Swan Lake

Site Description

Location

Water designation number (WDN)	18-0017-00
Legal description	T119N-R56W-Sec.3,4,8,9,10,15,16,17
County (ies)	Clark
Location from nearest town	5.0 miles east and 2.0 miles north of Bradley

Survey Dates and Sampling Information

Survey dates	May 27-28, 2015 (GN)
Gill net sets (n)	6

Morphometry (Figure 1)

Watershed area (acres)	17,223
Surface area (acres)	1,624
Maximum depth (ft)	20
Mean depth (ft)	13

Ownership and Public Access

Swan Lake is a non-meandered lake and the fishery is managed by the SDGFP. A single public access site is located on the northeast shoreline and is maintained by the SDGFP (Figures 1-2). Lands adjacent to Swan Lake are generally under state and private ownership.

Watershed and Land Use

The 17,223 acre Swan Lake sub-watershed (HUC-12) is located within the larger Grass, Dry, and Still Lakes (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

Swan Lake has no established OHWM and an outlet elevation was not available. On April 28 and October 19, 2015 the elevation of Swan Lake was 1757.2 and 1756.0 fmsl, respectively.

Fish Management Information

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Primary species	walleye, yellow perch
Other species	black bullhead, northern pike
Lake-specific regulations	none
Management classification	none
Fish consumption advisories	Mercury: walleye >21 inches. See the South Dakota Fishing Handbook for more details on meal and portion size recommendations. Also see Department of Health website: http://doh.sd.gov/food/fish-advisories.aspx for more information.
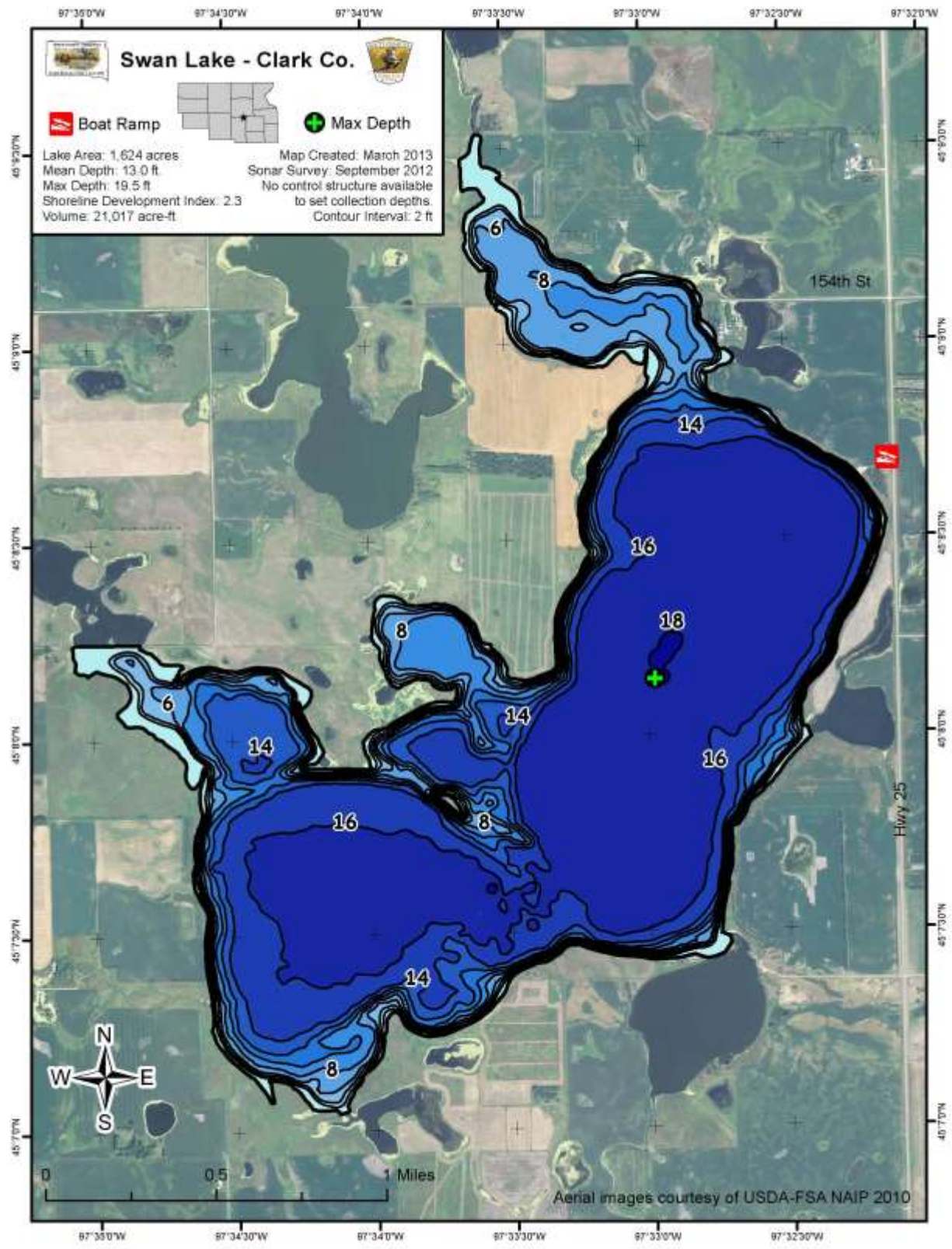
Figure 1. Map depicting access location and depth contours of Swan Lake, Clark County, South Dakota.

