

Four-Mile Lake

Site Description

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	3.0 miles west and 1.5 miles south of Lake City, SD

Survey Dates and Sampling Information

Survey dates	June 5-6, 2014 (FN, GN)
Frame net sets (n)	12
Gill net sets (n)	3

Morphometry (Figure 1)

Watershed area (acres)	34,744
Surface area (acres)	357
Maximum depth (ft)	11
Mean depth (ft)	unknown

Ownership and Public Access

Four-Mile Lake is a meandered lake owned by the State of South Dakota and the fishery is 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 with only a few homes and cabins present (Figure 2).

Watershed and Land Use

The 34,744 acre Roy Lake (HUC-12) sub-watershed encompasses Four-Mile Lake and is located within the larger Northern Coteau Lakes-Upper James River (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and scattered shelterbelts.

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 May 6, 2014 was 1798.2 fmsl; 0.6 ft higher than the fall 2013 elevation of 1797.6 fmsl. On October 29, 2014 the water level was 1797.4 fmsl.

Fish Management Information

Primary species	northern pike, yellow perch
Other species	black bullhead, black crappie, bluegill, common carp, green sunfish, walleye, white sucker
Lake-Specific regulations	none
Management classification	warm-water marginal
Fish consumption advisories	none

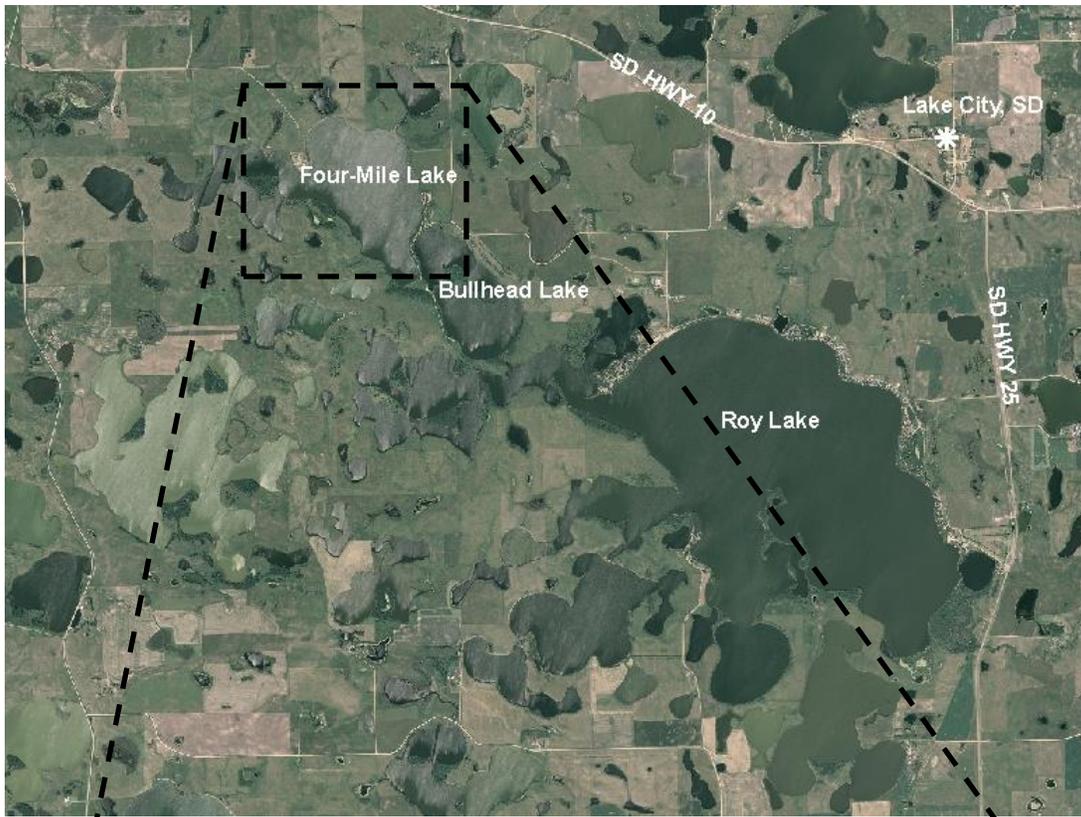


Figure 2. Map depicting geographic location of Four-Mile Lake from Lake City, South Dakota (top). Also noted is the boat ramp and standardized net locations for Four-Mile Lake (bottom). FMFN= frame nets, FMGN= gill nets

