

Lynn Lake Site Description

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, 5 miles north, 1 mile west, and 2 miles north of Webster, SD

Survey Dates and Sampling Information

Survey dates	August 31-September 2, 2010 (FN, GN) September 20, 2010 (FE-WAE)
Gill net sets (n)	6
Frame net sets (n)	17
Electrofishing-WAE (min)	48

Morphometry

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 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

Water levels on Lynn Lake are not monitored by SDDENR. Visual observation indicated that Lynn Lake has experienced a substantial increase in water levels in recent years, similar to other waters in the area (i.e., Antelope Lake, Reetz Lake, and Waubay Lake).

Aquatic Nuisance Species Monitoring

Plant Survey

Emergent vegetation is sparse along the shoreline of Lynn Lake; while submersed vegetation is common and rims the majority of the shoreline. Aquatic plant species identified during the 2010 survey include clasping leaf pondweed, common duckweed, northern milfoil, and sago pondweed. No aquatic nuisance plant species were encountered.

Macro-Invertebrate/Mussel Survey

No aquatic nuisance macro-invertebrate or mussel species were sampled in 2010.

Fish Community Survey

No aquatic nuisance fish species were captured during 2010.

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: 2 daily; minimum length 15"
Management classification	none
Fish Consumption Advisories	none

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.