Figure 2. Map depicting geographic location Swan Lake from Bradley, South Dakota (top). Also noted is the public access point and standardized net locations for Swan Lake SWGN= gill nets

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

Prior to the 1990's Swan Lake was a shallow slough unable to support a sport fishery. During the mid-1990's above average precipitation and resulting runoff provided an increase in surface area and water depth making the lake capable of supporting a sport fishery. Swan Lake is currently managed as a walleye and yellow perch fishery.

Primary Species

Walleye: The mean gill net CPUE of stock-length walleye during 2015 was 8.7 (Table 1) and was below the minimum objective ($\geq$ 10 stock-length walleye/net night; Table 3). The 2015 gill net CPUE is a substantial decrease from the 17.5 observed in 2012 and relative abundance is considered moderate (Table 2).

Walleye captured in gill nets during 2015 ranged in TL from 17 to 57 cm (6.7 to 22.4 in; Figure 3). Both the PSD of 79 and the PSD-P of 11 are above the management objective ranges of 30-60 and 5-10, respectively (Table 1; Table 3). Age estimates made using otoliths indicated that eight year classes (2005, 2008-2014) were represented in the 2015 gill net catch (Table 4). Three year-classes (2009, 2011 and 2013) coincide with stocking events; while year classes produced in 2005, 2008, 2010, 2012 and 2014 were naturally produced (Table 4; Table 6). The contribution of natural reproduction to year classes coinciding with stocking events is unknown.

Growth rates appear to be good with the weighted mean TL at capture of age-2 and age-3 walleye being 286 and 375 mm (11.3 and 14.8 in; Table 5). Walleye were in good condition with mean Wr values ranging from 91 to 99 for all length categories sampled. The mean Wr of stock-length walleye in the 2015 gill net catch was 93 (Table 1) and a slight decreasing trend in Wr was observed as TL increased.

Yellow Perch: The 2015 mean gill net CPUE of stock-length yellow perch was 9.8 (Table 1) and was below the minimum objective (≥ 30 stock-length yellow perch/net night; Table 3). The 2015 gill net CPUE represented a decrease from the 2012 CPUE of 28.0 and suggested moderate relative abundance.

Yellow perch captured in the gill nets ranged in TL from 12 to 26 cm (4.7 to 10.2 in; Figure 4). The PSD was 15 and PSD-P was 2 (Table 1). Both the PSD and PSD-P were below the management objective ranges of 30-60 and 5-10 (Table 3), respectively; indicating a population comprised of smaller individuals.

Otoliths were collected from a sub-sample of gill net captured yellow perch. Age structure information revealed the presence of four year-classes (2011-2014; Table 7). The 2013 cohort was the most represented and comprised 95% of yellow perch in the gill net catch (Table 7).

Growth rates appear to be good with the weighted mean TL at capture for age-2 yellow perch being 168 mm (6.6 in; Table 8). Yellow perch were in good condition with mean Wr values ranging from 90 to 104 for all length categories sampled. The mean Wr of stock-length yellow perch was 95 (Table 1). No length-related trend in Wr was observed.

