

# Lynn Lake

## Site Description

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### Location

Water designation number (WDN)	22-0010-00
Legal description	T123N-R57W-Sec. 15, 16, 21, 22, 23, 26, 27, 34, 35
County (ies)	Day
Location from nearest town	6 miles west and 3 miles south of Roslyn, SD

### Survey Dates and Sampling Information

Dates of current survey	September 9-11, 2008 (FN,GN) September 11, 2008 (EF-WAE)
Date of most recent survey	May 16-31, 2007 (SFN) September 4-7, 2007(GN) September 11, 2007 (EF-WAE)
Gill net sets (n)	6
Frame net sets (n)	18
Fall electrofishing-WAE (min)	60

### Morphometry (Figure 1)

Watershed area (acres)	unknown
Surface area (acres)	1,390
Maximum depth (ft)	~25
Mean depth (ft)	unknown

### Ownership and Public Access

Lynn Lake is a non-meandered lake managed by the SDGFP. A single boat ramp is located on the west shoreline and is a private fee ramp; shore fishing access is available on dead-end roads on the north, south, and east side of the lake (Figure 1). Lands adjacent to Lynn Lake are generally under state and private ownership.

### Watershed and Land Use

Land use within the Lynn Lake watershed is primarily agricultural with a mix of pasture or grassland, cropland, and woodland.

### Water Level Observations

No Ordinary High Water Mark has been established by the South Dakota Water Management Board on Lynn Lake. The elevation of Lynn Lake on May 6, 2008 was 1768.2 fmsl and indicated only a slight increase from the fall 2007 elevation of 1768.0 fmsl. By October 21, 2008 the water level had declined to an elevation of 1767.6 fmsl.

### Aquatic Vegetation and Exotics

Emergent and submergent vegetation are present in Lynn Lake; however, the type and extent have not been documented. No exotic species have been reported in Lynn Lake.

### Fish Management Information

Primary species	black crappie, muskellunge, walleye, yellow perch
Other species	black bullhead, bluegill, northern pike, rock bass, smallmouth bass, white bass, white sucker
Lake-specific regulations	NE Panfish Management Area: 10 daily; 50 possession Walleye/Saugeye: 2 daily; minimum length 16"
Management classification	none
Fish Consumption Advisories	none

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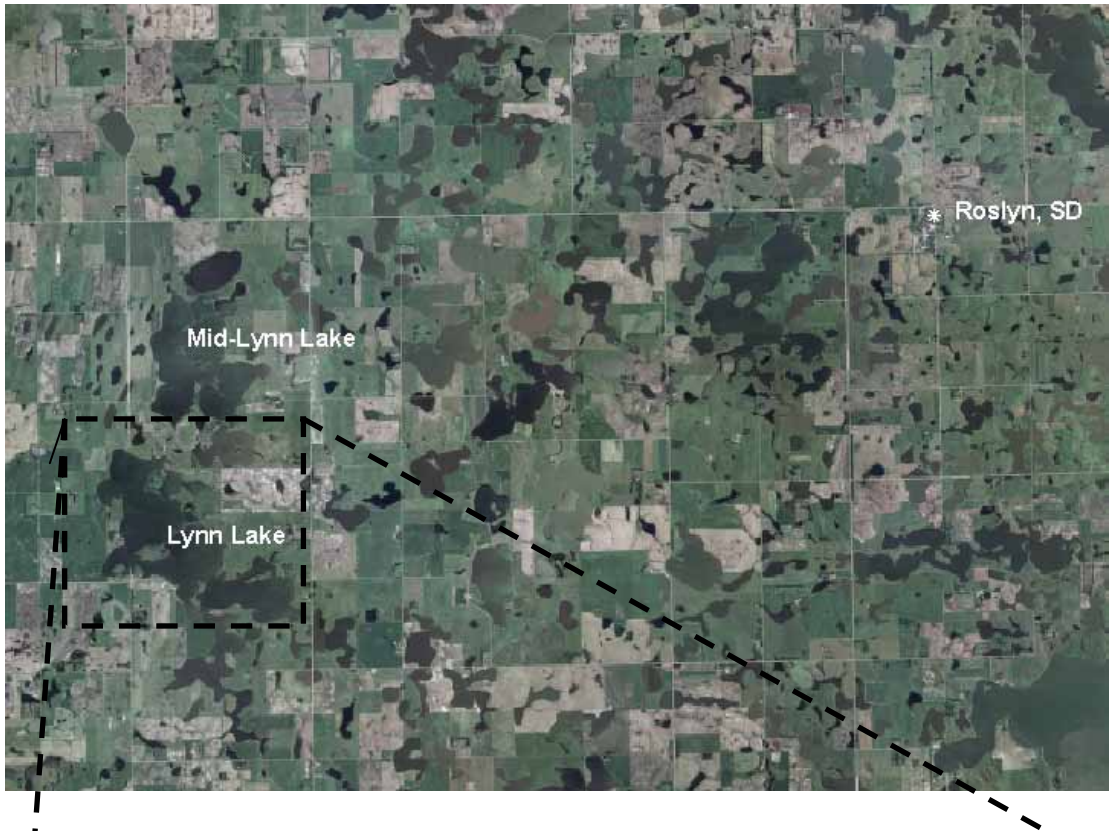


