

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	September 7-9, 2011 (FN, GN) October 19, 2011 (FE-WAE)
Gill net sets (n)	6
Frame net sets (n)	18
Electrofishing-WAE (min)	59

Morphometry

Watershed area (acres)	37,978
Surface area (acres)	≈1600
Maximum depth (ft)	≈28
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 2). Lands adjacent to Lynn Lake are under state and private ownership.

Watershed and Land Use

The 37,978 acre Lynn Lake sub-watershed (HUC-12) is located within the larger Pierpont Lake (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

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 much of the shoreline. Aquatic plant species identified during the 2011 survey included coontail, northern milfoil and sago pondweed. No aquatic nuisance plant species were encountered.

Shoreline Survey

No aquatic nuisance species were identified in 2011.

Fish Community Survey

No aquatic nuisance fish species were captured during 2011.

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	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.

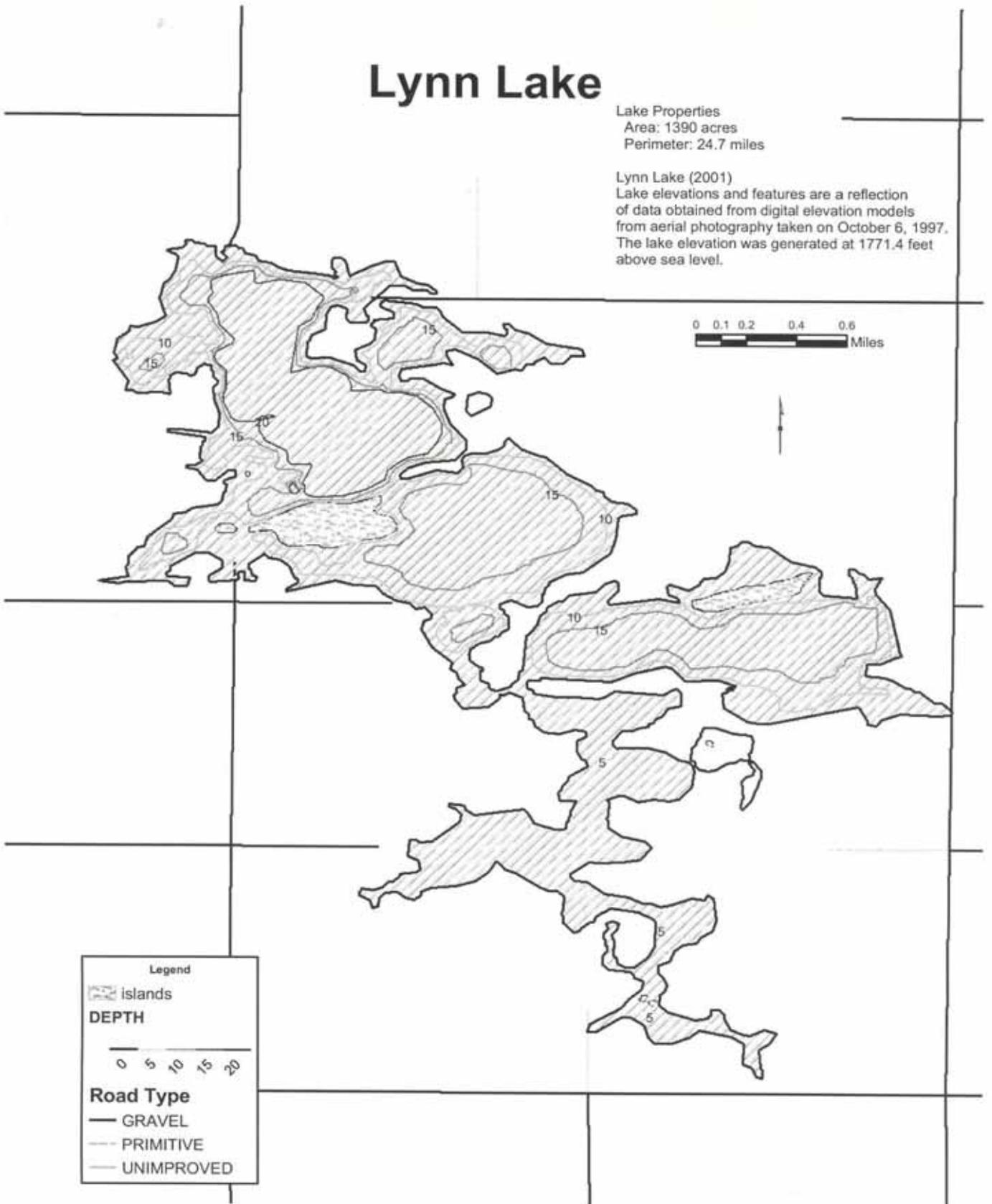


Figure 1. Map depicting depth contours for Lynn Lake, Day County, South Dakota.



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 SDGFP stocking of fish into Lynn Lake occurred in 1998 when saugeye and black crappie were stocked. 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.

From 2008-2010, the relative abundance of stock-length black crappie remained low with mean frame net CPUE values that ranged from 0.4 to 1.7 (Table 2). In 2011, the mean frame net CPUE of stock-length black crappie increased to 11.9, due in large part to recruitment of the 2010 year class (Table 1; Table 2; Table 4). The 2011 frame net CPUE was above the minimum objective (≥ 10 stock-length black crappie/net night; Table 3) and indicated high relative abundance.

Frame net captured black crappie ranged in total length from 13 to 32 cm (5.1 to 12.6 in), had a PSD of 45 and a PSD-P of 22 (Table 1; Table 3; Figure 3). The PSD was within the management objective of 30-60; while the PSD-P was above the objective range of 5-10 (Table 3; Figure 3).

Otoliths collected from a sub-sample of frame net captured black crappie indicated the presence of four year classes (2004, 2008-2010; Table 4). The 2010 year class was the most represented and comprised 75% of black crappie in the frame net