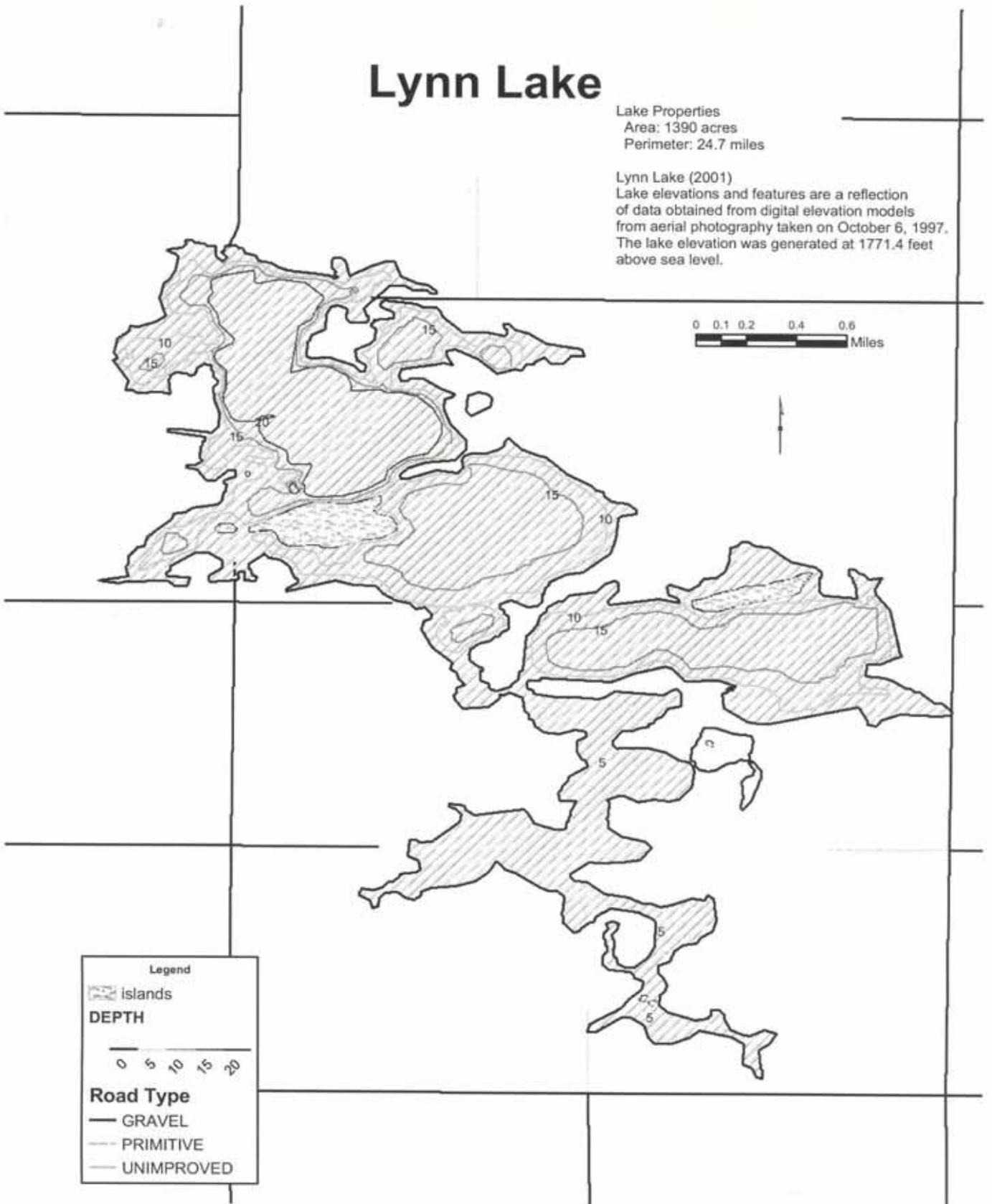


Figure 1. Map depicting depth contours for Lynn Lake, Day County, South Dakota.



Figure 2. Map depicting geographic location of several Day County, South Dakota Lakes including Lynn Lake (top). Also noted is the access location and standardized net locations for Lynn Lake (bottom). LFN= frame nets; LGN= gill nets

Management Objectives

- 1) Maintain a mean frame net CPUE of stock-length black crappie ≥ 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 ≥ 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 ≥ 30 , a PSD of 30-60, and a PSD-P of 5-10.

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 SDGFP stocking of fish into Lynn Lake occurred in 1998 when saugeye and black crappie were stocked (Table 6). Currently, Lynn Lake is managed as a black crappie, muskellunge, walleye, and yellow perch 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 the initial year classes (1998-2000) have succumbed to angling and natural mortality.

In 2010, the majority of black crappie in the frame net catch were less than stock-length resulting in a mean frame net CPUE for all sizes of 46.4. The mean frame net CPUE of stock-length black crappie in 2010 was 1.7 (Table 1) and below the minimum objective (≥ 10 stock-length black crappie/net night (Table 3).

Black crappie captured in the 2010 frame net catch ranged in total length from 7 to 32 cm (2.8 to 12.6 in), with the majority ranging in total length from 7 to 11 cm (2.6 to 4.3 in; Figure 3). The high proportion of black crappie less than stock-length (13 cm; 5 in) can be attributed to natural reproduction in 2010; however, recruitment of the 2010 year class to the fishery is unknown and will be assessed in future surveys.

Due to low sample size of stock-length black crappie in 2010, few inferences can be made concerning size structure, growth and condition of black crappie in Lynn Lake.

Muskellunge: Lynn Lake is one of two lakes in northeastern SD managed for muskellunge. Muskellunge were introduced into Lynn Lake in 2001, and subsequently stocked in 2003, 2004, 2006, and 2010 (Table 6). Muskellunge stockings are scheduled to take place on a biennial basis in conjunction with Amsden Dam, but the frequency of stockings depends 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.

In 2010, short-term gill netting was utilized to sample muskellunge on May 20, 2010. Five 3-hour gill net sets resulted in the capture of a single muskellunge with a total length of 760 mm (29.9 in) and weight of 2500 g (5.5 lb). No muskellunge were captured during the 2010 standard fish community survey at Lynn Lake. Anecdotal angler reports indicate that muskellunge exceeding the 1,016-mm (40-inch) minimum length restriction are present in the population.

Walleye: The 2010 mean gill net CPUE of stock-length walleye in Lynn Lake was 28.3 (Table 1) and above the minimum objective (≥ 10 stock-length walleye/net night; Table 3). Since 2003, the mean gill net CPUE has ranged from a low of 7.7 (2006) to a high of 51.8 (2003; Table 2). The 2010 gill net CPUE represented an increase from the 20.5 observed in 2009 (Table 2) and indicated high relative abundance.