Other Species

Northern Pike: The 2015 mean gill net CPUE of stock-length northern pike was 3.7 (Table 1). Relative abundance appears to be high. Northern pike captured in the gill net sample ranged in TL from 44 to 82 cm (17.3 to 32.3 in; Figure 5). The condition of gill net captured northern pike was similar to that of northern pike captured from other northeast South Dakota glacial lakes with mean Wr values that ranged from 84 to 99 for all length categories (e.g., stock to quality) sampled. Stock-length northern pike had a mean Wr of 95 (Table 1) and a decreasing trend in Wr was observed as total length increased.

Management Recommendations

1) Conduct fish community surveys utilizing gill nets on an every third year basis (next survey scheduled in summer 2018) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Stock walleye on a biennial basis (≈500 fry/acre) to establish additional year classes.

3) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.

4) Monitor winter and summer kill events. In cases of substantial winter or summer kill the need to re-establish a fishery in Swan 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 Swan Lake, 2015. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). NOP= northern pike; WAE= walleye; YEP= yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Gill nets								
NOP	3.7	0.5	82	14	27	17	95	5
WAE	8.7	2.3	79	10	35	11	93	1
YEP	9.8	2.2	15	8	2	3	95	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 Swan Lake, 2002-2015. BLB = black bullhead; NOP = northern pike; WAE = walleye; YEP = yellow perch

Species	CPUE								
	2002	2003	2004	2005	2006	2007	2009	2012	2015
Gill nets									
BLB	33.0	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
NOP	1.5	2.2	4.3	1.8	0.5	1.3	1.0	4.2	3.7
WAE	22.3	15.7	9.7	4.2	9.0	2.7	1.8	17.5	8.7
YEP	126.7	36.0	14.3	13.0	8.7	2.0	11.0	28.0	9.8

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 Swan Lake, 2002-2015. WAE = walleye; YEP = yellow perch

Species	2002	2003	2004	2005	2006	2007	2009	2012	2015	Objective
Gill nets										
WAE										
CPUE	22	16	10	4	9	3	2	18	9	> 10
PSD	36	87	62	56	61	100	27	57	79	30-60
PSD-P	2	4	10	8	13	75	18	4	35	5-10
Wr	96	97	95	87	94	79	92	93	93	---
YEP										
CPUE	127	36	14	13	9	2	11	28	10	≥ 30
PSD	37	56	100	97	63	33	80	89	15	30-60
PSD-P	14	28	42	91	31	17	0	38	2	5-10
Wr	102	104	98	100	106	111	107	116	95	---

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 Swan Lake, 2009-2015.

	Year Class													
Survey Year	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
2015		5	7	12	3	6	23	2				1		
2012	---	---	---		1	9	89	2	1	2		1		1
2009[1]	---	---	---	---	---	---		5	8			1		1
# stocked														
fry	750		750		1000		750			1500		1500		
sm. fingerling									76					
lg. fingerling														

[1] Older Walleye were sampled, but are not reported in this table.

Table 5. Weighted mean length at capture (mm) for walleye age-1 through age-10 captured in experimental gill nets (expanded sample size) from Swan Lake, 2005-2015. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

	Age									
Year	1	2	3	4	5	6	7	8	9	10
2015	181(5)	286(7)	379(12)	430(3)	487(6)	514(23)	544(2)	---	---	562(1)
2012	159 (1)	310 (9)	385 (89)	480 (2)	509 (1)	528 (2)	---	657 (1)	---	683 (1)
2009	213 (5)	302 (8)	---	---	494 (1)	---	649 (1)	---	---	655 (1)
2007	203 (3)	372 (3)	442 (1)	---	541 (1)	518 (1)	---	595 (2)	---	---
2006	238 (13)	314 (16)	351 (2)	433 (12)	---	494 (11)	502 (5)	602 (4)	---	---
2005	158 (2)	335 (11)	430 (9)	---	463 (2)	---	535 (2)	---	---	---

Table 6. Stocking history including size and number for fishes stocked into Swan Lake, 2002-2015.

