

Long Lake

Site Description

Location

Water designation number (WDN)	47-0008-00
Legal description	T127N-R70W-Sec. 2,3,10; T128N-R70W-Sec. 35
County (ies)	McPherson
Location from nearest town	3 miles west of Long Lake, SD

Survey Dates and Sampling Information

Survey dates	July 24, 2012 (GN)
Gill net sets (n)	3

Morphometry

Watershed area (acres)	29,097
Surface area (acres)	≈425
Maximum depth (ft)	≈10
Mean depth (ft)	unknown

Ownership and Public Access

Long Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. A relatively-small (3.5 acre) parcel of state-owned Game Production Area (GPA) located on the north shore provides public access. Lands adjacent to Long Lake are owned by US Fish and Wildlife Service, State of South Dakota, and private individuals.

Watershed and Land Use

The 29,097 acre Long Lake sub-watershed (HUC-12) is located within the larger Long Lake (HUC-10) watershed. Land use within the watershed is primarily agricultural including a mix of pasture or grassland and cropland.

Water Level Observations

Water levels on Long Lake are not currently monitored by SDDENR.

Fish Management Information

Primary species	Walleye, Yellow Perch
Other species	none
Lake-specific regulations	none
Management classification	warm-water marginal
Fish consumption advisories	none

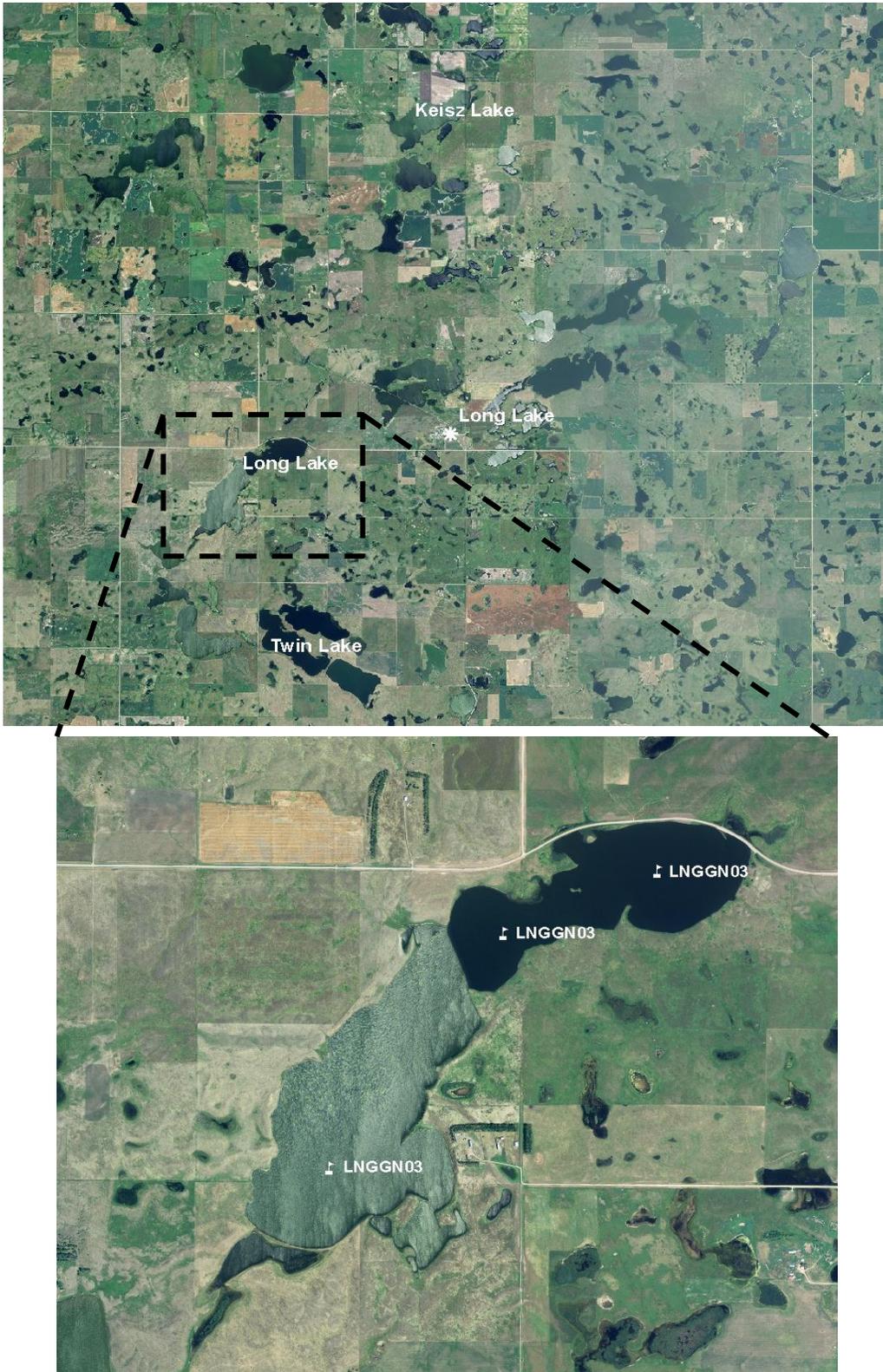


Figure 1. Map depicting geographic locations of several, McPherson County, lakes from Long Lake, South Dakota (top). Also noted are standardized net locations for Long Lake (bottom). LNGGN= gill net

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length Walleye ≥ 10 , 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.

Results and Discussion

Long Lake is a shallow-natural lake located near the City of Long Lake in McPherson County, South Dakota. Past surveys conducted in the 1970's indicated that Long Lake was highly susceptible to winterkill and primary management activities were limited to stockings of Black Bullheads, Northern Pike, and Yellow Perch (species believed to be more winterkill tolerant). However, heavy precipitation in the mid to late 1990's and the resulting run-off increased water depths and diminished the threat of winterkill. In 2000, Walleye and Yellow Perch were stocked into Long Lake and a sport fishery has developed. Currently, Long Lake is managed as a Walleye and Yellow Perch fishery.

