

Cattail/Kettle Lake

Site Description

Location

Water designation number (WDN)	48-0012-00
Legal description	T125N-R55W-Sec. 6,7,18,19 T125N-R56W-Sec. 1,2,10,11,12,13,14,23,24
County (ies)	Marshall
Location from nearest town	5.0 miles west and 3.0 miles north of Eden, SD

Survey Dates and Sampling Information

Survey dates	August 19-21, 2014 (FN, GN)
Frame net sets (n)	18
Gill net sets (n)	6
Electrofishing-WAE (min)	60

Morphometry (Figure 1)

Watershed area (acres)	29,465
Surface area (acres)	3,017
Maximum depth (ft)	18
Mean depth (ft)	10

Ownership and Public Access

Cattail/Kettle Lake is a non-meandered lake; however, a significant amount of land previously managed as a Game Production Area (GPA) is now submerged. Water elevations have encroached on private lands creating private ownership of much of the lakeshore. Both private and public land can be found beneath the water. A public access site is located on the west shore of Cattail/Kettle Lake and is maintained by the SDGFP (Figure 1; Figure 2).

Watershed and Land Use

The 29,465 acre Cattail/Kettle Lakes sub-watershed (HUC-12) is located within the larger Northern Coteau Lakes-Upper James River (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and woodland.

Water Level Observations

Cattail/Kettle Lake has no established OHWM and an outlet elevation was not available. On May 6, 2014 the elevation of Cattail/Kettle Lake was 1791.9 fmsl; 0.4 ft above the fall 2013 elevation of 1791.5 fmsl. On October 29, 2014 the elevation was 1791.3 fmsl.

Fish Management Information

Primary species	walleye, yellow perch
Other species	black bullhead, black crappie, bluegill, common carp, largemouth bass, northern pike, smallmouth bass, white sucker
Lake-specific regulations	walleye: minimum length 15"
Management classification	warm-water marginal
Fish consumption advisories	none