catch; while the 2008 and 2009 cohorts comprised 9 and 15%, respectively (Table 4). Black crappie in the frame net catch had a weighted mean total length at capture of 184 mm (7.2 in) at age 1, 249 mm (9.8 in) at age 2, and 289 mm (11.4 in) at age 3 (Table 5). Sampled black crappie had mean W_r values that were ≥ 109 for all length categories (e.g., stock to quality) sampled, with the mean W_r for stock-length black crappie being 114 (Table 1). No length-related trends in condition were apparent.

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 8). 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.

Muskellunge have proven difficult to sample in Lynn Lake (Table 2). No muskellunge were captured during the standard fish community survey. However, anecdotal angler reports indicate that muskellunge exceeding the 1,016-mm (40-inch) minimum length restriction are present in the population.

Walleye: The mean gill net CPUE of stock-length walleye was 7.0 (Table 1) and below the minimum objective (≥ 10 stock-length walleye/net night; Table 3). The 2011 gill net CPUE represented a substantial decrease from the 28.3 observed in 2010 and was the lowest recorded from 2003-2011 (Table 2). Based on the 2011 gill net CPUE, relative abundance is considered moderate.

Walleye in the gill net catch ranged in total length from 11 to 62 cm (4.3 to 24.4 in; Figure 4). The PSD was 95 and above the management objective of 30-60; while the PSD-P of 7 was within the objective range of 5-10 (Table 3). Based on age estimates made using otoliths, four year classes (2000, 2005, 2009-2011) were present in the gill net catch (Table 6). Walleye from the naturally-produced 2009 cohort comprised 88% of stock-length walleye in the gill net catch and were in the quality-preferred length category which resulted in the high PSD (Table 1; Table 4; Figure 4). The 2011 (age-0) year class, which coincided with a fry stocking, comprised 22% of walleye in the gill net catch (Table 6; Table 8; Figure 4) and had a mean fall night electrofishing CPUE of 143.0 (Table 1), potentially indicating production of a strong year class; however, recruitment 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.

Walleye in Lynn Lake tend to grow fast and typically exceed quality-length (38cm; 15 in) by 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). The 2009 year class had a weighted mean total length at capture of 174 mm (6.9 in) at age 0, 339 mm (13.3 in) at age 1, and 411 mm (16.2 in) at age 2 (Table 5). Gill net captured walleye from the 2009 year class had a mean W_r of 86.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 95.2 (Table 1) and well above 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 95.2 (2011; Table 2). Based on the 2011 gill net CPUE, relative abundance is high.