Note: Sampling was conducted approximately two months later (September 19) in 2007.

Primary Species

Walleye: The mean gill net CPUE of stock-length Walleye was 14.0 (Table 1) and above the minimum objective (≥ 10 stock-length Walleye/net night; Table 3). The 2012 gill net CPUE represented a decrease from the 16.3 observed in 2007 (Table 2), but still indicated high relative abundance.

Walleye captured in the 2012 gill net catch ranged in TL from 12 to 60 cm (4.7 to 23.6 in; Figure 2). The majority of walleye were \geq quality-length (38 cm; 15 in) resulting in a PSD of 98 which is above the management objective of 30-60 (Table 3; Figure 2). The PSD-P was 10 and within the objective range of 5-10 (Table 3).

Otoliths were collected from a sub-sample of gill net captured walleye. Five walleye year classes (2005, 2009-2012) were present (Table 4). The 2010 year class was the most represented and comprised 69% of walleye in the gill net catch (Table 4). The 2005, 2009, and 2011 year classes coincided with fry stockings; while the relatively-strong 2010 cohort was naturally produced (Table 4; Table 6). The capture of four individuals from the 2012 (age-0) year class indicates successful natural reproduction; however, recruitment of this cohort is currently unknown and will be assessed in future surveys. The contribution of stocked or naturally-produced walleye to year classes produced during stocked years is unknown, as stocked walleye were unmarked making it difficult to differentiate stocked from naturally-produced walleye.

In 2012, weighted mean TL at capture of age-2 and age-3 walleye was 423 and 485 mm (16.7 and 19.1 in; Table 5). The majority of Walleye in the gill net catch were in the quality-preferred length category which had a mean W_r of 101.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 164.3 (Table 1) and well above the minimum objective (≥ 30 stock-length Yellow Perch/net night; Table 3). The 2012 gill net CPUE was substantially higher than the 2007 CPUE of 64.0 (Table 2). Currently, relative abundance is considered high.

Yellow Perch captured in the gill net catch ranged in TL from 8 to 22 cm (3.1 to 8.7 in; Figure 3). The majority of Yellow Perch in the gill net catch were \leq quality length (20 cm; 8 in) as indicated by the low PSD and PSD-P values of 4 and 0, respectively (Table 1; Table 3; Figure 3). Both the PSD and PSD-P were below management objectives of 30-60 and 5-10 (Table 3).