Walleye captured in the 2009 gill net catch ranged in total length from 18 to 62 cm (7.1 to 24.4 in), had a PSD of 22 and a PSD-P of 4 (Table 3; Figure 4). The 2010 PSD and PSD-P were below the objective ranges of 30-60 and 5-10 (Table 3) indicating a population comprised of smaller walleye (Figure 4). Walleye from the strong 2009 year class dominated the 2010 gill net sample and were in the stock-quality category resulting in the low size structure (Table 4).

Otoliths were collected from a sub-sample of gill net captured walleye in 2010. Eight walleye year classes were present (2000, 2002, 2003, 2005, and 2007-2010) with the 2009 cohort being the most represented (Table 4). The 2009 year class was naturally produced and comprised 74% of stock-length walleye in the 2010 gill net catch (Table 4). Six age-0 walleye were captured in the 2010 gill net catch (Table 4), but none were captured during fall night electrofishing (Table 1) potentially indicating limited recruitment of the 2010 year class.

Walleye in Lynn Lake tend to grow fast and typically exceed quality-length (38cm; 15 in) by the end of their fourth growing season (age-3; Table 5). Since 2005, the weighted mean total length at capture for age-3 walleye has ranged from 422 to 470 mm (16.6 to 18.5 in; Table 5). Mean W_r values of walleye captured in the 2010 gill net catch ranged from 92 to 98 for all length categories sampled with the mean W_r of stock-length walleye being 93 (Table 1). No length-related trends in walleye condition were apparent in 2010.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2010 was 29.5 (Table 1) and near the minimum objective (≥ 30 stock-length yellow perch/net night; Table 3). Since 2003, the mean gill net CPUE of stock-length yellow perch has fluctuated from a low of 5.3 (2003) to a high of 42.5 (2006) with the 2003-2010 average being 17.9 (Table 2). Based on the 2010 gill net catch, relative abundance appears to be moderate.

Yellow perch captured in the 2010 gill net catch ranged in total length from 10 to 29 cm (3.9 to 11.4 in), had a PSD of 31 and a PSD-P of 7 (Table 1; Figure 5). The 2010 PSD and PSD-P were within the objective range of 30-60 and 5-10 (Table 3) indicating a relatively balanced population (defined as PSD of 30-60 and an RSD-P of 5-10).

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2010. Age structure information indicated that year classes produced in 2006-2010 comprised the entire sample, with the 2009 (age-1) year class being the most represented (Table 7). The weighted mean total length at capture for age-2 male yellow perch was 219 mm (8.6 in; Table 8). The weighted mean total length at capture for age-2 female yellow perch was 257 mm (10.1 in; Table 8). Mean W_r values of gill net captured yellow perch in 2010 ranged from 96 to 101 for all length categories sampled with the mean W_r of stock-length yellow perch being 100 (Table 1). No length-related trends in yellow perch condition were apparent in 2010.

Other Species

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 (Figure 6). In 2010, the mean frame net CPUE was 6.8 (Table 1). The 2010 frame net CPUE represented a substantial decrease from the 2009 CPUE of 20.6 and indicated low to moderate relative abundance.

Bluegill sampled in frame nets during 2010 ranged in total length from 9 to 22 cm (3.5 to 8.7 in), had a PSD of 37 and a PSD-P of 7 (Table 3; Figure 6). No growth information was collected in 2010; however, frame net captured bluegill were in good condition with mean W_r values that exceeded 110 for all length categories sampled. The mean W_r for stock-length fish bluegill was 116 (Table 1) and an increasing trend in condition was apparent as bluegill total length increased in 2010.

Other: Black bullhead, northern pike, rock bass, and smallmouth bass were other fish species captured in low numbers during the 2010 fish community survey on Lynn Lake (Table 1).