Gill net captured yellow perch ranged in total length from 9 to 31 cm (3.5 to 12.2 in), had a PSD of 69 and a PSD-P of 9 (Table 1; Table 3; Figure 5). The PSD was above the management objective of 30-60; while the PSD-P was within the objective range of 5-10 (Table 3).

Since 2009, otoliths were collected from a sub-sample of gill net captured yellow perch. In 2011, yellow perch from five consecutive year classes (2007-2011) were sampled (Table 9). Year classes produced in 2009 and 2010 were the most represented and comprised 64 and 29% of yellow perch in the gill net catch (Table 9).

Yellow perch in Lynn Lake exhibit fast growth and attain quality-length (20 cm; 8 in) by age 2 (Table 10). In 2011, the weighted mean total length at capture of age-1 and age-2 male yellow perch was 164 mm (6.5 in) and 212 mm (8.3 in); while the weighted mean total length at capture of age-1 and age-2 female yellow perch was 174 mm (6.9 in) and 239 mm (9.4 in), respectively (Table 10). Mean W_r values of gill net captured yellow perch ranged from 95 to 102 for all length categories (e.g., stock to quality) sampled, with the mean W_r of stock-length yellow perch being 101 (Table 1). No length-related trends in yellow perch condition were apparent.

Other Species

Bluegill: From 2008-2010, mean frame net CPUE values of stock-length bluegill varied from a low of 3.6 (2008) to a high of 20.6 (2009; Table 2). In 2011, the mean frame net CPUE was 22.4 (Table 1) and relative abundance was considered moderate.

Bluegill sampled in frame nets ranged in total length from 8 to 25 cm (3.1 to 9.8 in), had a PSD of 40 and a PSD-P of 19 (Table 1; Table 3; Figure 6). Otoliths were collected from a sub-sample of frame net captured bluegill and indicated the presence of four consecutive year classes (2007-2010; Table 11). The 2010 cohort was well represented and comprised 60% of bluegill in the frame net catch; while year classes produced in 2008 and 2009 comprised 11 and 29% (Table 11). Bluegill in the frame net catch had a weighted mean total length at capture of 119 mm (4.7 in) at age 1, 192 mm (7.6 in) at age 2, and 220 mm (8.7 in) at age 3 (Table 12). Sampled bluegill had mean W_r values that were ≥ 115 for all length categories (e.g., stock to quality) sampled and exhibited an increasing trend in condition as total length increased.

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

Management Recommendations

- 1) Conduct fish community assessment surveys on an annual basis (next survey scheduled in summer 2012) 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, 2011. 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	0.7	0.6	42	27	8	15	88	9
BLC	11.9	2.3	45	6	22	5	114	<1
BLG	22.4	5.4	40	4	19	3	120	1
NOP	0.1	<0.1	100	---	0	---	92	---
ROB	0.4	0.3	63	35	0	---	110	2
SMB	0.6	0.4	10	18	10	18	120	4
WAE	1.6	0.7	97	6	76	14	90	<1
YEP	18.7	5.6	82	3	46	4	94	6
<i>Gill nets</i>								
BLB	0.3	0.3	0	---	0	---	94	14
BLC	6.5	2.0	0	---	0	---	114	<1
BLG	0.7	0.5	75	59	0	---	130	10
NOP	1.7	1.0	90	18	30	28	88	3
ROB	0.3	0.3	50	50	0	---	116	67
WAE	7.0	2.5	95	6	7	7	87	2
YEP	95.2	13.1	69	3	9	2	101	<1
<i>Electrofishing</i>								
WAE ¹	143.0	---	---	---	---	---	---	---

¹ 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, 2003-2011. BLB= black bullhead; BLC= black crappie; BLG= bluegill; MUE= muskellunge; NOP= northern pike; ROB= rock bass; SMB= smallmouth bass; WAE= walleye; YEP= yellow perch