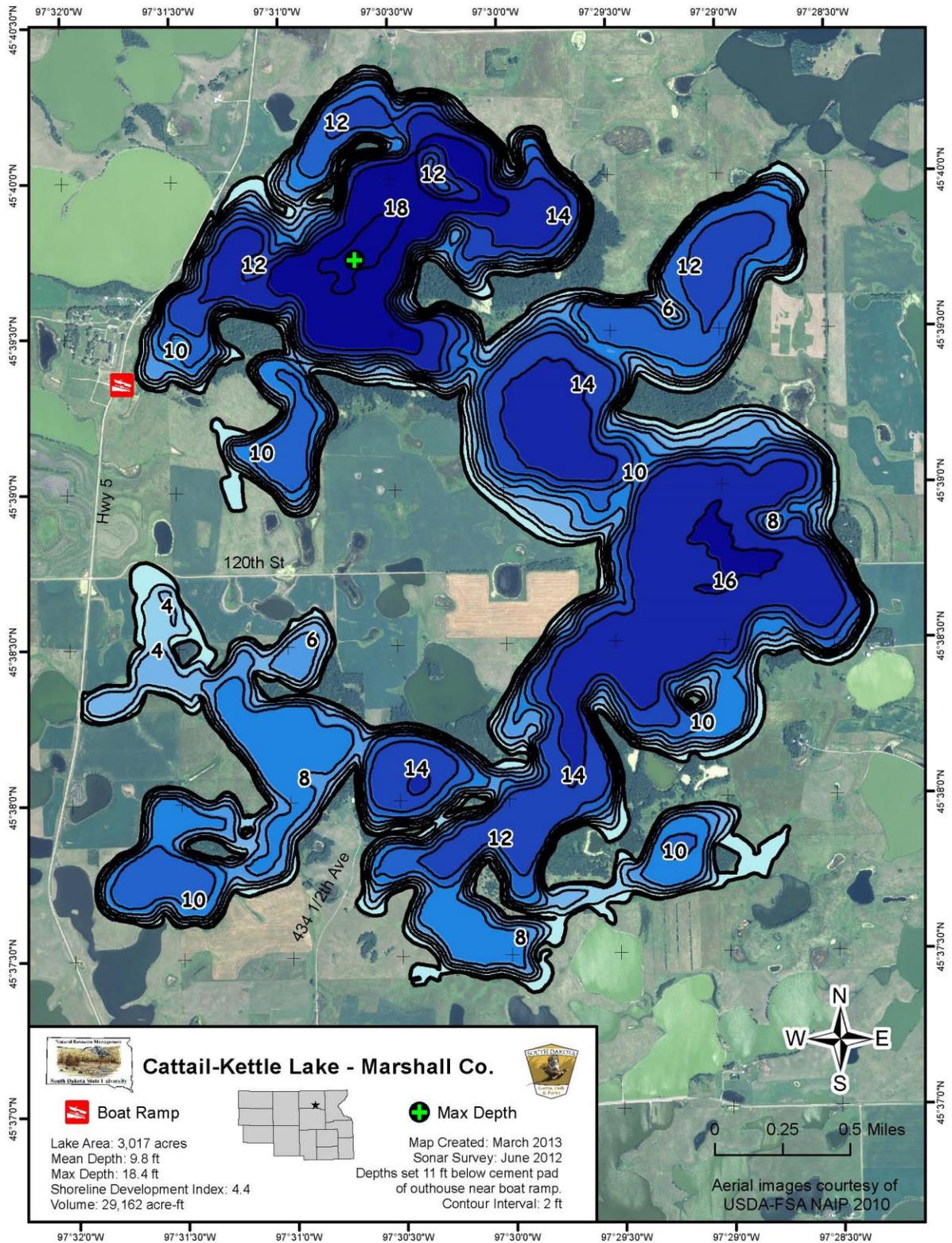


Figure 1. Map depicting depth contours of Cattail/Kettle Lake, Marshall County, South Dakota.