Management Recommendations

- 1) Conduct fish community assessment surveys on an annual basis (next survey scheduled in summer 2011) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from black crappie, bluegill, walleye, and yellow perch to assess the age structure and growth rates of each population.
- 3) Explore sampling options (i.e., spring trap netting, short-term gill netting, angling) for monitoring relative abundance and size structure of muskellunge in Lynn Lake.
- 4) Stock 1500 (\approx 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 statewide 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 age-0 walleye relative abundance.
- 7) Stock walleye at (\approx 500 fry/acre; 50% OTC marked) to establish additional year classes if fall night electrofishing CPUE of young-of-the-year walleye and gill netting results warrant (i.e., low gill net CPUE of walleye $<$ 25 cm (10 in) and/or fall night electrofishing CPUE of age-0 walleye $<$ 75 fish/hour).
- 8) Maintain the 381-mm (15-in) minimum length limit and daily limit of two on walleye to benefit the population and comply with tool box options (Lucchesi and Blackwell 2009).
- 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 electrofishing in Lynn Lake, 2010. 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; ROB= rock bass; SMB= smallmouth bass; 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	0.1	50	50	0	---	89	14
BLC	1.7	0.5	62	16	21	13	120	8
BLG	6.8	2.4	37	7	7	4	116	1
NOP	0.1	0.1	100	0	0	---	95	50
ROB	0.1	0.1	50	50	0	---	113	61
SMB	0.1	<0.1	100	---	0	---	114	---
WAE	2.2	1.0	95	5	82	10	93	2
YEP	2.7	1.1	26	11	7	6	95	1
<i>Gill nets</i>								
BLC	0.3	0.3	50	50	0	---	126	18
BLG	0.5	0.3	67	33	0	---	123	17
ROB	1.0	1.0	67	33	0	---	110	5
WAE	28.3	6.3	22	6	4	2	93	<1
YEP	29.5	2.7	31	5	7	4	100	<1
<i>Electrofishing</i>								
WAE [†] (age-0)	0.0	---	---	---	---	---	---	---

[†] Fall night electrofishing-WAE; catch rate (CPUE) represents age-0 walleye not stock length.

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 electrofishing in Lynn Lake, 2003-2010. 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
	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	
<i>Frame nets</i>									
BLB	---	---	---	---	---	0.1	0.0	0.1	0.1
BLC	---	---	---	---	---	0.4	1.7	1.7	1.3
BLG	---	---	---	---	---	3.6	20.6	6.8	10.3
NOP	---	---	---	---	---	0.1	0.1	0.1	0.1
ROB	---	---	---	---	---	0.0	0.3	0.1	0.1
SMB	---	---	---	---	---	0.0	0.1	0.1	0.1
WAE	---	---	---	---	---	2.8	1.5	2.2	2.2
YEP	---	---	---	---	---	0.4	1.7	2.7	1.6
<i>Gill nets</i>									
BLB	1.8	1.0	0.0	1.2	0.7	0.0	0.0	0.0	0.6
BLC	0.2	1.7	3.2	4.8	0.2	0.2	0.5	0.3	1.4
BLG	0.3	0.5	1.0	5.3	0.5	0.3	0.2	0.5	1.1
MUE	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
NOP	0.2	0.3	0.3	0.5	0.0	0.0	0.2	0.0	0.2
ROB	0.0	0.3	0.0	0.0	0.0	0.0	0.0	1.0	0.2
WAE	51.8	46.2	37.3	7.7	14.3	12.2	20.5	28.3	27.3
YEP	5.3	19.3	9.8	42.5	23.2	5.5	8.2	29.5	17.9
<i>Electrofishing</i>									
WAE ² (age-0)	---	---	8.7	708.5	988.5	99.4	127.1	0.0	322.0

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

² Fall night electrofishing-WAE; catch rate (CPUE) represents age-0 walleye not stock-length

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish , 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, 2003-2010. BLC= black crappie; BLG= bluegill; WAE= walleye; YEP= yellow perch

Species	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	Average	Objective
<i>Frame nets</i>										
BLC										
CPUE	---	---	---	---	---	<1	2	2	1	≥ 10
PSD	---	---	---	---	---	86	55	62	68	30-60
PSD-P	---	---	---	---	---	86	16	21	41	5-10
Wr	---	---	---	---	---	110	121	120	117	---
BLG										
CPUE	---	---	---	---	---	4	21	7	11	---
PSD	---	---	---	---	---	2	13	37	17	---
PSD-P	---	---	---	---	---	0	0	7	2	---
Wr	---	---	---	---	---	115	116	116	116	---
<i>Gill nets</i>										
WAE										
CPUE	52	46	37	8	14	12	21	28	27	≥ 10
PSD	80	71	97	100	66	55	35	22	66	30-60
PSD-P	3	1	9	30	19	30	14	4	14	5-10
Wr	91	95	95	86	85	89	90	93	91	---
YEP										
CPUE	5	19	10	43	23	6	8	30	18	≥ 30
PSD	75	53	100	62	35	18	45	31	52	30-60
PSD-P	28	37	58	50	14	3	2	7	25	5-10
Wr	116	107	107	105	106	104	108	100	107	---

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

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (Number stocked x 1,000) from Lynn Lake, 2006-2010.