Species	CPUE								
	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	2011
<i>Frame nets</i>									
BLB	---	---	---	---	---	0.1	0.0	0.1	0.7
BLC	---	---	---	---	---	0.4	1.7	1.7	11.9
BLG	---	---	---	---	---	3.6	20.6	6.8	22.4
NOP	---	---	---	---	---	0.1	0.1	0.1	0.1
ROB	---	---	---	---	---	0.0	0.3	0.1	0.4
SMB	---	---	---	---	---	0.0	0.1	0.1	0.6
WAE	---	---	---	---	---	2.8	1.5	2.2	1.6
YEP	---	---	---	---	---	0.4	1.7	2.7	18.7
<i>Gill nets</i>									
BLB	1.8	1.0	0.0	1.2	0.7	0.0	0.0	0.0	0.3
BLC	0.2	1.7	3.2	4.8	0.2	0.2	0.5	0.3	6.5
BLG	0.3	0.5	1.0	5.3	0.5	0.3	0.2	0.5	0.7
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	1.7
ROB	0.0	0.3	0.0	0.0	0.0	0.0	0.0	1.0	0.3
WAE	51.8	46.2	37.3	7.7	14.3	12.2	20.5	28.3	7.0
YEP	5.3	19.3	9.8	42.5	23.2	5.5	8.2	29.5	95.2
<i>Electrofishing</i>									
WAE ²	---	---	8.7	708.5	988.5	99.4	127.1	0.0	143.0

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, 2003-2011. BLC= black crappie; BLG= bluegill; WAE= walleye; YEP= yellow perch

Species	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	2011	Objective
<i>Frame nets</i>										
BLC										
CPUE	---	---	---	---	---	<1	2	2	12	≥ 10
PSD	---	---	---	---	---	86	55	62	45	30-60
PSD-P	---	---	---	---	---	86	16	21	22	5-10
Wr	---	---	---	---	---	110	121	120	114	---
BLG										
CPUE	---	---	---	---	---	4	21	7	22	---
PSD	---	---	---	---	---	2	13	37	40	---
PSD-P	---	---	---	---	---	0	0	7	19	---
Wr	---	---	---	---	---	115	116	116	120	---
<i>Gill nets</i>										
WAE										
CPUE	52	46	37	8	14	12	21	28	7	≥ 10
PSD	80	71	97	100	66	55	35	22	95	30-60
PSD-P	3	1	9	30	19	30	14	4	7	5-10
Wr	91	95	95	86	85	89	90	93	87	---
YEP										
CPUE	5	19	10	43	23	6	8	30	95	≥ 30
PSD	75	53	100	62	35	18	45	31	69	30-60
PSD-P	28	37	58	50	14	3	2	7	9	5-10
Wr	116	107	107	105	106	104	108	100	101	---

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 black crappie sampled in frame nets from Lynn Lake, 2009-2011.

Survey Year	Year Class								
	2011	2010	2009	2008	2007	2006	2005	2004	2003
2011		152	30	18				2	
2009			3	11	11	4	3	1	2

¹ Older black crappie were sampled, but are not reported in this table.

Table 5. Weighted mean total length (mm) at capture for black crappie sampled in frame nets (expanded sample size) from Lynn Lake, 2009-2011.

Year	Age							
	0	1	2	3	4	5	6	7
2011	---	184(152)	249(30)	289(18)	---	---	---	327(2)
2009	69(3)	146(11)	197(11)	204(4)	251(3)	311(1)	298(2)	---

Table 6. 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, 2007-2011.

Survey Year	Year Class												
	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
2011	12	2	37				1						2
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	
# stocked													
fry	700					1500				1500	1500	1000	910
sm. fingerling													
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 7. 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, 2005-2011. 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
2011	137(12)	346(2)	411(37)	---	---	---	628(1)	---	---	---	---
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 8. Stocking history including size and number for fishes stocked into Lynn Lake, 1999-2011. BLC= black crappie; MUE= muskellunge; SXW= saugeye; WAE= walleye; YEP= yellow perch

Year	Species	Size	Number
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
2006	MUE	fingerling	500
	WAE	fry	1,500,000
2010	MUE	fingerling	1,250
	MUE	juvenile	770
2011	WAE	fry	700,000

Table 9. Year class distribution based on the age/length summary for yellow perch sampled in gill nets from Lynn Lake, 2009-2011.