Figure 1. Map depicting location of Lynn Lake Complex from Roslyn, Day County, South Dakota; including access site and standardized net locations. LFN= frame nets; LGN= gill nets.

# Lynn Lake

Lake Properties  
Area: 1390 acres  
Perimeter: 24.7 miles

Lynn Lake (2001)  
Lake elevations and features are a reflection of data obtained from digital elevation models from aerial photography taken on October 6, 1997. The lake elevation was generated at 1771.4 feet above sea level.



Figure 2. Map depicting depth contours for Lynn Lake, Day County, South Dakota.

## Management Objectives

- 1) Maintain a mean frame net CPUE of stock-length black crappie  $\geq 10$ , a PSD of 30-60, and a PSD-P of 5-10.
- 2) Maintain a low density muskellunge population to provide a unique angling opportunity in northeastern South Dakota.
- 3) Maintain a mean gill net CPUE of stock-length walleye  $\geq 10$ , a PSD of 30-60, and a PSD-P of 5-10.
- 4) Maintain a mean gill net CPUE of stock-length yellow perch  $\geq 25$ , a PSD of 30-60, and a PSD-P of 5-10.
- 5) Maintain a mean frame net CPUE of stock length bullhead  $\leq 100$ .

## Results and Discussion

Prior to heavy precipitation during the 1990's, Lynn Lake was a shallow cattail slough. Heavy precipitation and resulting run-off resulted in increased water levels capable of sustaining fish life. The first known stocking of fish into Lynn Lake occurred in 1998 when saugeye and black crappie were stocked (Table 5). In 2002, a reduced daily limit of two walleye with a 406-mm (16-inch) minimum-length restriction and one walleye over 508-mm (20 inch) regulation was placed on the Lynn Lake walleye population to maintain predator abundance and to provide a measure of sustainability to the walleye fishery.

### *Primary Species*

Black crappie: Strong year-classes of black crappie were produced between 1998 and 2000 resulting in relatively high black crappie abundance. The high black crappie abundance led to an increased number of anglers targeting black crappies at Lynn Lake. However, since the initial "boom" black crappie relative abundance has declined as recruitment has become limited and black crappie from initial year classes (1998-2000) have succumbed to angling and natural mortality (Table 2).

Prior to 2008, the Lynn Lake black crappie population was assessed using frame nets during mid to late May. In 2008, the timing of frame netting was adjusted and completed in conjunction with gill netting in early-September. Seven black crappie ranging in total length from 15 to 35 cm (5.9 to 13.8 in) were captured during the 2008 survey resulting in a mean frame net CPUE of 0.4 (Table 1), well below the minimum objective ( $\geq 10$  stock-length black crappie/net; Table 3). The presence of age-0 black crappie in both the frame net and gill net catch indicates successful reproduction in 2008; however recruitment is unknown at this time.

Muskellunge: Lynn Lake is one of two lakes in northeastern SD managed for muskellunge. Muskellunge were first introduced into Lynn Lake in 2001, and subsequently stocked in 2003, 2004 and 2006 (Table 5). Muskellunge stockings are scheduled to take place on a biennial basis in conjunction with Amsden Dam, but depend upon availability. The goal is to maintain a low-density muskellunge population (one 30-inch fish/5 acres) that would provide anglers a diverse and unique opportunity in NE South Dakota.