Survey Year	Year Class												
	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
2010	6	131	21	11		1		2	1		3		
2009	---	94	37	48	7	6		2	6	2	13	1	
2008	---	---	11	38	8	4		4	8	1	20	1	
2007 ^{1,2}	---	---	---		41	6		11	13		27		
2006 ¹	---	---	---	---				9	11		27		
# stocked													
fry					1500				1500	1500	1000	910	
sm. fingerling													5
lg. fingerling													

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

² Older walleye were sampled, but are not reported in this table.

Table 5. Weighted mean total length at capture (mm) for walleye age-0 through age-10 sampled in experimental gill nets (expanded sample size) from Lynn Lake, 2005-2010. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age										
	0	1	2	3	4	5	6	7	8	9	10
2010	197(6)	339(131)	425(21)	470(11)	---	571(1)	---	511(2)	511(1)	---	577(3)
2009	174(94)	301(37)	356(48)	422(7)	498(6)	---	484(2)	517(6)	546(2)	516(13)	669(1)
2008	172(11)	260(38)	361(8)	453(4)	---	514(4)	519(8)	485(1)	539(20)	599(1)	---
2007	---	257(41)	406(6)	---	459(11)	500(13)	---	518(27)	---	---	653(1)
2006	---	---	---	447(9)	462(11)	---	512(27)	---	---	---	---
2005	195(3)	---	396(65)	432(63)	435(4)	483(91)	550(1)	---	---	---	---

Table 6. Stocking history including size and number for fishes stocked into Lynn Lake, 1998-2010. BLC= black crappie; MUE= muskellunge; SXW= saugeye; WAE= walleye; YEP= yellow perch

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
	MUE	fingerling	1,250
2010	MUE	juvenile	770

Table 7. Year class distribution based on the age/length summary for yellow perch sampled in gill nets from Lynn Lake, 2009-2010.

Survey Year	Year Class					
	2010	2009	2008	2007	2006	2005
2010	9	157	12	7	1	
2009	---	442	35	22		

Table 8. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Lynn Lake, 2009-2010.

Year	Age					
	0	1	2	3	4	5
2010						
Male	109(4)	179(68)	219(4)	---	---	---
Female	103(5)	195(90)	257(7)	289(7)	281(1)	---
Combined	106(9)	188(157)	239(12)	289(7)	281(1)	
2009						
Male	96(314)	154(7)	213(2)	---	---	---
Female	96(131)	149(25)	234(20)	---	---	---
Combined	96(442)	146(35)	232(22)	---	---	---