Otoliths were collected from a sub-sample of gill net captured Yellow Perch and age structure information suggested the presence of three year classes (2010-2012; Table 7). The 2011 cohort was the most represented and comprised 82% of Yellow Perch in the gill net catch (Table 7).

The weighted mean TL at capture for age-1 and age-2 male Yellow Perch was 127 and 175 mm (5.0 and 6.9 in; Table 8). The weighted mean TL at capture for age-1 and age-2 female Yellow Perch was 140 and 193 mm (5.5 and 7.6 in), respectively (Table 8). Gill net captured Yellow Perch had high condition with mean W_r values ≥ 100 for all length categories (e.g., stock to quality) sampled. The mean W_r of stock-length Yellow Perch was 103 (Table 1) and no length-related trends in condition were apparent.

Management Recommendations

- 1) Conduct fish community assessment surveys on an every fifth year basis (next survey scheduled in summer 2017) 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 (≈ 500 fry/acre) on a biennial basis (odd years) to establish additional year classes.
- 4) Monitor winter and summerkill events. In cases of substantial winter/summerkill the need to re-establish a fishery in Long Lake should be evaluated. If water levels are sufficient, Walleye and Yellow Perch should be stocked 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 experimental gill nets from Long Lake, 2012. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). WAE= Walleye; YEP= Yellow Perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
<i>Gill Nets</i>								
WAE	14.0	8.2	98	4	10	8	100	1
YEP	164.3	44.3	4	2	0	---	103	1

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in experimental gill nets from Long Lake, 2007-2012. Note: sampling was conducted approximately two months later in 2007. WAE= Walleye; YEP= Yellow Perch

Species	CPUE					
	2007	2008	2009	2010	2011	2012
<i>Gill nets</i>						
WAE	16.3	---	---	---	---	14.0
YEP	64.0	---	---	---	---	164.3

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 in experimental gill nets from Long Lake, 2007-2012. Note: sampling was conducted approximately two months later in 2007. WAE = Walleye; YEP = Yellow Perch

Species	2007	2008	2009	2010	2011	2012	Objective
<i>Gill nets</i>							
WAE							
CPUE	16	---	---	---	---	14	≥ 10
PSD	80	---	---	---	---	98	30-60
PSD-P	35	---	---	---	---	10	5-10
Wr	92	---	---	---	---	100	---
YEP							
CPUE	64	---	---	---	---	164	≥ 30
PSD	26	---	---	---	---	4	30-60
PSD-P	4	---	---	---	---	0	5-10
Wr	88	---	---	---	---	103	---

Table 4. Year class distribution based on the expanded age/length summary for Walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Long Lake, 2007-2012. Note: sampling was conducted approximately two months later in 2007.

Survey Year	Year Class												
	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
2012	4	4	33	5				2					
2007 ¹	---	---	---	---	---	14	3	28					16
# stocked													
fry		190		200				400					
sm. fingerling													81
lg. fingerling													

¹ Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 5. Weighted mean TL at capture (mm) for Walleye sampled in experimental gill nets (expanded sample size) from Long Lake, 2007-2012. Note: sampling was conducted approximately two months later in 2007.

Year	Age										
	0	1	2	3	4	5	6	7	8	9	10
2012	128(4)	246(4)	423(33)	485(5)	---	---	---	573(2)	---	---	577(1)
2007 ¹	199(14)	327(3)	391(28)	---	---	---	---	569(16)	---	---	---

¹ Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 6. Stocking history including size and number for fishes stocked into Long Lake, 2000-2012. WAE= Walleye; YEP= Yellow Perch

Year	Species	Size	Number
2000	WAE	small fingerling	80,600
	YEP	adult	2,150
2005	WAE	fry	400,000
2009	WAE	fry	200,000
2011	WAE	fry	190,000

Table 7. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from Long Lake, 2012.

Survey Year	Year Class		
	2012	2011	2010
2012	17	679	136

Table 8. Weighted mean TL (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Long Lake, 2012.