Survey Year	Year Class					
	2011	2010	2009	2008	2007	2006
2011	25	171	382	7	11	
2010	---	9	157	12	7	1
2009	---	---	442	35	22	

Table 10. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Lynn Lake, 2009-2011.

Year	Age				
	0	1	2	3	4
2011					
Male	96(21)	164(70)	212(193)	246(1)	248(1)
Female	95(4)	174(78)	239(222)	302(1)	316(5)
Combined	95(25)	174(171)	227(382)	254(7)	279(11)
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)	---	---

Table 11. Year class distribution based on the expanded age/length summary for bluegill sampled in frame nets from Lynn Lake, 2011.

Survey Year	Year Class				
	2011	2010	2009	2008	2007
2011		241	116	44	2

Table 12. Weighted mean total length (mm) at capture for bluegill sampled in frame nets (expanded sample size) from Lynn Lake, 2011.

Year	Age			
	1	2	3	4
2011	119(241)	192(116)	220(44)	247(2)

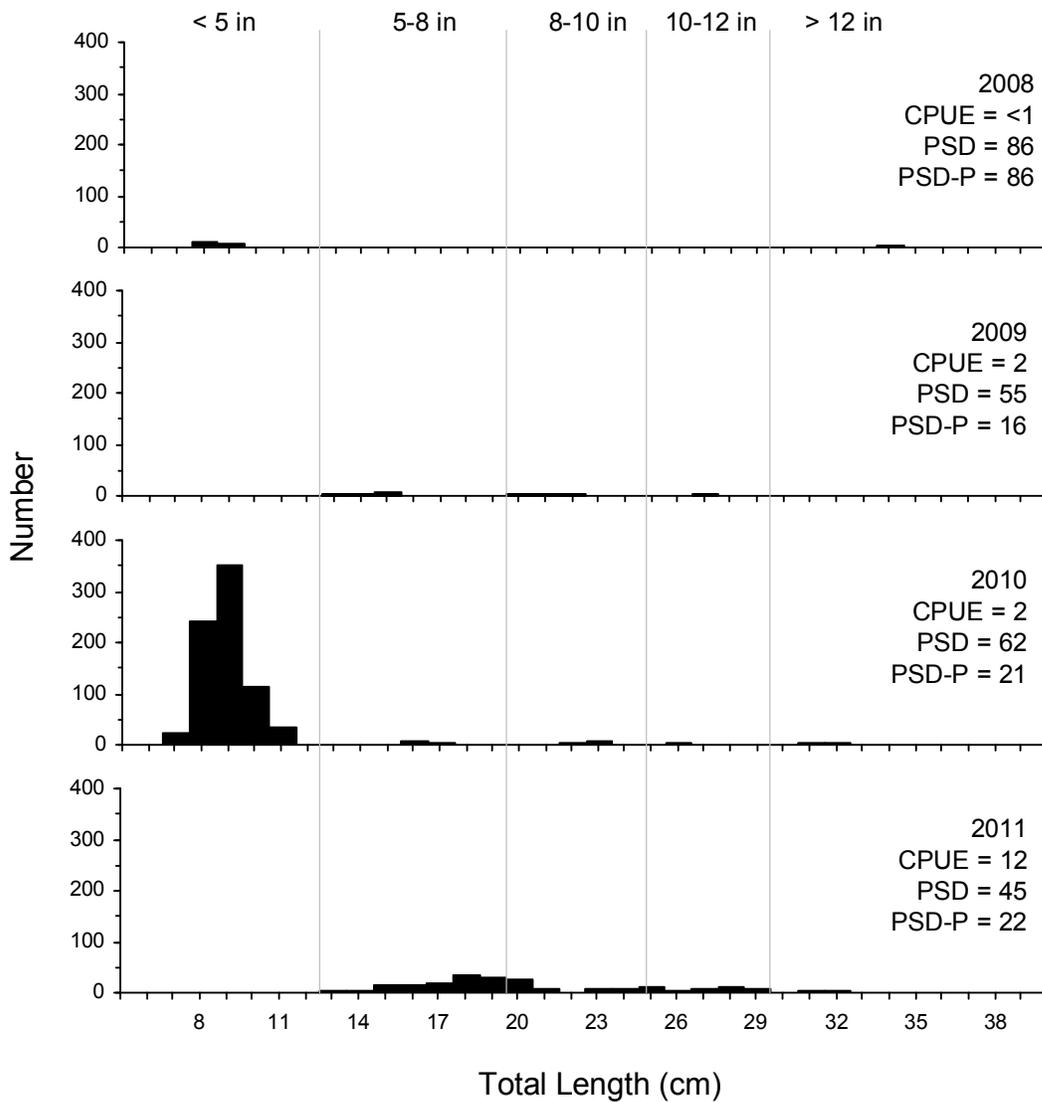


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured using frame nets in Lynn Lake, 2008-2011.

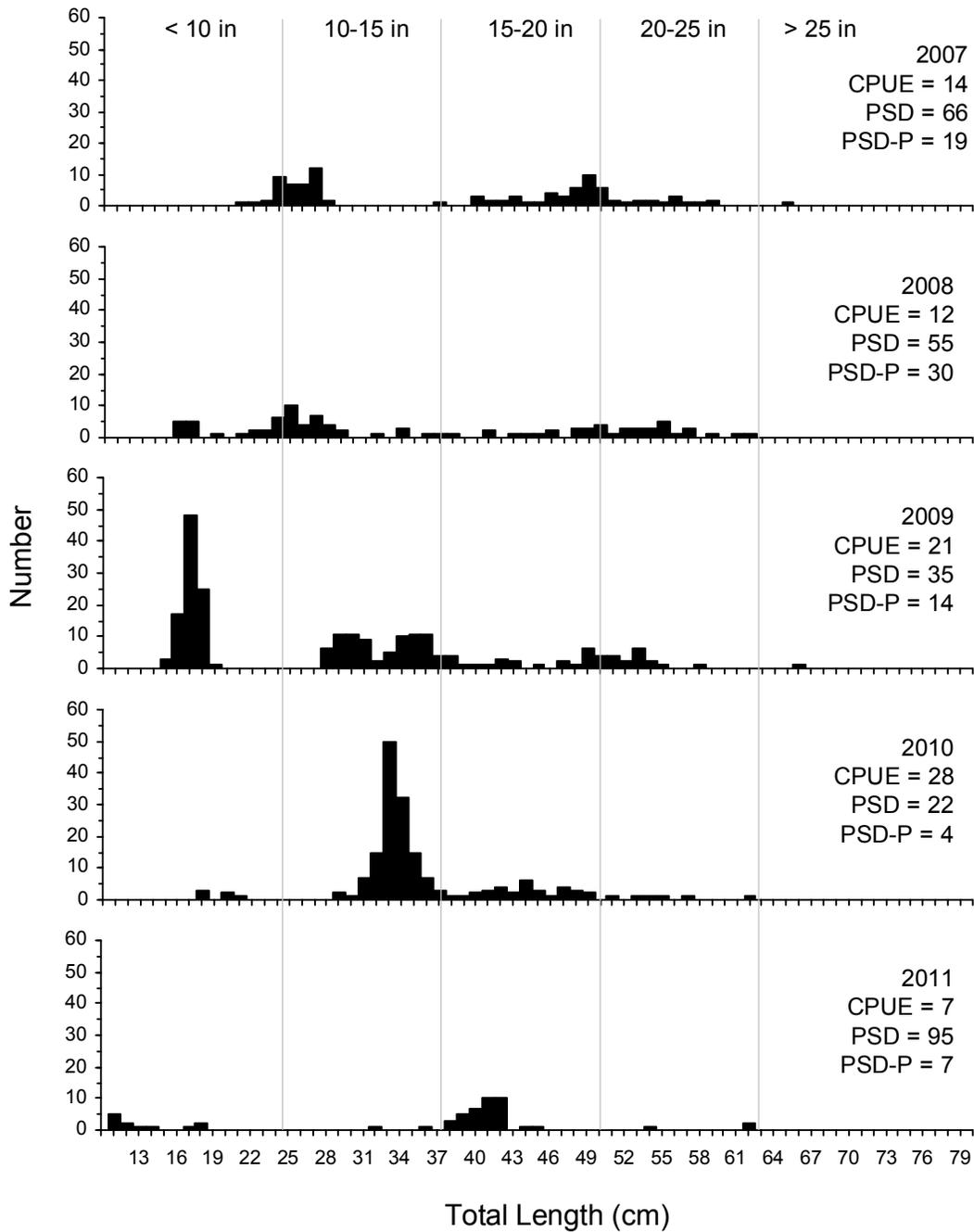


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Lynn Lake, 2007-2011.