No muskellunge were captured during the 2008 fish community survey at Lynn Lake; however, muskellunge were reported in the angler creel. Anglers caught an estimated 81 muskellunge during the summer period (May-August) 2008 (personal communication, Brian Blackwell). Anecdotal angler reports indicate that muskellunge exceeding the 1,016-mm (40-inch) minimum length restriction are present in the population.

Walleye: The 2008 mean gill net CPUE of stock-length walleye in Lynn Lake was 12.2 (Table 1) and above the minimum objective ( $\geq 10$  stock length walleye/net; Table 3). Since 2002, the mean gill net CPUE has ranged from a low of 7.7 (2006) to a high of 51.8 (2003) with the 2002-2008 average being 29.9 (Table 2). Based on the 2008 gill net CPUE, relative abundance is considered high ( $> 11$  stock-length walleye/net).

Walleye in Lynn Lake exhibited consistent-high recruitment from 2000-2003 resulting in high relative abundance (Table 2; Table 6). Limited walleye recruitment in 2004-2005 coupled with natural mortality and high angler harvest of year classes produced in 2000-2003 resulted in the decreased relative abundance observed from 2006-2008 (Table 2; Table 6). Since 2006, strong walleye year classes (defined as  $> 75$  age-0 walleye/hour electrofishing) have been produced annually in Lynn Lake, with mean fall night electrofishing CPUE (age-0 walleye/hour) values ranging from 99.4 (2008) to 988.5 (2007; Table 2). However, recruitment of the 2006 year-class is currently unclear. The 2006 year-class was well represented in the 2007 gill net catch, but few were present in the 2008 gill net catch (Table 6). Walleye from what appears to be a relatively strong 2007 year-class comprised 40% of walleye captured in the 2008 gill net catch (Table 6). Recruitment of the 2008 walleye year-class in Lynn Lake is unknown and will be assessed during future surveys. Overall, nine walleye year classes were present in the 2008 gill net catch with walleye from the 2000 and 2007 cohorts being the most represented (Table 6).

Walleye captured in gill nets during 2008 ranged in total length from 16 to 62 cm (6.3 to 24.4 in), had a PSD of 55 and a PSD-P of 30 (Table 1; Figure 3). The PSD was within the objective range (30-60) and the PSD-P was above the objective range (5-10) indicating a population comprised of a high proportion of preferred-length fish ( $>510$ mm; 20 in; Table 3). High PSD-P values since 2006 can be attributed to high relative abundance of walleye from the 2000 year-class (Table 3; Table 4; Table 6). In 2008, approximately 41% of the walleye captured in gill nets were above the 406-mm (16-inch) minimum length restriction and available for angler harvest on Lynn Lake (Figure 3).

Walleye in Lynn Lake tend to grow fast and typically attain 406 mm (16 inches) during their third growing season (age-2; Table 4). The weighted mean total length at capture of age-3 walleye has ranged from 432 to 453 mm in surveys conducted from 2005-2008; while age-4 walleye had weighted mean total length at capture values that ranged from 435 to 462 mm (Table 4). Mean Wr values ranged from 85-89 for all length groups sampled and no length-related trends in condition were apparent during 2008. The mean Wr of stock-length walleye captured in gill nets from Lynn Lake during 2008 was 89 (Table 1).

SDGFP personnel tag walleyes on Lynn Lake using colored dangler tags placed just behind the dorsal fin, in an effort to monitor growth and exploitation of the walleye population. Anglers are encouraged to report tags as information obtained from tag returns is important to current and future management of walleye populations. Tags can be reported by: letter (addressed to SDGFP, 603 East 8<sup>th</sup> Ave, Webster, SD 57274, phone (605-345-3381), or online <http://www.sdgfp.info/Wildlife/fishing/Info/Tagreports.asp>

Yellow Perch: The 2008 mean gill net CPUE of stock-length yellow perch was 5.5 and below the minimum objective ( $\geq 25$  stock-length yellow perch/net) in Lynn Lake (Table 1; Table 3). Since 2002, the gill net CPUE of stock-length yellow perch has fluctuated from a low of 5.3 (2003) to a high of 42.5 (2006; Table 2). Based on the 2008 gill net catch, yellow perch relative abundance in Lynn Lake appears to be low.

