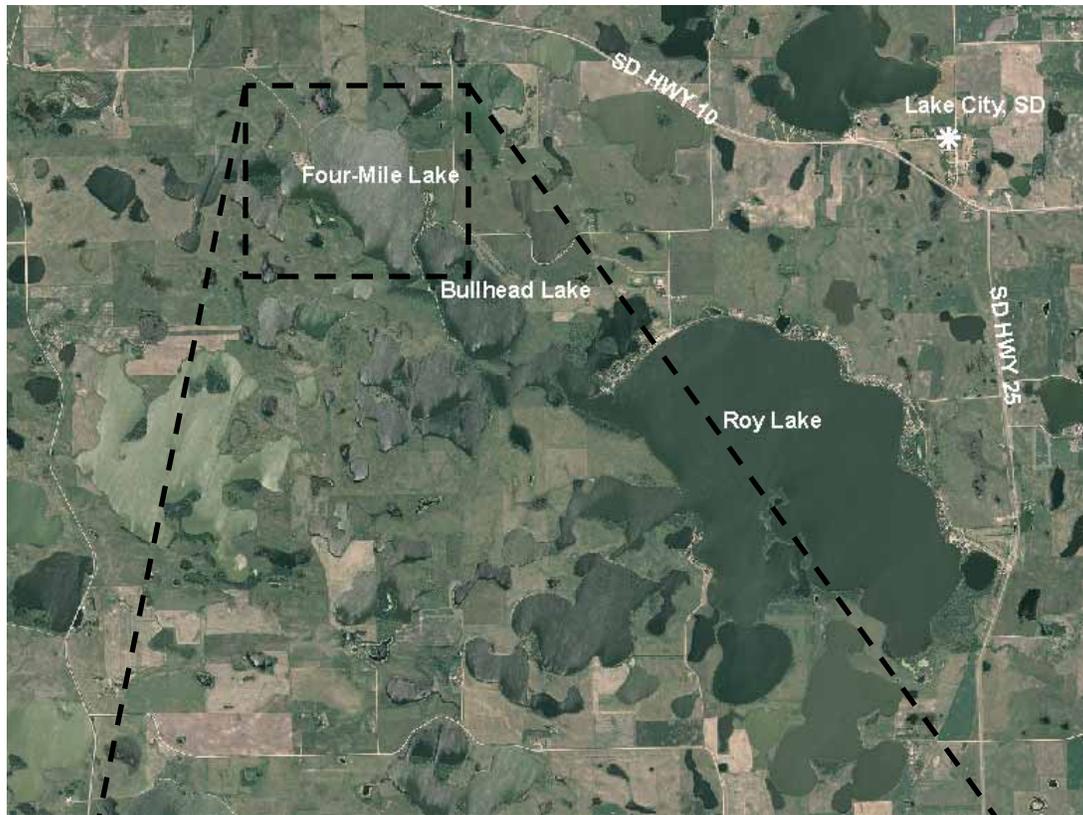


Figure 2. Map depicting geographic location of Four-Mile Lake from Lake City, South Dakota (top). Also noted is the boat ramp and standardized net locations for Four-Mile Lake (bottom). FMFN= frame nets, FMGN= gill nets

## Management Objectives

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

## Results and Discussion

Four-Mile Lake is a shallow natural lake located southwest of Lake City, South Dakota. The lake receives surface water from the local watershed and Six-Mile Lake to the north. During periods of high water, Four-Mile Lake flows southeast over a concrete roadbed spillway into Bullhead Lake.

Four-Mile Lake has a history of winter and summerkill events and the fish community has been primarily comprised of black bullhead, northern pike, and yellow perch (species believed to be more winterkill tolerant). However, anecdotal information suggests that occasional short-lived intervals of relatively-high walleye abundance have occurred between winterkill events. Currently, Four-Mile Lake is managed as a northern pike and yellow perch fishery.