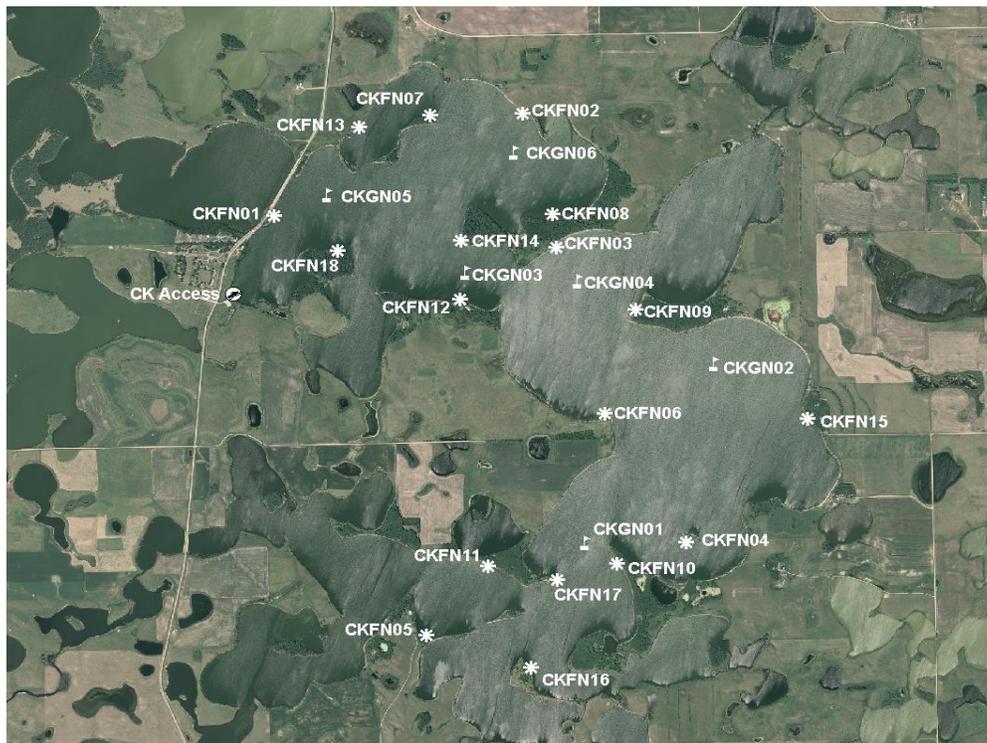
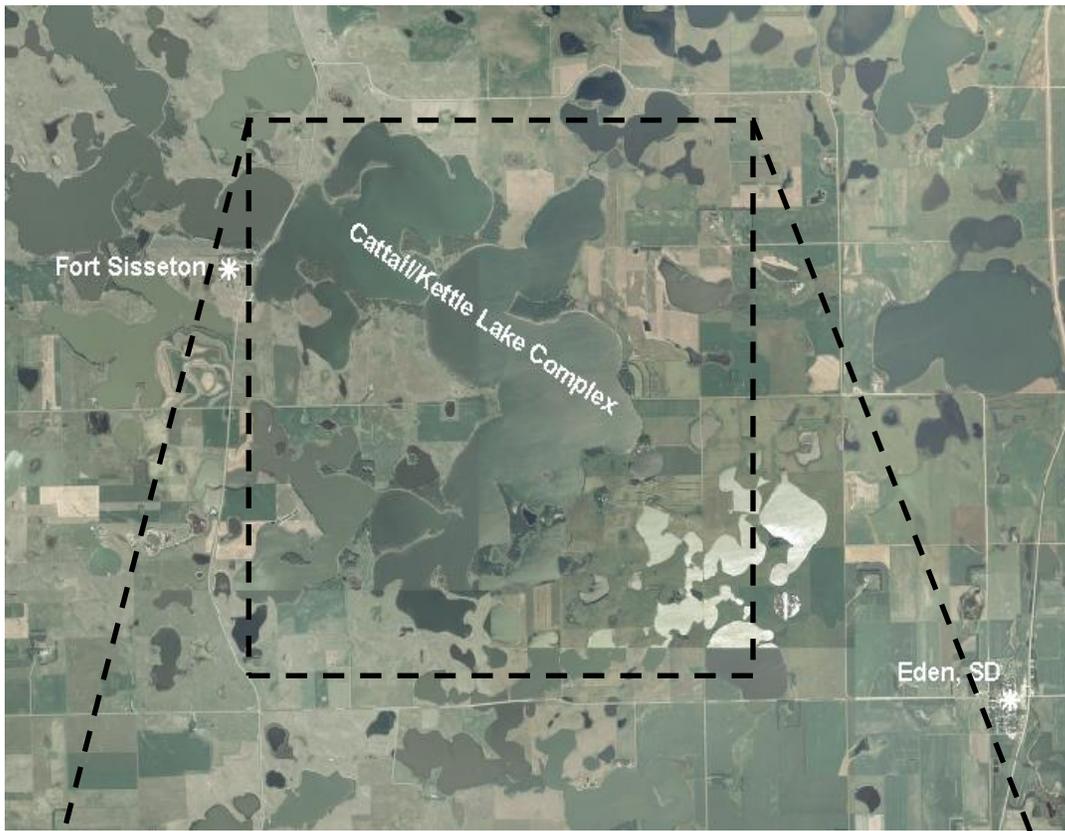


Figure 2. Map depicting location of the Cattail/Kettle Lake Complex from Eden, Marshall County, South Dakota (top). Also noted are standardized net locations and the access area which includes boat ramp, dock, and public toilet (bottom). CKFN = frame nets, CKGN= gill nets

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.
- 3) Maintain a mean frame net CPUE of stock-length black bullhead ≤ 100 .

Results and Discussion

Cattail/Kettle Lake is a natural lake located in Marshall County of northeastern South Dakota. High water levels during the 1990s combined Cattail and Kettle lakes along with several smaller sloughs into one large body that is now commonly referred to as Cattail/Kettle Lake. Water flows into Cattail/Kettle Lake from Lost Lake to the north and through a series of shallow lakes to the northwest. The outlet is located on the southwest corner and flows toward Hickman Dam to the west. During high water events many area lakes become connected allowing fish to move among the various water basins allowing many fish species to be introduced to Cattail/Kettle Lake via these waters. Cattail/Kettle Lake is primarily managed as a walleye and yellow perch fishery. Overall, as many as 10 species of fish contribute to the fishery in Cattail/Kettle Lake.