Length-frequency analysis of yellow perch in the 2008 gill net catch suggests the presence of a single year class ranging in total length from 15 to 20 cm (5.9 to 7.9 in) dominating the population (Figure 4). Yellow perch in the 2008 gill net catch had a PSD of 18 and a PSD-P of 3 (Table 1). Both the PSD and PSD-P for yellow perch in the 2008 gill net catch were below the management objectives of 30-60 and 5-10, respectively (Table 3).

No growth information was available in 2008. The majority of yellow perch in the 2008 gill net catch were in the stock- to quality-length category which had a mean Wr of 104.

### *Other Species*

Black bullhead: Prior to 2008, the Lynn Lake black bullhead population was assessed using frame nets during mid to late May and black bullhead relative abundance, remained low with mean frame net CPUE values of less than five stock-length bullheads/net night from 2003-2007 (Table 2). In 2008, the timing of frame netting was adjusted and completed in conjunction with gill netting in early-September. Only one black bullhead was captured during 2008 resulting in a mean frame net CPUE of 0.1 (Table 1).

Maintaining predator densities will likely aid in controlling black bullhead recruitment. In examining fish survey data from 23 Eastern South Dakota glacial lakes, black bullhead densities were found to decrease as walleye densities increased (Brown et al. 1998).

Bluegill: Although not abundant, bluegills in Lynn Lake proved attractive to many anglers in the early to mid 2000's as many of the bluegills exceeded memorable-length (250 mm). However, in recent years the size structure has declined (Table 3).

Prior to 2008, the Lynn Lake bluegill population was assessed using frame nets during mid to late May. In 2008, the timing of frame netting was adjusted and completed in conjunction with gill netting in early-September. The 2008 mean frame net CPUE was 3.6 (Table 1) and indicative of low relative abundance. Bluegill captured in frame nets during 2008 ranged in total length from 8 to 19 cm (3.1 to 7.5 in), had a PSD of 2 and a PSD-P of 0 (Table 1).

No growth information was available in 2008. The majority of bluegill in the 2008 frame net catch were in the stock- to quality-length category which had a mean  $W_r$  of 115.

Other: A single northern pike was the only other fish captured during the 2008 fish community survey on Lynn Lake (Table 1).

## Management Recommendations

- 1) Conduct fish community assessment surveys on an annual basis (next survey scheduled in early fall 2009) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from black crappie, walleye and yellow perch to assess the age structure and growth rates of each population.
- 3) Conduct spring frame netting/experimental gill netting near peak of spawning activity (49 to 60° F) annually to monitor muskellunge relative abundance and size structure.
- 4) Stock 500 (≈ 12-inch) muskellunge fingerlings on a biennial basis, in an effort to maintain a low density population which provides a unique angling opportunity in northeastern South Dakota.
- 5) Maintain the 1,016-mm (40-inch) minimum length restriction on muskellunge in an effort to develop a unique trophy fishery.
- 6) Conduct fall night electrofishing on an annual basis to monitor walleye young-of-the-year abundance.
- 7) Stock walleye at (≈1,000 fry/acre) to establish additional year classes if the fall night electrofishing CPUE of young-of-the-year walleye and gill netting results warrant (i.e., low gill net CPUE of < 250-mm (10-inch) walleye and/or fall night electrofishing CPUE of age-0 walleye < 75 fish/hour).
- 8) Evaluate walleye population dynamics and implement regulations to benefit the population and comply with tool box options.
- 9) Establish a public boat ramp and parking area on Lynn Lake.

Table 1. Mean catch rate (CPUE; gill/frame nets = catch/net night, electrofishing = catch/hour) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) of stock-length fish for various fish species captured in experimental gill nets, frame nets, and fall electrofishing in Lynn Lake, 2008. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; 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
<i>Frame nets</i>								
BLB	0.1	0.0	100	---	100	---	80	---
BLC	0.4	0.2	86	14	86	14	110	8
BLG	3.6	1.9	2	2	0	---	115	<1
NOP	0.1	0	100	---	100	---	87	---
WAE	2.8	0.8	90	7	70	11	88	1
YEP	0.4	0.4	0	---	0	---	99	3
<i>Gill nets</i>								
BLC	0.2	0.2	0	---	0	---	124	---
BLG	0.3	0.3	0	---	0	---	119	47
WAE	12.2	3.7	55	10	30	9	89	1
YEP	5.5	1.4	18	12	3	5	104	1
<i>Electrofishing</i>								
WAE <sup>1</sup> (age-0)	99.4	---	---	---	---	---	---	---

<sup>1</sup> fall night electrofishing.