Year	Species	Size	Number
2004	WAE	fry	1,500,000
2006	WAE	fry	1,500,000
2007	WAE	small fingerling	75,600
2009	WAE	fry	750,000
2011	WAE	fry	1,000,000
2013	WAE	fry	750,000
2015	WAE	fry	750,000

Table 7. Year class distribution based on the expanded age/length summary for yellow perch sampled in gill nets from Swan Lake, 2009-2015.

	Year Class								
Survey Year	2015	2014	2013	2012	2011	2010	2009	2008	2007
2115		1	57	1	2				
2012	---	---	---		67	60	99	5	4
2009	---	---	---	---	---	---			66

Table 8. Weighted mean TL (mm) at capture for yellow perch captured in experimental gill nets (expanded sample size) from Swan Lake, 2009-2015.

Year	Age				
	1	2	3	4	5
2015	174(1)	168(57)	213(1)	253(2)	---
2012	104(67)	206(60)	254(99)	285(5)	331(4)
2009	---	209(66)	---	---	---
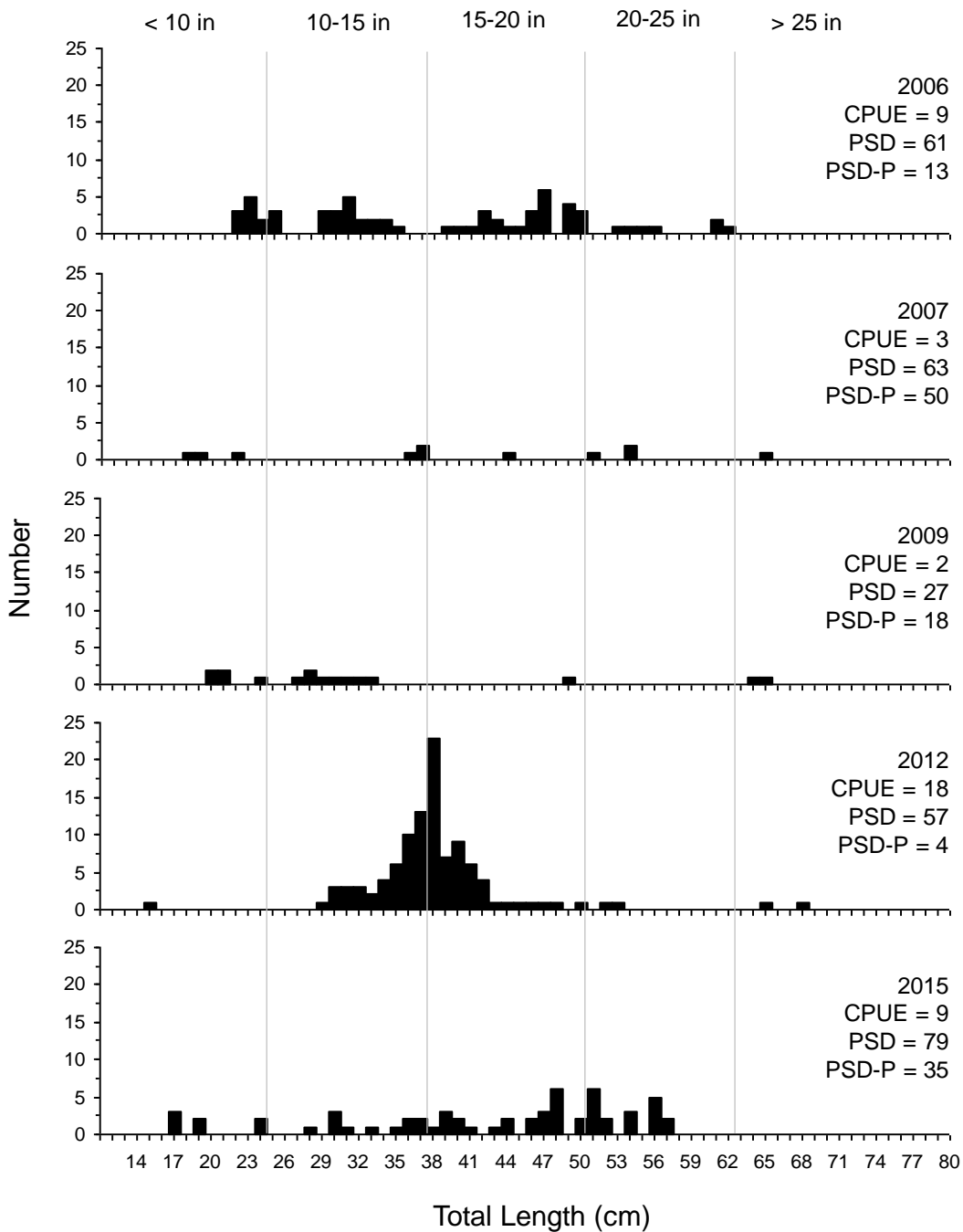
Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Swan Lake, 2006-2015.
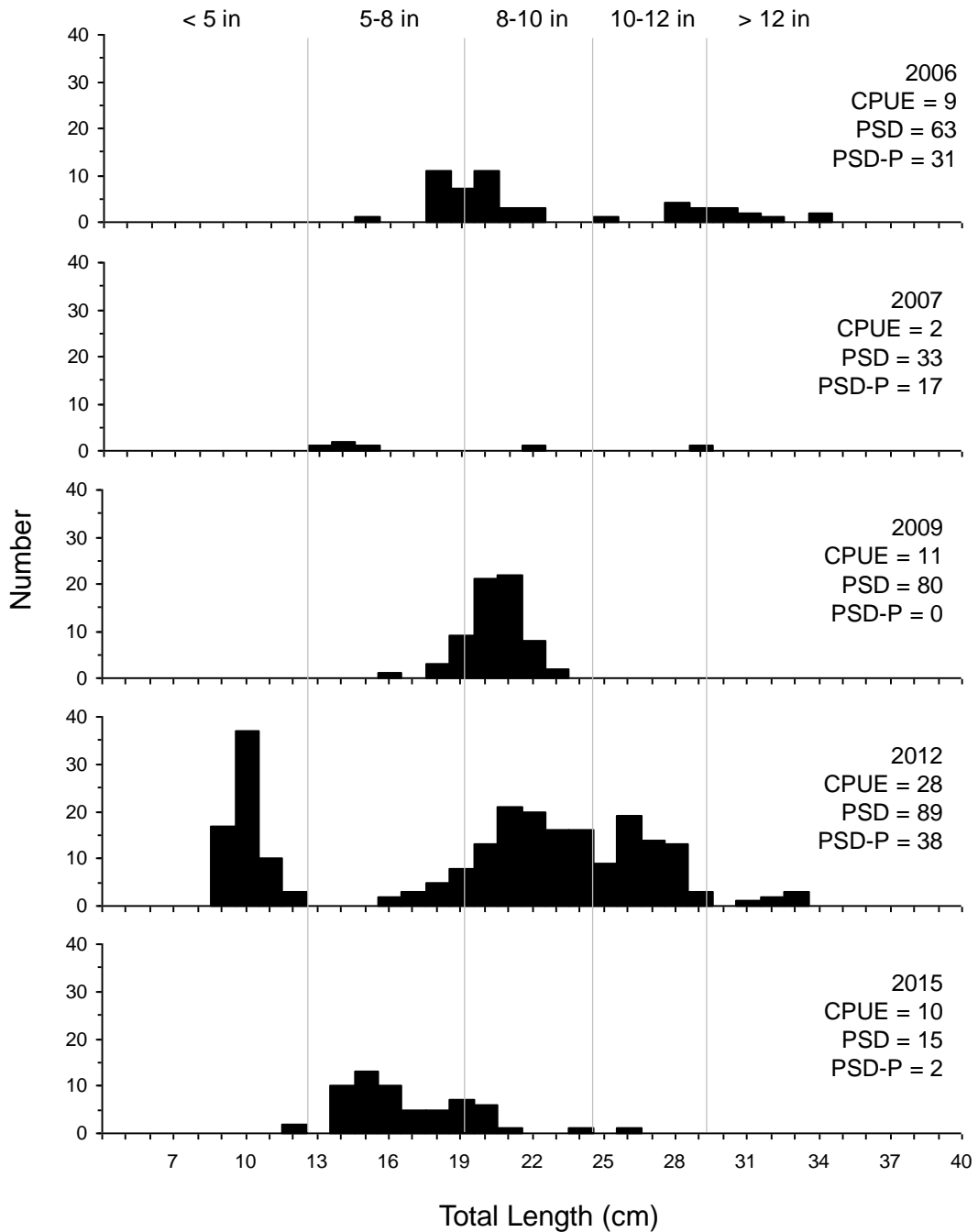
Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Swan Lake, 2006-2015.
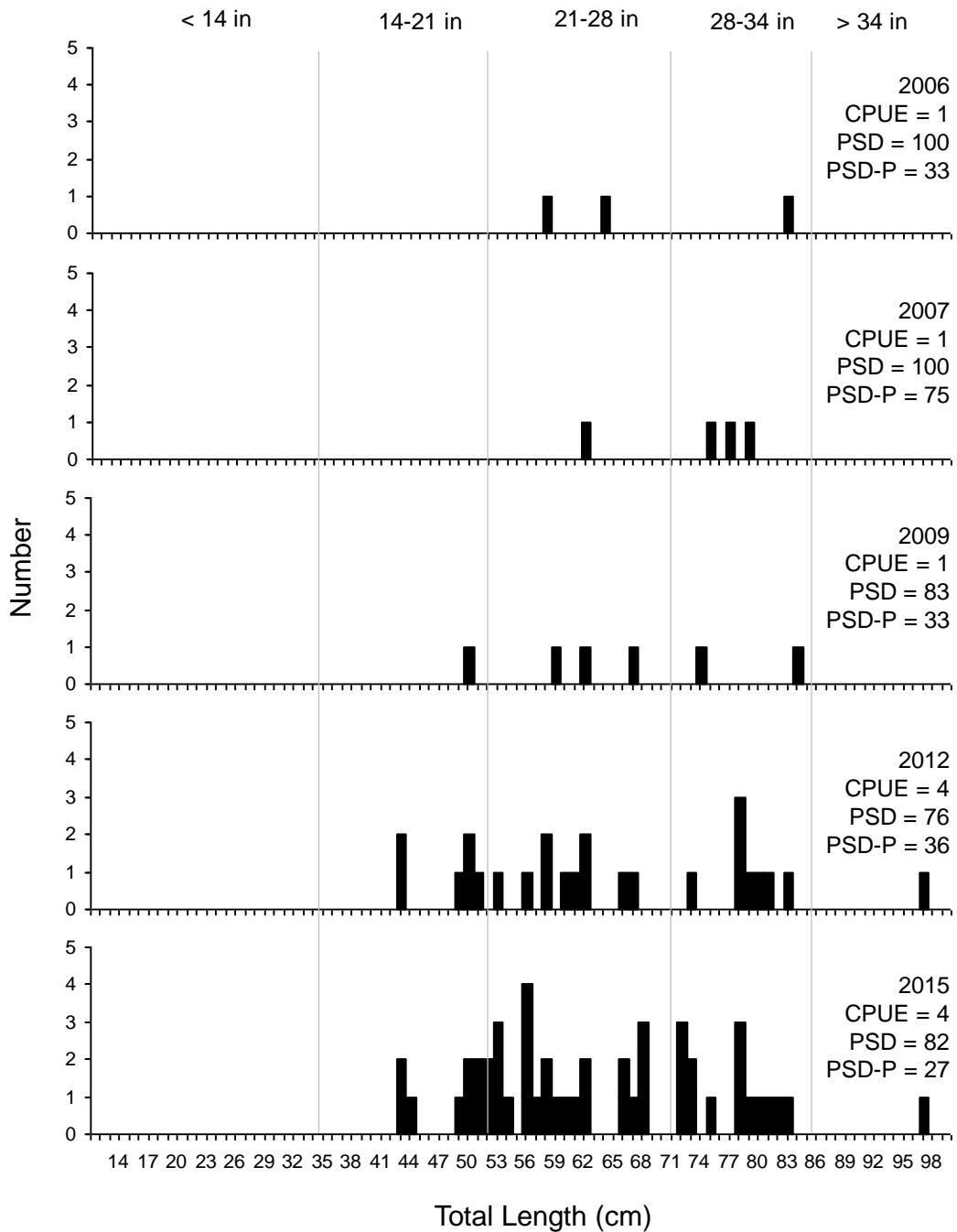
Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using experimental gill nets in Swan Lake, 2006-2015.