Primary Species

Walleye: The 2014 mean gill net CPUE for stock-length walleye of 2.0 represented a decrease from the 2013 CPUE of 3.7 and is below the minimum objective (≥ 10 stock-length walleye/net night; Tables 1-3). Currently, relative abundance is low.

In 2014, gill net captured walleye ranged in TL from 14 to 63 cm (5.5 to 24.8 in; Figure 3). Age estimates made using otoliths revealed the presence of six year classes (2006, 2009 and 2011-2014; Table 4). Unfortunately, recruitment has been poor in recent years and each cohort was represented by a limited number of individuals (Table 4). Natural recruitment contributes to the population (e.g., 2009); however, stronger year classes (e.g., 2006, 2011) tend to coincide with fry stockings (Table 4; Table 6). The contribution of stocked or naturally-produced walleye to year classes produced during stocked years is often unknown, as stocked fish are typically unmarked making it difficult to differentiate stocked from naturally-produced walleye. In 2011, stocked walleye were marked with Oxytetracycline (OTC) so that the contribution of stocked fish could be evaluated. The estimated stocking contribution was 30%; however, it was noted that individual marks were faint. Therefore, the stocking contribution may have been higher.

Few inferences can be made concerning size structure, growth, and condition of stock-length walleye due to low sample size (Table 1; Table 5).

Yellow Perch: The mean gill net CPUE of stock-length yellow perch was 67.2 (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 21.5 (2006) to a high of 156.8 (2013; Table 2). Based on the 2014 gill net catch, relative abundance is high.

Yellow perch captured in the gill net catch ranged in TL from 8 to 25 cm (3.1 to 9.8 in), with the majority being $<$ quality-length (20 cm; 8 in), which resulted in low PSD and PSD-P values of 5 and 0 (Table 1; Figure 4). Both the PSD and PSD-P were below management objectives of 30-60 and 5-10, respectively (Table 3).

Yellow perch have exhibited consistent recruitment of varying magnitude (Table 7). In 2014, otoliths collected from a sub-sample of gill net captured yellow perch indicated the presence of four consecutive year classes (2011-2014; Table 7). The 2013 and 2014 cohorts were abundant and collectively comprised 94% of the sample (Table 7). Few yellow perch \geq age 3 have been sampled from Cattail/Kettle Lake since 2009 (Table 7; Table 8).

Strong year classes produced in 2011 and 2012 have exhibited slower growth than previous cohorts (Table 8). Since 2009, weighted mean TL at capture values of age-2 fish have ranged from 169 to 227 mm (6.7 to 8.9 in), when both males and females were combined (Table 8). In 2014, the weighted mean TL at capture for age 2 males and females was 173 and 199 mm (6.8 and 7.8 in), respectively (Table 8). There was no length related trend in condition and the mean W_r values were > 90 for all length categories (e.g., stock to quality) sampled.

Other Species

Black Bullhead: Black bullheads were the second most abundant fish species in the frame net catch. The mean frame net CPUE of stock-length black bullheads was 23.7 (Table 1). The 2014 frame net CPUE represented an increase from the 2013 CPUE of 20.2 (Table 2), but remained within the management objective (≤ 100 stock-length black bullhead/net night; Table 3).

Frame net captured black bullheads ranged in TL from 11 to 32 cm (4.3 to 12.6 in). A high proportion (76%), were < 200 mm (7.9 in.). The PSD was 24 and the PSD-P was 6 (Table 1). No age and growth information was collected in 2014. Black bullheads in the stock-quality length category, which dominated the sample, had a mean W_r of 88.

Black Crappie: Since 2004, mean frame net CPUE values of stock-length black crappie has varied from a low of 0.4 (2009) to a high of 11.9 (2012; Table 2). The mean frame net CPUE of stock-length fish in 2014 was 1.9 (Table 1) and indicated low relative abundance.

Frame net captured black crappie ranged in TL from 8 to 21 cm (3.1 to 8.3 in), had a PSD of 3 and a PSD-P of 0 (Table 1; Figure 5). Stock-quality length black crappie, which comprised $>90\%$ of the sample, had a mean W_r of 115. No age and growth information was collected in 2014 due to small sample size.

Bluegill: The mean frame net CPUE of stock-length bluegill was 23.6 (Table 1) and the highest recorded since 2013 (Table 2). Based on the 2014 frame net CPUE, relative abundance appears to be moderate.