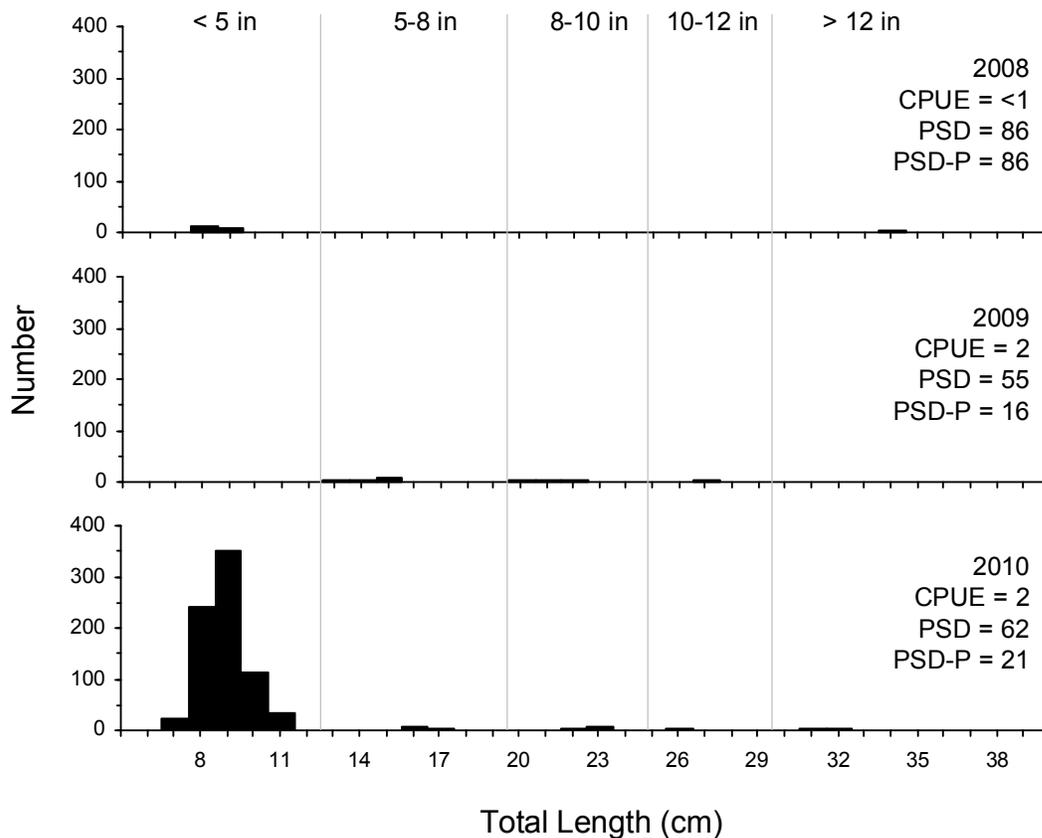


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured using frame nets in Lynn Lake, 2008-2010.