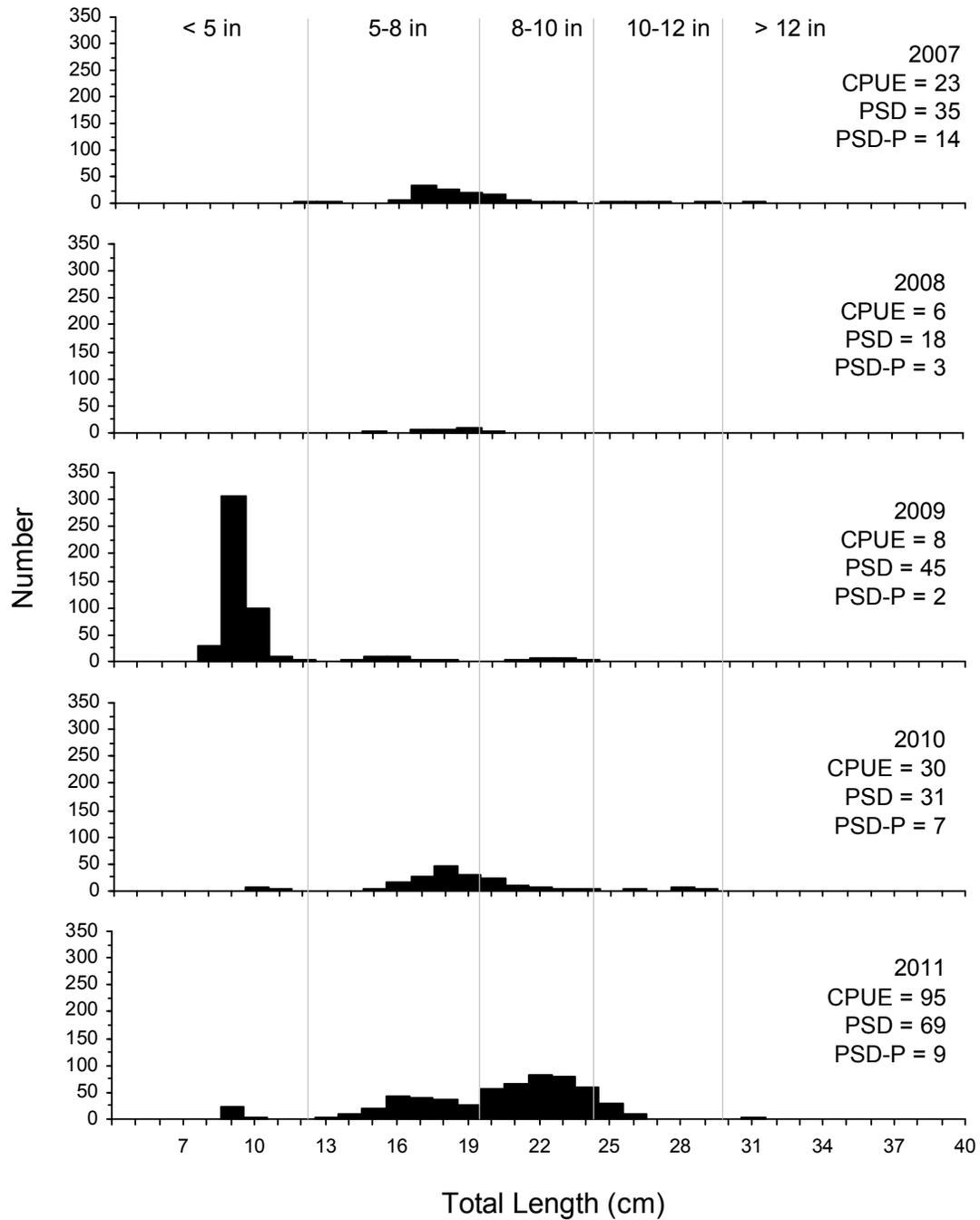


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Lynn Lake, 2007-2011.