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night, electrofishing = catch/hour) of stock-length fish for various fish species captured in experimental gill nets, frame nets, and fall electrofishing in Lynn Lake, 2001-2008. BLB= black bullhead; BLC= black crappie; BLG= bluegill; MUE= muskellunge; NOP= northern pike; ROB= rock bass; SMB= smallmouth bass; WAE= walleye; WHS= white sucker; YEP= yellow perch

Species	CPUE								Mean
	2001	2002	2003	2004	2005	2006 <sup>b</sup>	2007 <sup>b</sup>	2008	
<i>Frame nets<sup>1</sup></i>									
BLB	---	---	---	---	---	---	---	0.1	0.1
BLC	---	---	---	---	---	---	---	0.4	0.4
BLG	---	---	---	---	---	---	---	3.6	3.6
NOP	---	---	---	---	---	---	---	0.1	0.1
WAE	---	---	---	---	---	---	---	2.8	2.8
YEP	---	---	---	---	---	---	---	0.4	0.4
<i>Frame nets<sup>2</sup></i>									
BLB	---	---	1.9	0.1	0.7	0.3	1.6	---	0.9
BLC	---	---	10.7	5.5	6.8	24.2	1.3	---	9.7
BLG	---	---	1.3	0.3	1.4	7.1	0.6	---	2.1
MUE	---	---	0.0	0.0	< 0.1	N/A <sup>3</sup>	<0.1	---	<0.1
NOP	---	---	0.1	< 0.1	0.1	0.0	<0.1	---	0.1
ROB	---	---	0.1	0.1	0.1	N/A <sup>3</sup>	0.1	---	0.1
SMB	---	---	0.0	0.0	0.0	N/A <sup>3</sup>	<0.1	---	<0.1
WAE	---	---	3.3	0.7	2.5	1.2	1.3	---	1.8
WHB	---	---	0.0	0.0	0.0	0.0	<0.1	---	0.0
WHS	---	---	0.0	0.0	0.1	N/A <sup>3</sup>	0.1	---	<0.1
YEP	---	---	1.3	0.1	0.2	0.4	0.1	---	0.4
<i>Gill nets</i>									
BLB	---	2.3	1.8	1.0	0.0	1.2	0.7	0.0	1.0
BLC	---	4.5	0.2	1.7	3.2	4.8	0.2	0.2	2.1
BLG	---	0.8	0.3	0.5	1.0	5.3	0.5	0.3	1.2
MUE	---	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
NOP	---	1.7	0.2	0.3	0.3	0.5	0.0	0.0	0.4
ROB	---	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
WAE	---	39.8	51.8	46.2	37.3	7.7	14.3	12.2	29.9
YEP	---	24.2	5.3	19.3	9.8	42.5	23.2	5.5	18.5
<i>Electrofishing</i>									
WAE <sup>2</sup> (age-0)	---	---	---	---	8.7	708.5	988.5	99.4	451.3

<sup>1</sup> Frame nets set in conjunction with September gill netting.

<sup>2</sup> Spring frame nets (mid to late May).

<sup>3</sup> Catch rates were not calculated, as frame nets with muskellunge, rock bass, smallmouth bass, and white sucker present were fished longer than 24 hours.

<sup>4</sup> Fall night electrofishing.