### *Primary Species*

Northern Pike: The 2009 mean gill net CPUE of stock-length northern pike was 4.7 (Table 1) and above the minimum objective of ( $\geq 3$  stock-length fish/net night). Based on the 2009 gill net catch, relative abundance of northern pike in Four-Mile Lake appears to be high ( $< 3$  stock-length pike/net night).

Northern pike sampled in gill nets during 2009 ranged in total length from 48 to 75 cm (18.9 to 29.5 in), had a PSD of 71, and a PSD-P of 14 (Figure 3). Both the PSD and PSD-P were above the management objectives of 30-60 and 5-10. Gill net sampled northern pike in 2009 had mean  $W_r$  values that ranged from 91 to 102 for all length categories sampled, and no length-related trends in condition were apparent. Mean  $W_r$  values were likely at a seasonal low, as Neumann and Willis (1995) reported that  $W_r$  values were lowest during spring following the spawn and remained low throughout the summer in Lake Thompson, South Dakota. The mean  $W_r$  for stock-length northern pike was 95 (Table 1).

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 5.0 (Table 1), and below the minimum objective ( $\geq 30$  stock-length yellow perch/net night). Based on the 2009 gill net catch the relative abundance of stock-length yellow perch appears to be low ( $<8$  stock-length yellow perch/net night).

Yellow perch captured in the 2009 gill net catch ranged in total length from 8 to 15 cm (3.1 to 5.9 in) with the majority being less than stock-length (Table 3; Figure 4). No quality- or preferred-length yellow perch were captured resulting in a PSD and PSD-P of 0, well below the management objectives of 30-60 and 5-10.

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2009 and indicated that approximately 98% of yellow perch captured were from the 2007 (age-2) year class (Table 3). The weighted mean total length at capture for age-2 and age-3 male yellow perch was 96 and 147 mm (3.8 and 5.8 in), respectively (Table 2). The weighted mean total length at capture for age-2 female yellow perch was 104 mm (4.1 in; Table 2). No age-3 female yellow perch were captured. Mean  $W_r$  values of gill net captured yellow perch in 2009 ranged from 94 to 97 for all length categories sampled. The majority of yellow perch were in the sub-stock length category which had a mean  $W_r$  of 97.

### *Other Species*

Black Bullhead: The mean frame net CPUE of stock-length black bullhead during 2009 was 0.3 (Table 1), and within the management objective ( $\leq 100$  stock-length fish/net-night). Black bullhead relative abundance is currently classified as low in Four-Mile Lake. Given the current low relative abundance, the impact of the black bullhead population on the sport fishery is likely minimal.

Walleye: The mean gill net CPUE of stock-length walleye was 2.0 (Table 1) indicating low relative abundance. Walleye fry stockings made in 2004 and 2008 (Table 4) appear to have been unsuccessful at increasing relative abundance, as only 7 walleye ranging in total length from 19 to 59 cm (7.9 to 23.2 in) were captured in gill nets. However, walleye from the 2008 fry stocking may have been too small to capture during the 2009 survey.

The shallow nature and susceptibility of Four-Mile Lake to winterkill exclude walleye from being a primary management species. However, the potential exists for occasional walleye year classes to develop and provide angling opportunities. Therefore, walleye stockings should continue provided water levels are favorable (i.e., lake is full), excess walleye are available, and higher priority stockings have been completed.

Other: Black crappie, bluegill, common carp and white sucker were other fish species captured in relatively-low numbers during the 2009 fish community survey (Table 1).

### **Management Recommendations**

- 1) Conduct fish community surveys utilizing gill nets and frame nets on an every fifth year basis (next survey scheduled in summer 2014) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Continue to manage as a self-sustaining northern pike and yellow perch fishery.
- 3) Stock walleye provided water levels are favorable (i.e., lake is full), excess walleye are available, and other higher priority stockings have been completed.
- 4) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.
- 5) Monitor winter and summerkill events. In cases of substantial winter/summerkill stock with northern pike and yellow perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Four-Mile Lake, 2009. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; NOP= northern pike; WAE= walleye; WHS= white sucker; YEP= yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
<i>Frame nets</i>								
BLB	0.3	0.2	50	50	0	---	91	20
BLG	1.0	0.8	0	---	0	---	108	3
COC	0.1	0.1	100	---	100	---	97	---
NOP	0.6	0.4	100	0	44	33	84	6
WAE	0.6	0.3	100	0	100	0	92	3
YEP	0.4	0.3	0	---	0	---	87	9
<i>Gill nets</i>								
BLC	0.3	0.3	0	---	0	---	107	---
NOP	4.7	0.6	71	23	14	17	95	3
WAE	2.0	0.4	67	33	33	43	96	5
WHS	1.0	0.0	100	0	0	---	106	3
YEP	5.0	2.5	0	---	0	---	94	2