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length northern pike ≥ 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 ≥ 30 , a PSD of 30-60, and a PSD-P of 5-10.
- 3) Maintain a mean frame net CPUE of stock-length black bullhead ≤ 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 summer-kill events and the fish community has been primarily comprised of black bullhead, northern pike, and yellow perch. 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 2014 mean gill net CPUE of stock-length northern pike was 15.3 (Table 1) and above the minimum objective of (≥ 3 stock-length fish/net night). Based on the 2014 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 2014 ranged in TL from 31 to 72 cm (12.2 to 28.3 in), had a PSD of 46 and a PSD-P of 2 (Figure 3). The PSD was above the management objective of 30-60 and the PSD-P was below the management objective of 5-10. Gill net sampled northern pike in 2014 had mean W_r values that ranged from 88 to 91 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 89 (Table 1).

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 38.7 (Table 1), and above the minimum objective (≥ 30 stock-length yellow perch/net night). Based on the 2014 gill net catch, relative abundance of stock-length yellow perch appears to be high (≥ 30 stock-length yellow perch/net night).

Yellow perch captured in the 2014 gill net catch ranged in TL from 8 to 27 cm (3.1 to 10.6 in) with approximately 90% being less than 20 cm (8 in :Table 3; Figure 4),

had a PSD of 15 and a PSD-P of 5 (Figure 4). The PSD was below the management objectives of 30-60 and the PSD-P was within the management objective of 5-10.

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2014 and indicated that approximately 70% of yellow perch captured were from the 2012 (age-2) year class (Table 4). The weighted mean TL at capture for age-2 and age-3 male yellow perch was 131 and 153 mm (5.1 and 5.9 in), respectively (Table 5). The weighted mean TL at capture for age-2 and age-3 female yellow perch was 139 and 155 (5.4 and 6.1 Table 5). Mean *Wr* values of gill net captured yellow perch in 2014 ranged from 83 to 118 for all 10-mm length groups sampled; a decreasing trend in condition was apparent as TL increased. The mean *Wr* of stock-length individuals was 97 (Table 1).

Other Species

Black Bullhead: The mean frame net CPUE of stock-length black bullhead was 56.2 (Table 1) and within the management objective (≤ 100 stock-length black bullheads/net-night).

Frame net captured black bullhead ranged in TL from 9 to 21 cm (3.5 to 8.3 in); all were < quality-length (23 cm; 9 in) resulting in a PSD and PSD-P of 0 (Table 1). Mean *Wr* values exceeded 90 for all length categories represented in the frame net catch. The mean *Wr* of stock-length black bullheads was 93 and no length-related trends in condition were apparent.

Walleye: No walleye were captured during the 2014 fish community survey.

Other: Black crappie, bluegill, green sunfish, hybrid sunfish and white sucker were other fish species captured in relatively-low numbers during the 2014 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 2019) 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, 2014. 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; GSF= green sunfish; HYB= sunfish hybrid; NOP= northern pike; 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	56.2	21.0	0	---	0	---	93	3
BLC	0.3	0.2	0	---	0	---	120	33
BLG	4.9	3.1	22	9	0	---	125	1
GSF	0.4	0.3	0	---	0	---	132	14
HYB ¹	2.2	1.3	---	---	---	---	---	---
NOP	0.7	0.3	50	36	13	24	95	3
WHS	0.6	0.4	0	---	0	---	96	7
YEP	28.8	17.1	1	1	0	---	106	3
<i>Gill nets</i>								
BLB	15.7	9.9	21	10	0	---	100	1
NOP	15.3	3.8	46	12	2	4	89	1
WHS	0.7	1.3	100	---	100	---	106	39
YEP	38.7	1.3	14	5	5	4	97	<1