Frame net captured bluegill ranged in TL from 8 to 16 cm (3.1 to 6.3 in), with what appeared to be a single cohort that ranged from 8 to 12 cm (3.1 to 4.7 in) dominating the sample (Figure 6). The PSD was 0 and the PSD-P was 0 (Table 1; Figure 6). No age or growth information was collected. Bluegill in the stock-quality, length category, which was the most abundant, had a mean W_r of 107.

Northern Pike: Northern pike typically are not sampled effectively during mid-summer fish community surveys. As a result, mean gill net CPUE values are often low. Northern pike relative abundance in Cattail/Kettle Lake has generally been considered low to moderate, with mean gill net CPUE values that ranged from 0.0 to 1.7 from 2004-2011 (Table 2). In 2012 - 2014, relative abundance increased and is currently considered high with mean gill net CPUE values for stock-length northern pike of ≥ 4 , respectively (Table 2).

Gill net captured northern pike ranged in TL from 53 to 90 cm (20.9 to 35.4 in), had a PSD of 100 and PSD-P of 13 (Table 1; Figure 7). Size structure indices should be interpreted with caution as sample size was low (i.e., 24 stock-length northern pike). Although sample size was low, northern pike condition appeared to be similar to that of northern pike captured from other northeast South Dakota glacial lakes (e.g., Roy and Clear Lakes) with the mean W_r of stock-length fish being 89 (Table 1).

Other: Smallmouth bass, common carp and white sucker were other fish species captured in low numbers during the 2014 survey (Table 1).

Management Recommendations

- 1) Conduct annual fish community assessment surveys utilizing frame nets and experimental gill nets (next survey scheduled in summer 2015) to monitor fish relative abundance, size structure, growth and stocking success.
- 2) Conduct fall night electrofishing annually to monitor age-0 walleye relative abundance.
- 3) Stock walleye (≈ 500 fry/acre) to establish additional year classes if fall night electrofishing CPUE of age-0 walleye and gill netting results warrant [i.e., low gill net CPUE of sub-stock (i.e., < 25 cm; 10 in) walleye and/or fall night electrofishing CPUE of age-0 walleye < 75 fish/hour].
- 4) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.
- 5) Re-evaluate the 381-mm (15 in) minimum length limit on walleye. Currently, walleye are a minimal component of the fishery and few benefits of the regulation are being realized.
- 6) Consider spring night electrofishing to monitor largemouth bass population parameters; an increased presence of largemouth bass (primarily age-0) in both frame nets and gill nets has been observed in recent surveys.

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 using frame nets, experimental gill nets and electrofishing from Cattail/Kettle Lake, 2014. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; NOP = northern pike; SMB= smallmouth bass; WAE = walleye; WHS = white sucker; 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	23.7	10.4	24	4	6	2	88	1
BLC	1.9	0.9	3	32	0	---	115	1
BLG	23.6	6.6	0	---	0	---	107	1
COC	0.1	0.1	50	50	50	50	100	---
GSF	0.1	0.1	0	---	0	---	98	---
NOP	0.7	0.2	92	13	8	13	84	1
SMB	0.5	0.4	44	33	44	33	117	6
WAE	0.1	0.1	100	---	100	---	---	---
YEP	36.7	15.8	1	1	0	1	86	1
<i>Gill nets</i>								
BLB	2.8	2.7	24	19	6	10	99	2
BLC	0.3	0.3	0	---	0	---	121	18
BLG	0.5	0.3	0	---	0	---	110	<1
COC	0.2	0.2	100	---	100	---	96	---
NOP	4.0	1.4	100	0	13	12	89	1
SMB	0.2	0.2	0	---	0	---	120	---
WAE	2.0	1.1	83	20	50	27	93	3
WHS	0.7	0.5	100	0	100	0	103	4
YEP	67.2	17.6	5	2	0	1	96	0

Table 2. Historic mean catch rate (CPUE; frame/gill nets= catch/net night, electrofishing= catch/hour) of stock-length fish for various fish species captured by experimental gill nets, frame nets, and electrofishing from Cattail/Kettle Lake, 2005-2014. BLB = black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; LMB= largemouth bass; NOP = northern pike; SMB = smallmouth bass; WAE = walleye; WHS = white sucker; YEP = yellow perch