<sup>5</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

Table 3. Mean catch rate (CPUE; gill/frame nets = catch/net night, electrofishing = catch/hour), proportional stock density of quality- (PSD) and preferred-length (PSD-P) fish, and relative weight (Wr) for selected species captured in experimental gill nets and frame nets in Lynn Lake, 2001-2008. BLB= black bullhead; BLC= black crappie; BLG= bluegill; WAE= walleye; YEP= yellow perch

Species	2001	2002	2003	2004	2005	2006 <sup>3</sup>	2007 <sup>3</sup>	2008	Average	Objective
<i>Frame nets</i> <sup>1</sup>										
BLB										≤ 100
CPUE	---	---	---	---	---	---	---	<1	<1	---
PSD	---	---	---	---	---	---	---	100	100	---
PSD-P	---	---	---	---	---	---	---	100	100	---
Wr	---	---	---	---	---	---	---	80	80	---
BLC										≥ 10
CPUE	---	---	---	---	---	---	---	<1	<1	30-60
PSD	---	---	---	---	---	---	---	86	86	5-10
PSD-P	---	---	---	---	---	---	---	86	86	---
Wr	---	---	---	---	---	---	---	110	110	---
BLG										---
CPUE	---	---	---	---	---	---	---	4	4	---
PSD	---	---	---	---	---	---	---	2	2	---
PSD-P	---	---	---	---	---	---	---	0	0	---
Wr	---	---	---	---	---	---	---	115	115	---
<i>Frame nets</i> <sup>2</sup>										
BLB										
CPUE	---	---	2	< 1	1	< 1	2	---	1	---
PSD	---	---	71	89	92	72	44	---	74	---
PSD-P	---	---	13	63	87	52	13	---	46	---
Wr	---	---	114	101	102	102	100	---	104	---
BLC										
CPUE	---	---	11	6	7	24	1	---	10	---
PSD	---	---	99	100	91	58	70	---	84	---
PSD-P	---	---	74	95	89	39	16	---	63	---
Wr	---	---	116	117	113	118	113	---	115	---
BLG										
CPUE	---	---	1	< 1	1	7	1	---	2	---
PSD	---	---	100	72	81	40	46	---	68	---
PSD-P	---	---	89	54	74	14	7	---	48	---
Wr	---	---	131	130	146	125	122	---	131	---
<i>Gill nets</i>										
WAE										
CPUE	---	40	52	46	37	8	14	12	30	≥ 10
PSD	---	47	80	71	97	100	66	55	74	30-60
PSD-P	---	2	3	1	9	30	19	30	13	5-10
Wr	---	86	91	95	95	86	85	89	90	---
YEP										
CPUE	---	24	5	19	10	43	23	6	19	≥ 25
PSD	---	42	75	53	100	62	35	18	55	30-60
PSD-P	---	17	28	37	58	50	14	3	30	5-10
Wr	---	112	116	107	107	105	106	104	108	---

<sup>1</sup> Fall frame nets.

<sup>2</sup> Spring frame nets.

<sup>3</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill nets in Lynn Lake, 2002-2007. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	N	Age										
		0	1	2	3	4	5	6	7	8	9	10
2008 <sup>1</sup>	95	172	260	361	453	---	514	519	485	539	599	---
2007 <sup>1</sup>	99	---	257	406	---	459	500	---	518	---	---	653
2006 <sup>1</sup>	47	---	---	---	447	462	---	512	---	---	---	---
2005 <sup>1</sup>	224	---	---	396	432	435	483	---	---	---	---	---
2004	275	---	303	385	405	453	533	---	---	---	---	---
2003	311	---	292	354	411	541	578	---	---	---	---	---
2002	238	---	277	376	492	555	---	---	---	---	---	---

<sup>1</sup>Age assignments made using otoliths; scales were used in previous years.

Table 5. Stocking history including size and number for fishes stocked into Lynn Lake, 1998-2007. No fish stockings were made by SDGFP personnel prior to 1998.

Year	Species	Size	Number
1998	BLC	fingerling	80,100
	SXW	fingerling	1,762
	SXW	juvenile	3,150
1999	SXW	fry	910,000
2000	WAE	fry	1,000,000
	YEP	adult	1,500
2001	MUE	fingerling	1,625
	WAE	fry	1,500,000
2002	WAE	fry	1,500,000
2003	MUE	fingerling	2,000
2004	BLC	fingerling	16,324
	MUE	fingerling	500
2006	WAE	fry	1,500,000
	MUS	fingerling	1,250

Table 6. Numbers of walleye sampled using gill nets (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Lynn Lake, 2002-2008.