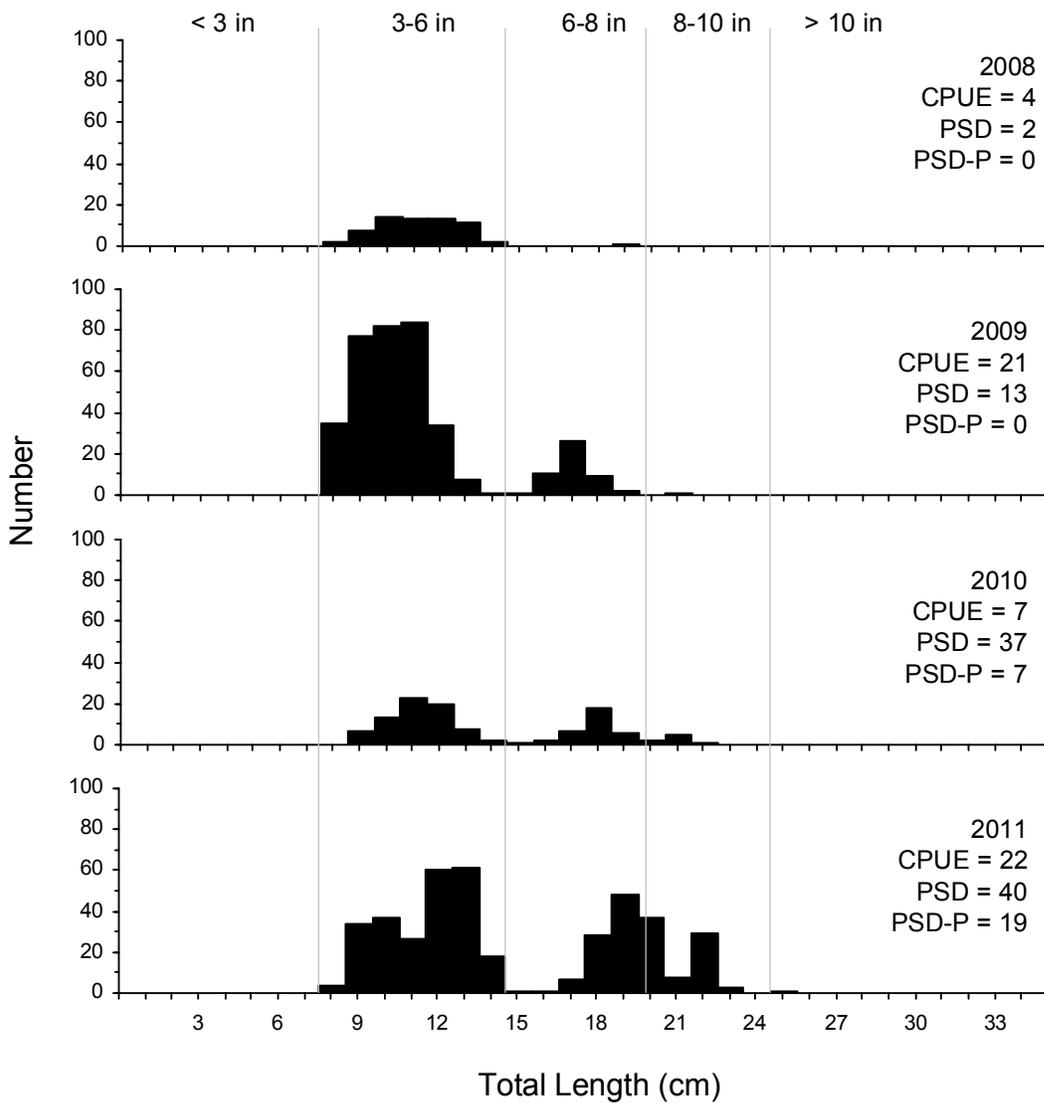


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for bluegill captured using frame nets in Lynn Lake, 2008-2011.