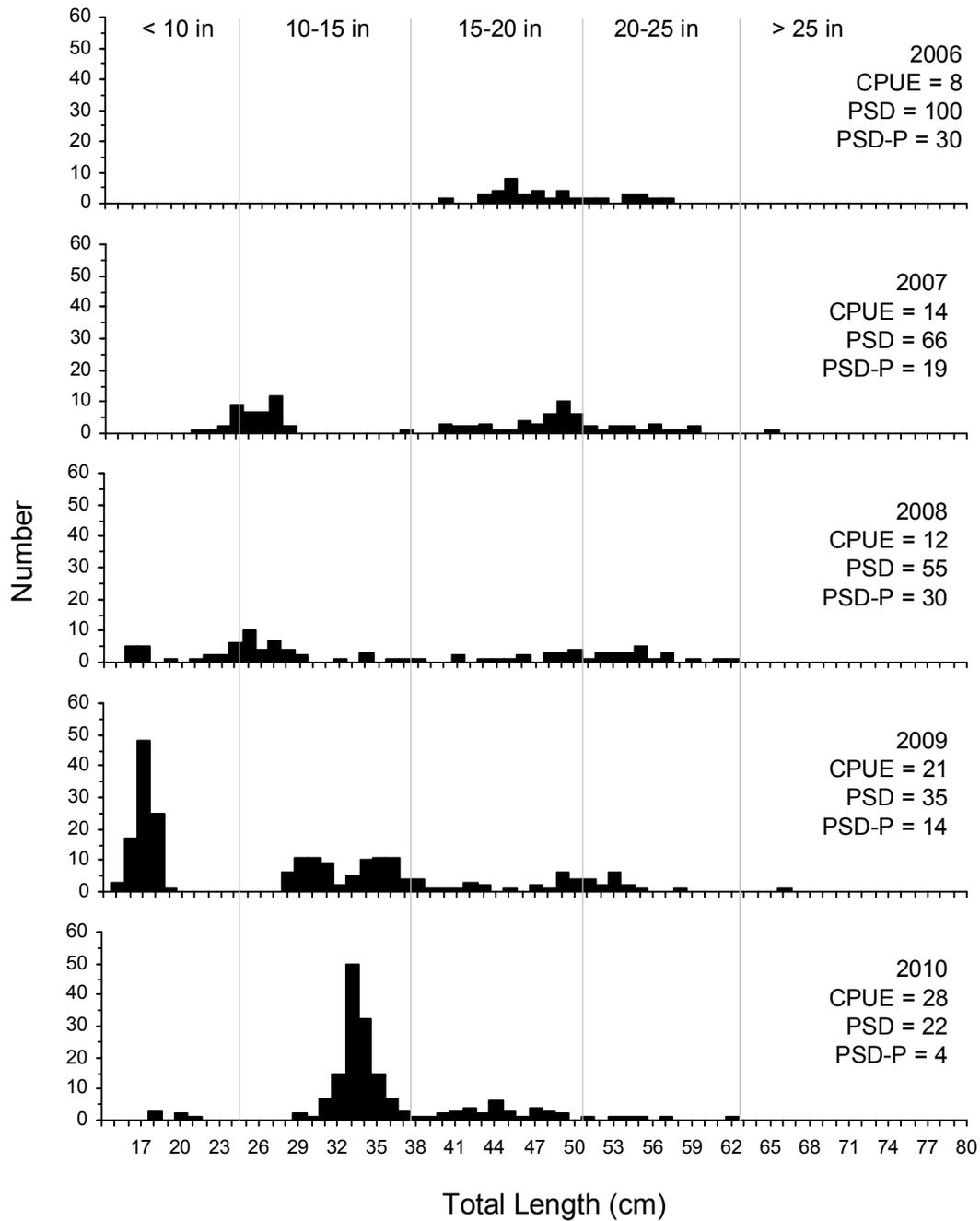


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Lynn Lake, 2006-2010.