Survey Year	Year Class													
	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997		
2008 <sup>1</sup>	11	38	8	4	---	4	8	1	20	1	---	---		
2007 <sup>1,2</sup>	---	---	41	6	---	11	13	---	27	---	---	1		
2006 <sup>1,2</sup>	---	---	---	---	---	9	11	---	27	---	---	---		
2005 <sup>1</sup>	---	---	---	---	---	65	63	4	91	1	---	---		
2004	---	---	---	---	---	47	84	7	132	5	---	---		
2003	---	---	---	---	---	---	49	3	250	7	2	---		
2002	---	---	---	---	---	---	---	3	215	18	2	---		
Number stocked														
fry			1,500						1,500	1,500	1,000	910		
small fingerling												5		
large fingerling														

<sup>1</sup>Age assignments made using otoliths; scales were used in previous years.

<sup>2</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

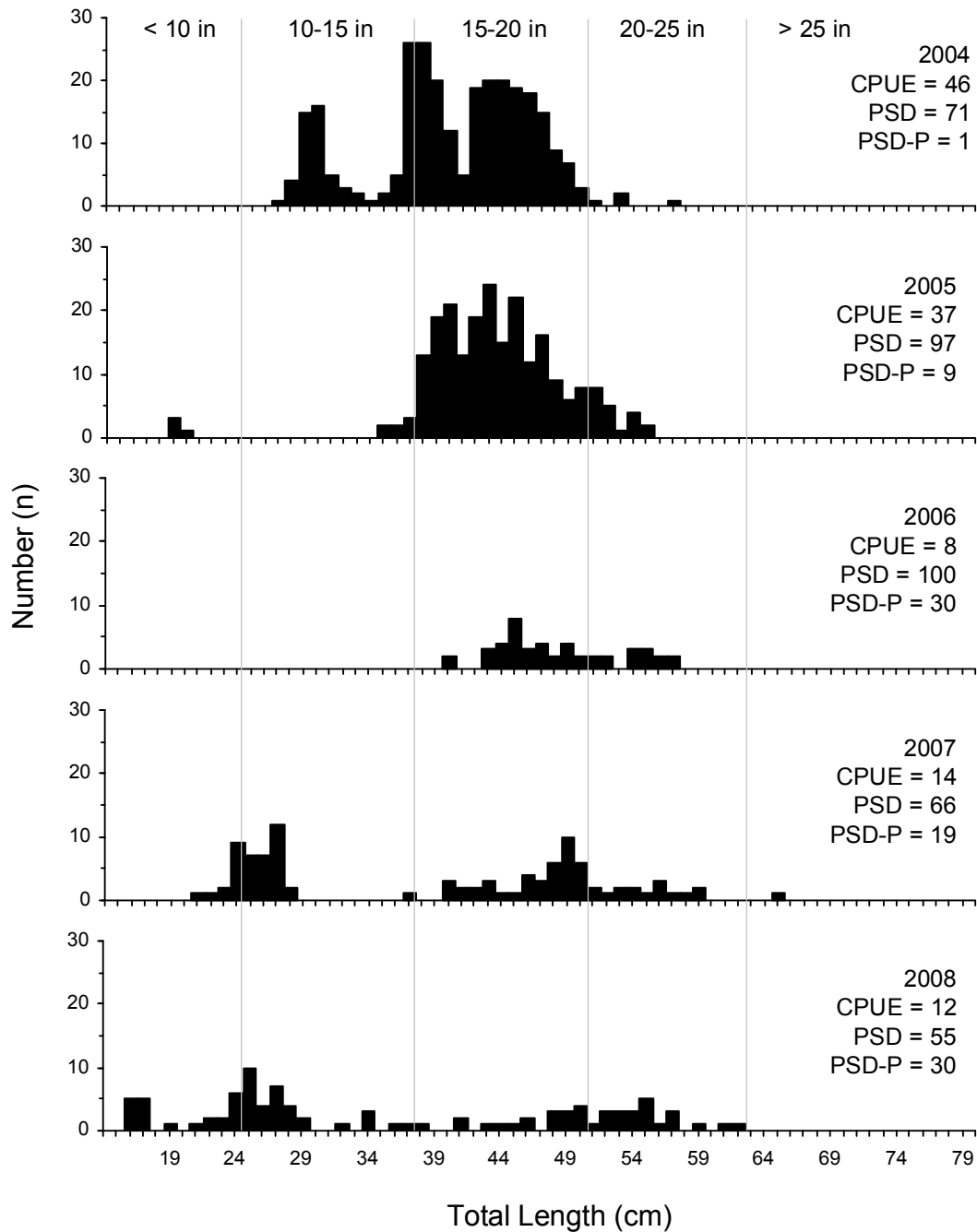


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Lynn Lake, 2004-2008.