Species	CPUE									
	2005	2006 ¹	2007 ¹	2008	2009	2010	2011	2012	2013	2014
<i>Frame nets</i>										
BLB	1.3	15.1	2.9	0.1	0.0	0.0	0.1	4.4	20.2	23.7
BLC	1.3	10.3	7.1	2.5	0.4	1.9	5.5	11.9	3.2	1.9
BLG	0.0	0.0	0.0	1.8	0.1	0.7	1.8	2.4	13.3	23.6
COC	1.7	4.2	3.2	0.9	0.4	0.5	0.1	0.2	0.0	0.1
GSF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
LMB	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0
NOP	1.3	0.8	0.2	1.3	0.6	0.3	0.2	0.5	0.7	0.7
SMB	0.0	0.8	0.0	0.8	0.2	0.7	1.3	0.6	0.7	0.5
WAE	5.4	3.8	2.3	2.0	1.2	0.3	0.1	0.5	0.3	0.1
WHS	3.9	0.8	0.1	0.2	0.1	0.1	0.1	0.3	0.0	0.0
YEP	0.6	2.7	1.9	3.2	5.6	18.7	19.0	21.2	26.1	36.7
<i>Gill nets</i>										
BLB	1.3	38.0	2.8	0.0	0.0	0.0	0.0	2.3	4.2	2.8
BLC	0.8	9.7	4.7	0.3	0.7	30.7	8.3	12.3	2.5	0.3
BLG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
COC	0.0	2.5	8.5	2.0	1.5	0.3	0.3	0.0	0.0	0.2
NOP	0.5	0.0	1.7	1.3	0.8	0.3	0.7	4.0	5.0	4.0
SMB	0.0	0.0	0.0	0.0	0.3	3.7	0.3	0.0	0.2	0.2
WAE	20.7	10.8	15.0	5.3	6.7	8.5	7.5	2.8	3.7	2.0
WHS	0.0	0.2	0.2	0.2	0.3	0.5	0.5	1.3	2.5	0.7
YEP	23.5	21.5	72.5	58.7	83.0	140.2	92.2	152.0	156.8	67.2
<i>Electrofishing</i>										
WAE ²	---	---	---	295.1	---	0.0	87.0	---	---	2.0

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

² Fall Electrofishing-WAE; catch rate (CPUE) represents age-0 Walleye/hour

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 frame nets and experimental gill nets from Cattail/Kettle Lake, 2005-2014. BLB= black bullhead; BLC= black crappie; BLG= bluegill; NOP= northern pike; WAE= walleye; YEP= yellow perch

Species	2005	2006 ¹	2007 ¹	2008	2009	2010	2011	2012	2013	2014	Objective
<i>Frame nets</i>											
BLB											
CPUE	1	15	3	<1	0	0	<1	4	20	3	≤ 100
PSD	100	53	71	100	---	---	50	29	5	24	---
RSD-P	92	39	6	100	---	---	0	0	4	6	---
Wr	98	95	91	85	---	---	88	91	86	99	---
BLC											
CPUE	1	10	7	3	<1	2	6	12	3	2	---
PSD	4	4	84	78	57	31	4	4	9	3	---
RSD-P	4	0	9	64	57	31	2	0	2	0	---
Wr	121	112	111	111	112	115	113	117	120	115	---
BLG											
CPUE	0	0	0	2	<1	1	2	2	13	24	---
PSD	---	---	---	0	0	0	0	5	2	0	---
RSD-P	---	---	---	0	0	0	0	0	0	0	---
Wr	---	---	---	89	135	110	102	111	98	107	---
<i>Gill nets</i>											
WAE											
CPUE	21	11	15	5	7	9	8	3	4	2	≥ 10
PSD	71	95	53	16	90	67	80	65	73	83	30-60
RSD-P	15	18	27	9	3	12	20	18	36	50	5 – 10
Wr	97	97	89	87	88	96	96	94	89	93	---
YEP											
CPUE	24	22	73	59	83	140	92	152	157	67	≥ 30
PSD	11	72	24	26	3	10	16	10	3	5	30-60
RSD-P	3	17	6	2	0	0	1	2	0	0	5-10
Wr	101	98	103	107	105	102	95	95	97	96	---

¹ Monofilament gill net mesh size (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 (# stocked x 1000) from Cattail/Kettle Lake, 2010-2014.