¹ All fish sizes; *Lepomis spp.*

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Four-Mile Lake, 2009-2014. BLB= black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; HYB= hybrid sunfish; NOP = northern pike; WAE = walleye; WHS = white sucker; YEP = yellow perch

Species	CPUE					
	2009	2010	2011	2012	2013	2014
<i>Frame nets</i>						
BLB	0.3	---	---	---	---	56.2
BLC	0.0	---	---	---	---	0.3
BLG	1.0	---	---	---	---	4.9
COC	0.1	---	---	---	---	0.0
GSF	0.0	---	---	---	---	0.4
HYB ¹	0.0	---	---	---	---	2.2
NOP	0.6	---	---	---	---	0.7
WAE	0.6	---	---	---	---	0.0
WHS	0.0	---	---	---	---	0.6
YEP	0.4	---	---	---	---	28.8
<i>Gill nets</i>						
BLB	0.0	---	---	---	---	15.7
BLC	0.3	---	---	---	---	0.0
NOP	4.7	---	---	---	---	15.3
WAE	2.0	---	---	---	---	0.0
WHS	1.0	---	---	---	---	0.7
YEP	5.0	---	---	---	---	38.7

¹ All fish sizes; *Lepomis spp.*

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured by experimental gill nets in Bullhead Lake, 2009-2014. NOP = northern pike; YEP = yellow perch

Species	2009	2010	2011	2012	2013	2014	Objective
<i>Gill nets</i>							
NOP							
CPUE	5	---	---	---	---	15	≥ 3
PSD	71	---	---	---	---	46	30-60
PSD-P	14	---	---	---	---	2	5-10
Wr	95	---	---	---	---	89	---
YEP							
CPUE	5	---	---	---	---	39	≥ 30
PSD	0	---	---	---	---	14	30-60
PSD-P	0	---	---	---	---	5	5-10
Wr	94	---	---	---	---	97	---

Table 4. Year class distribution based on expanded age/length summary for yellow perch sampled in gill nets from Four-Mile Lake, 2009-2014.

Survey Year	Year Class								
	2014	2013	2012	2011	2010	2009	2008	2007	2006
2014		21	114	11	10	5		1	
2009								222	4

Table 5. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Four-Mile Lake, 2009-2014.

Year	Age						
	1	2	3	4	5	6	7
2014							
Male	92 (18)	131 (36)	153 (4)	---	---	---	---
Female	91 (4)	139 (77)	155 (6)	235 (10)	252 (5)	---	266 (1)
Combined	92 (21)	135 (114)	152 (11)	235 (10)	252 (5)	---	266 (1)
2009							
Male	---	96 (31)	147 (4)	---	---	---	---
Female	---	104 (191)	---	---	---	---	---
Combined	---	102 (222)	147 (4)	---	---	---	---

Table 6. Stocking history including size and number for fishes stocked into Four-Mile Lake, 2001-2014. WAE= walleye

Year	Species	Size	Number
2001	WAE	fry	200,000
2004	WAE	fry	350,000
2008	WAE	fry	200,000
2010	WAE	fry	350,000
2012	WAE	fry	175,000
2014	WAE	fry	200,000