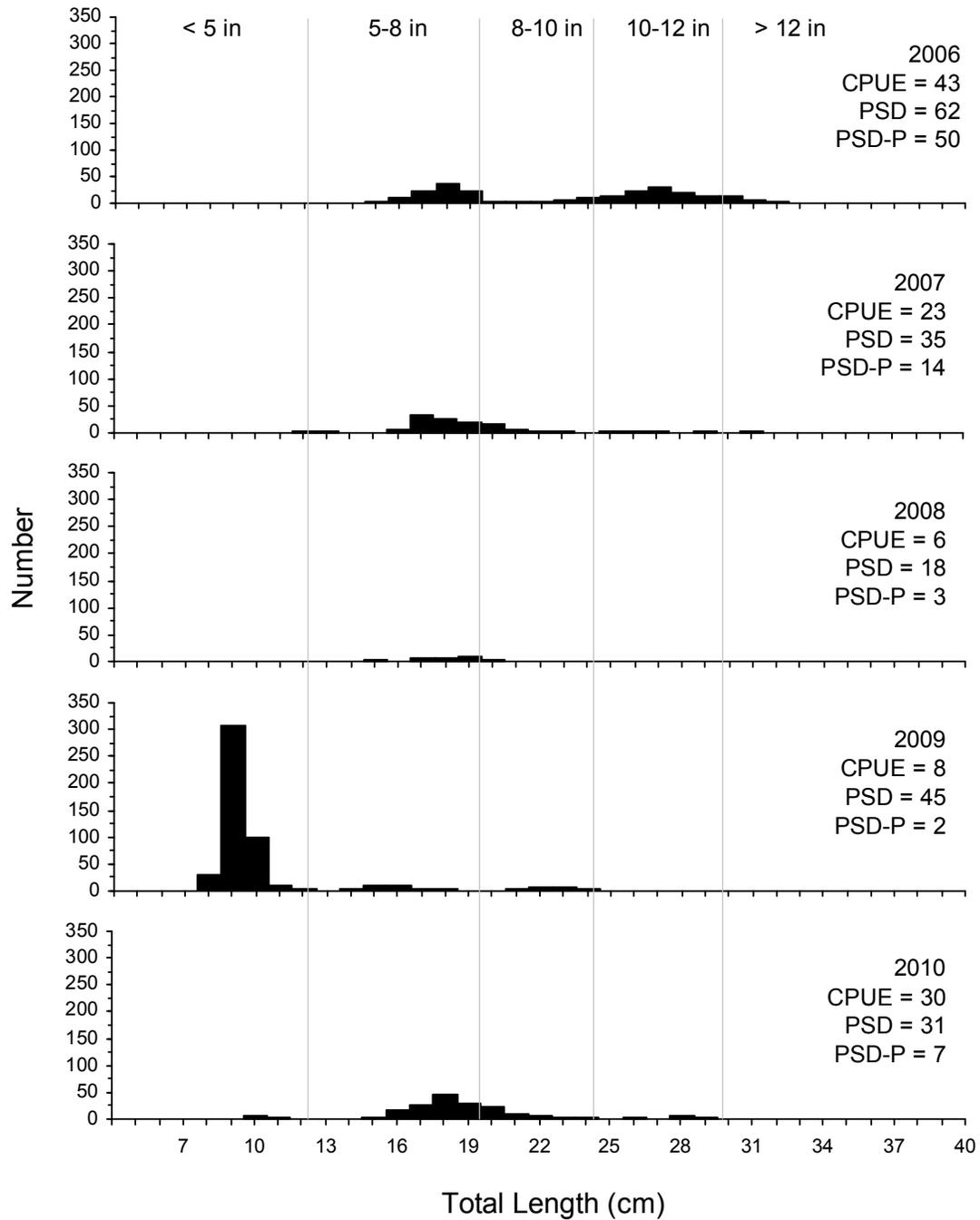


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Lynn Lake, 2006-2010.

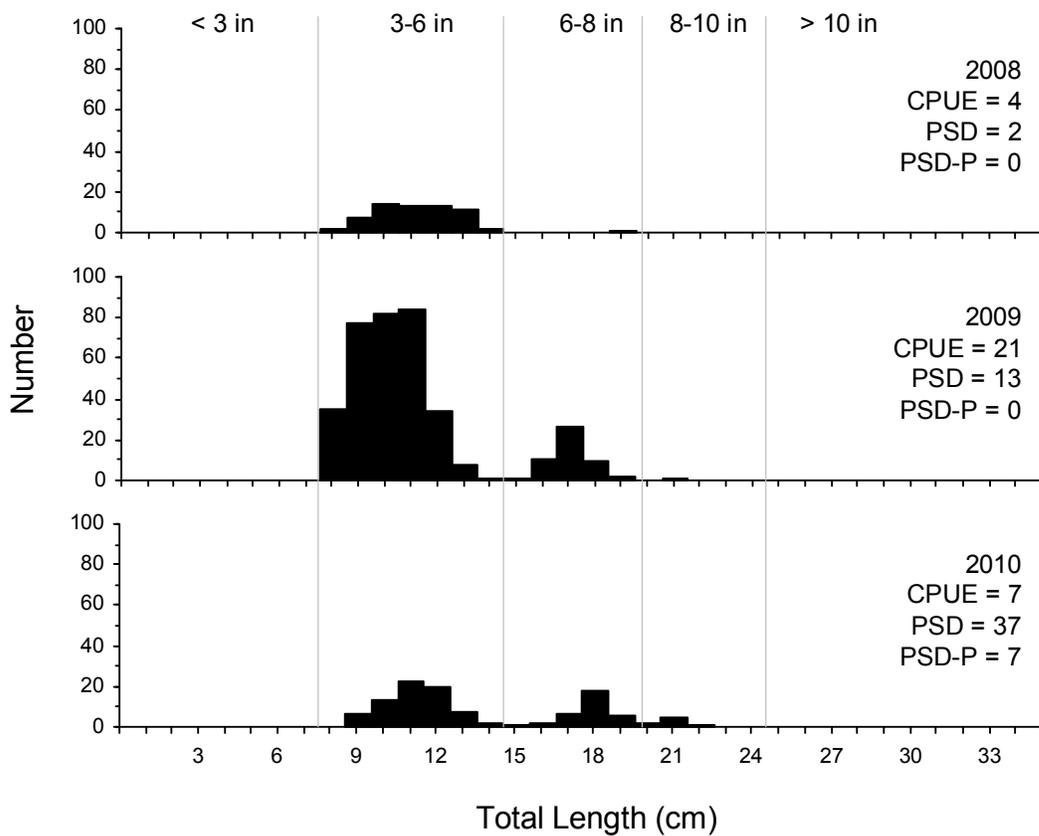


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for bluegill captured using frame nets in Lynn Lake, 2008-2010.