Survey Year	Year Class													
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2014	3	1	1	4		1			5					
2013 ¹	---	15	1	9	4	2	1		3					
2012	---	---		6	4		6		1					
2011 ¹	---	---	---	85	8	4	21		9	1				
2010 ¹	---	---	---	---	6	6	20		22			1		
# stocked														
fry		1350		1400	1350		4000		2700					3000
sm. fingerling												300		
lg fingerling	5													

¹ Older walleye were sampled, but are not reported in this table

Table 5. Weighted mean TL at capture (mm) for walleye age-0 through age-10 captured in experimental gill nets (expanded sample size) from Cattail/Kettle Lake, 2005-2014. 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
2014	168(3)	307(1)	331(1)	467(4)	---	523(1)	---	---	566(5)	---	---
2013 ¹	128(15)	309(1)	377(9)	492(4)	567(2)	555(1)	---	559(3)	---	---	---
2012	---	301(6)	440(4)	---	494(6)	---	546(1)	---	---	---	---
2011 ¹	143(85)	322(8)	407(4)	452(21)	---	517(9)	549(1)	---	---	---	---
2010 ¹	168(6)	299(6)	372(20)	---	482(22)	---	---	608(1)	---	---	---
2009 ¹	135(13)	242(11)	---	411(35)	438(1)	---	---	---	---	---	---
2008 ¹	124(29)	257(2)	323(26)	---	---	473(1)	---	---	---	635(1)	---
2007	---	256(62)	403(10)	444(7)	479(5)	570(1)	499(2)	553(3)	558(7)	---	590(13)
2006	183(15)	199(2)	326(3)	429(49)	522(1)	507(1)	563(1)	568(4)	554(4)	643(1)	543(1)
2005	---	305(25)	393(52)	463(13)	482(3)	490(8)	507(4)	---	537(18)	---	---

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

Table 6. Stocking history including size and number for fishes stocked into Cattail/Kettle Lake, 2001-2014. WAE= walleye

Year	Species	Size	Number
2000	WAE	fry	3,000,000
2001	WAE	fry	3,000,000
2003	WAE	small fingerling	300,290
2006	WAE	fry	2,700,000
2008	WAE	fry	4,000,000
2010	WAE	fry	1,350,000
2011	WAE	fry	1,400,000
2013	WAE	fry	1,350,000
2014	WAE	large fingerling	5,165

Table 7. Year class distribution based on expanded age/length summary for yellow perch sampled in gill nets from Cattail/Kettle Lake, 2009-2014.

Survey Year	Year Class									
	2014	2013	2012	2011	2010	2009	2008	2007	2006	
2014	84	462	23	10	---	---	---	---	---	
2013	---	78	756	624	---	---	---	---	---	
2012	---	---	---	2573	187	14	---	---	---	
2011	---	---	---	11	453	108	4	---	---	
2010	---	---	---	---	463	710	131	---	---	
2009	---	---	---	---	---	9	488	17	1	

Table 8. Weighted mean TL (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Cattail/Kettle Lake, 2009-2014.

Year	Age			
	0	1	2	3
2014				
Male	96(49)	137(171)	173(2)	191(2)
Female	93(22)	149(269)	199(19)	217(8)
Combined	94(84)	144(462)	197(23)	212(10)
2013				
Male	93(33)	122(369)	159(378)	---
Female	103(19)	137(292)	180(315)	---
Combined	99(78)	130(756)	169(624)	---
2012				
Male	---	115(1103)	189(38)	---
Female	---	128(1440)	197(160)	254(15)
Combined	---	121(2573)	195(187)	254(14)
2011				
Male	88(10)	156(151)	183(28)	---
Female	92(1)	167(314)	228(68)	271(4)
Combined	89(11)	163(453)	212(108)	271(4)
2010				
Male	93(232)	154(227)	197(40)	---
Female	94(169)	163(491)	228(69)	---
Combined	94(463)	159(710)	210(131)	---
2009				
Male	89(9)	150(118)	217(2)	---
Female	---	160(370)	228(15)	285(1)
Combined	89(9)	157(488)	227(17)	285(1)