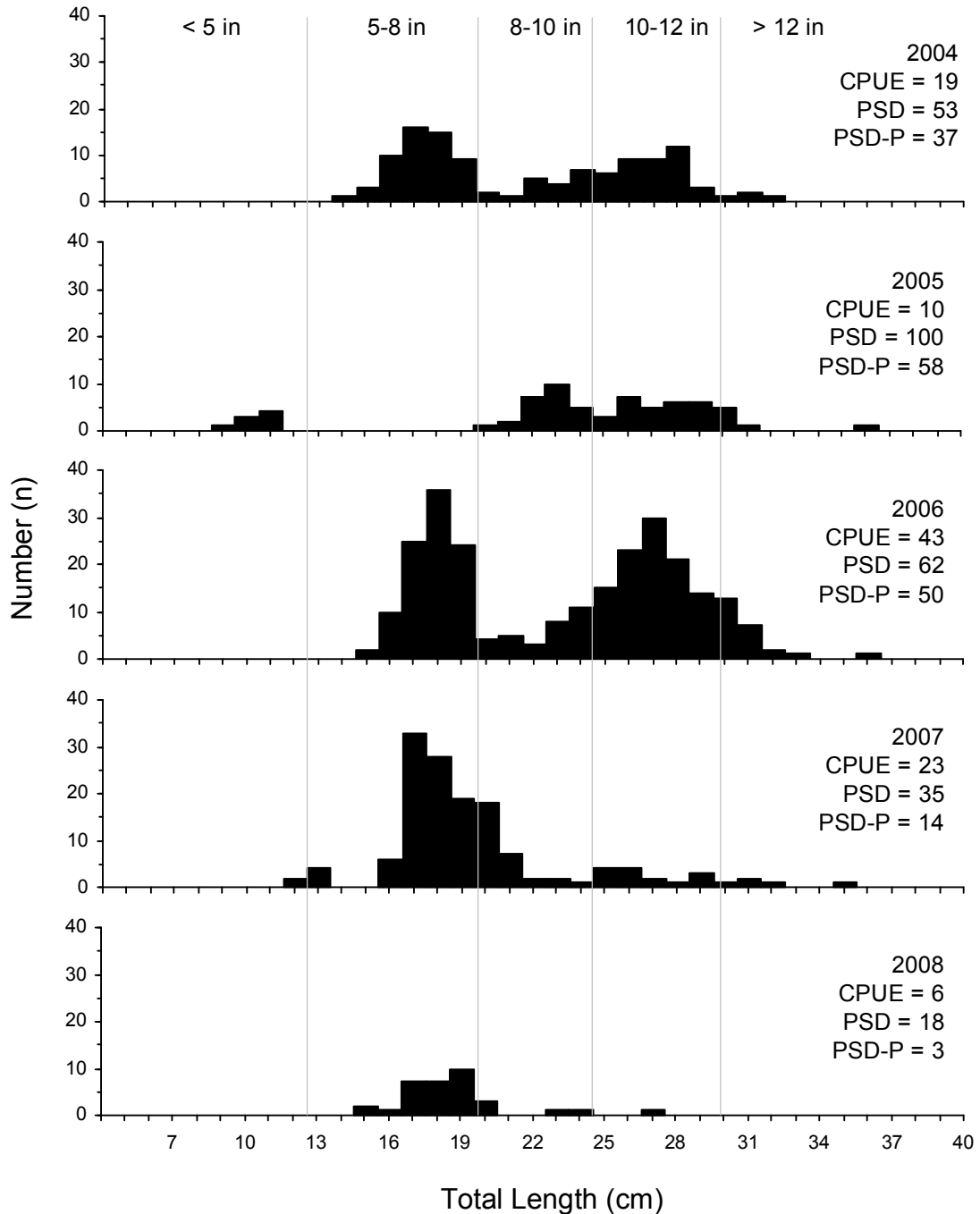


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Lynn Lake, 2004-2008.