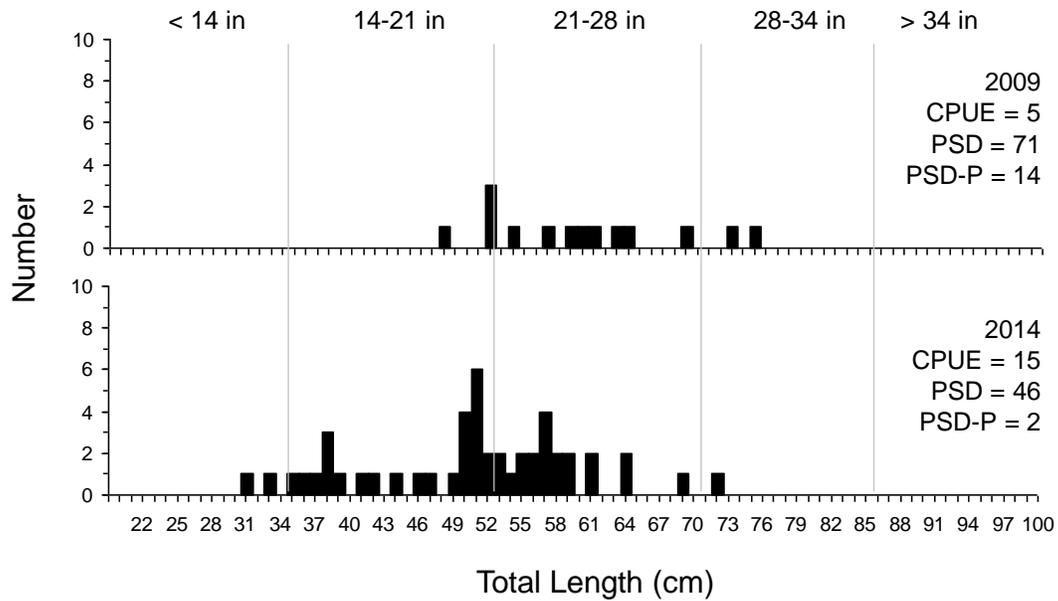


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using experimental gill nets in Four-Mile Lake, 2009-2014.

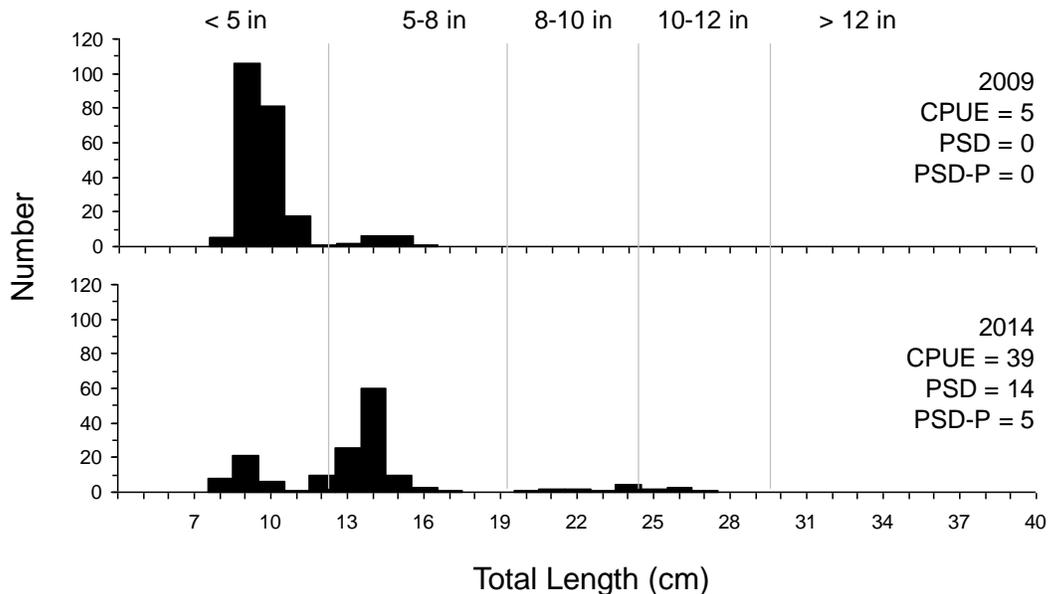


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Four-Mile Lake, 2009-2014.