Year	Age		
	0	1	2
2012			
Male	87 (5)	127 (128)	175 (22)
Female	88 (11)	140 (341)	193 (98)
Combined	87 (17)	132 (679)	183 (136)

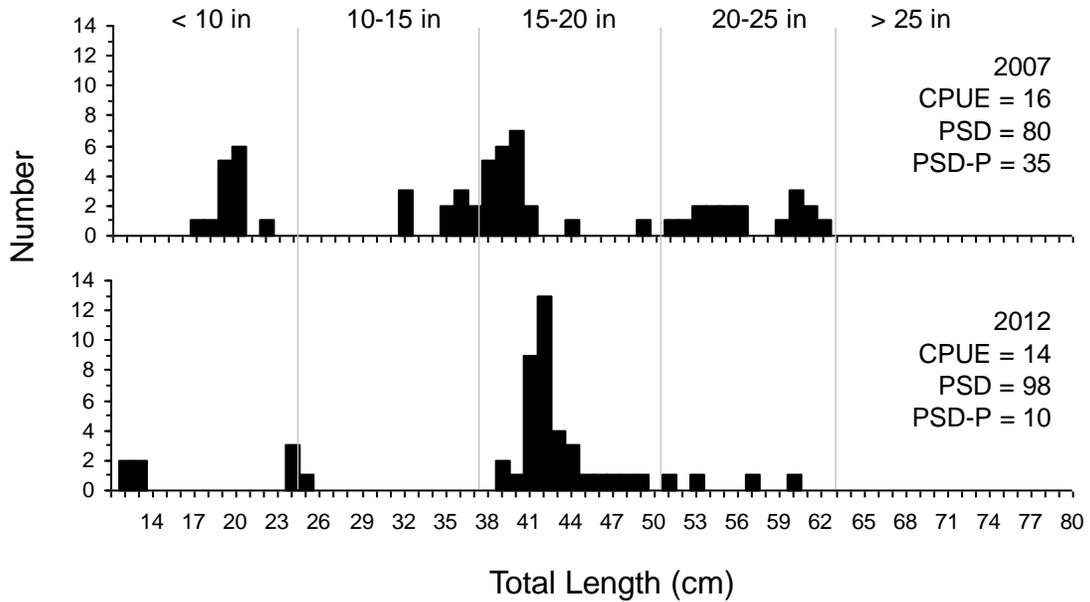


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in Long Lake, 2007 and 2012.

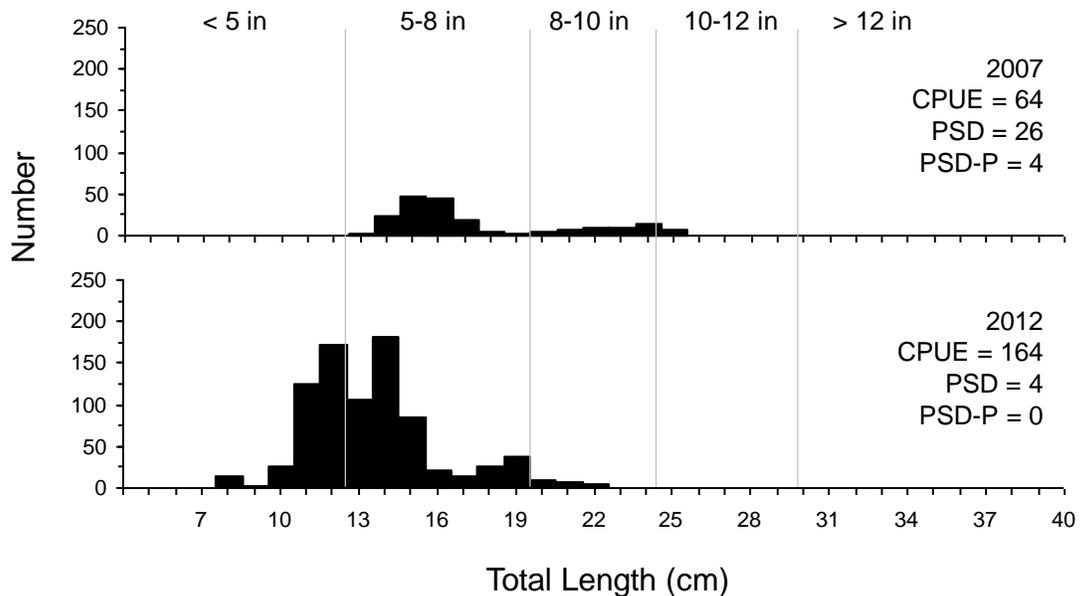


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Long Lake, 2007 and 2012.