Table 2. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Four-Mile Lake, 2009.

Year	Age				
	1	2	3	4	5
2009					
Male	---	96 (31)	147 (4)	---	---
Female	---	104 (191)	---	---	---
Combined	---	102 (222)	147 (4)	---	---

Table 3. Year class distribution based on expanded age/length summary for yellow perch sampled in gill nets from Four-Mile Lake, 2009.

Survey Year	Year Class					
	2009	2008	2007	2006	2005	2004
2009			222	4		

Table 4. Stocking history including size and number for fishes stocked into Four-Mile Lake, 2001-2009.

Year	Species	Size	Number
2001	WAE	fry	200,000
2004	WAE	fry	350,000
2008	WAE	fry	200,000

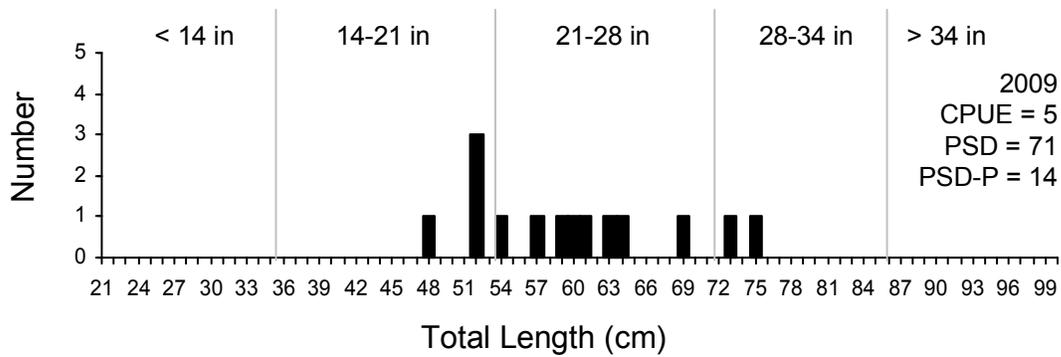


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P) for northern pike captured using gill nets in Four-Mile Lake, 2009.

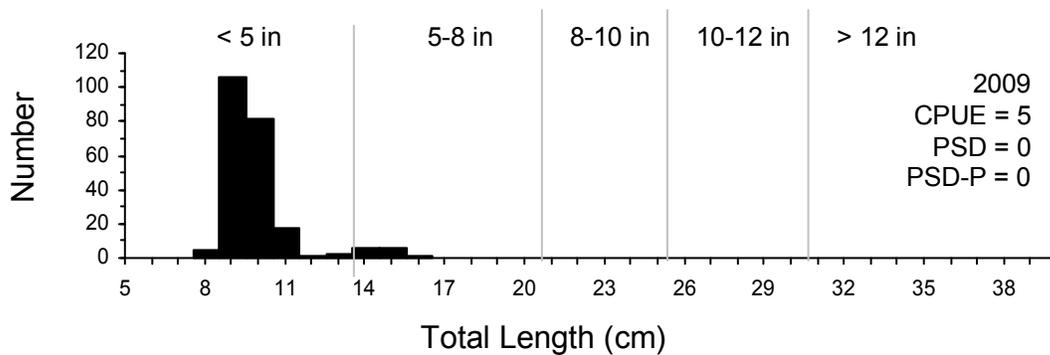


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P) for yellow perch captured using gill nets in Four-Mile Lake, 2009.