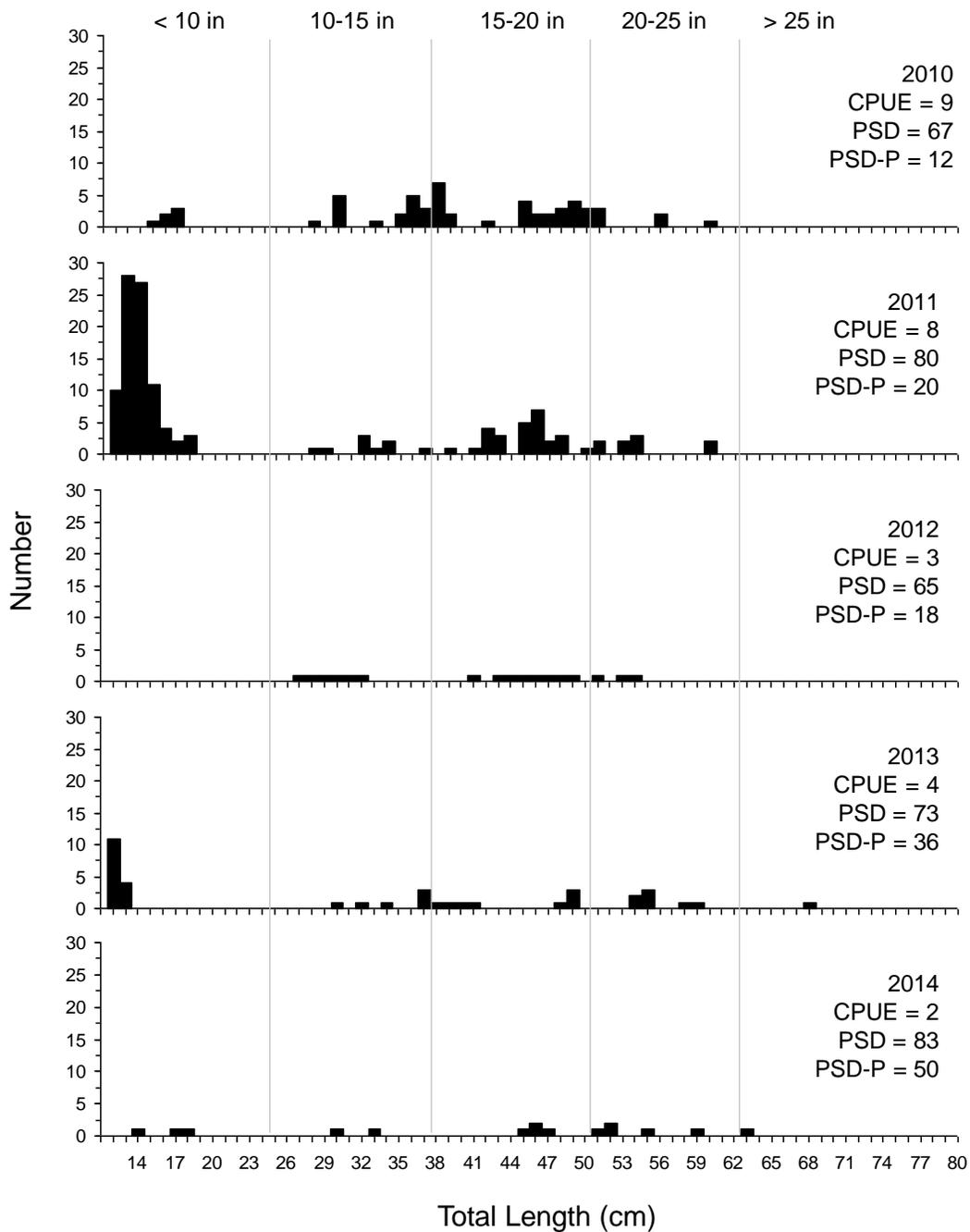


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Cattail/Kettle Lake, 2010-2014.

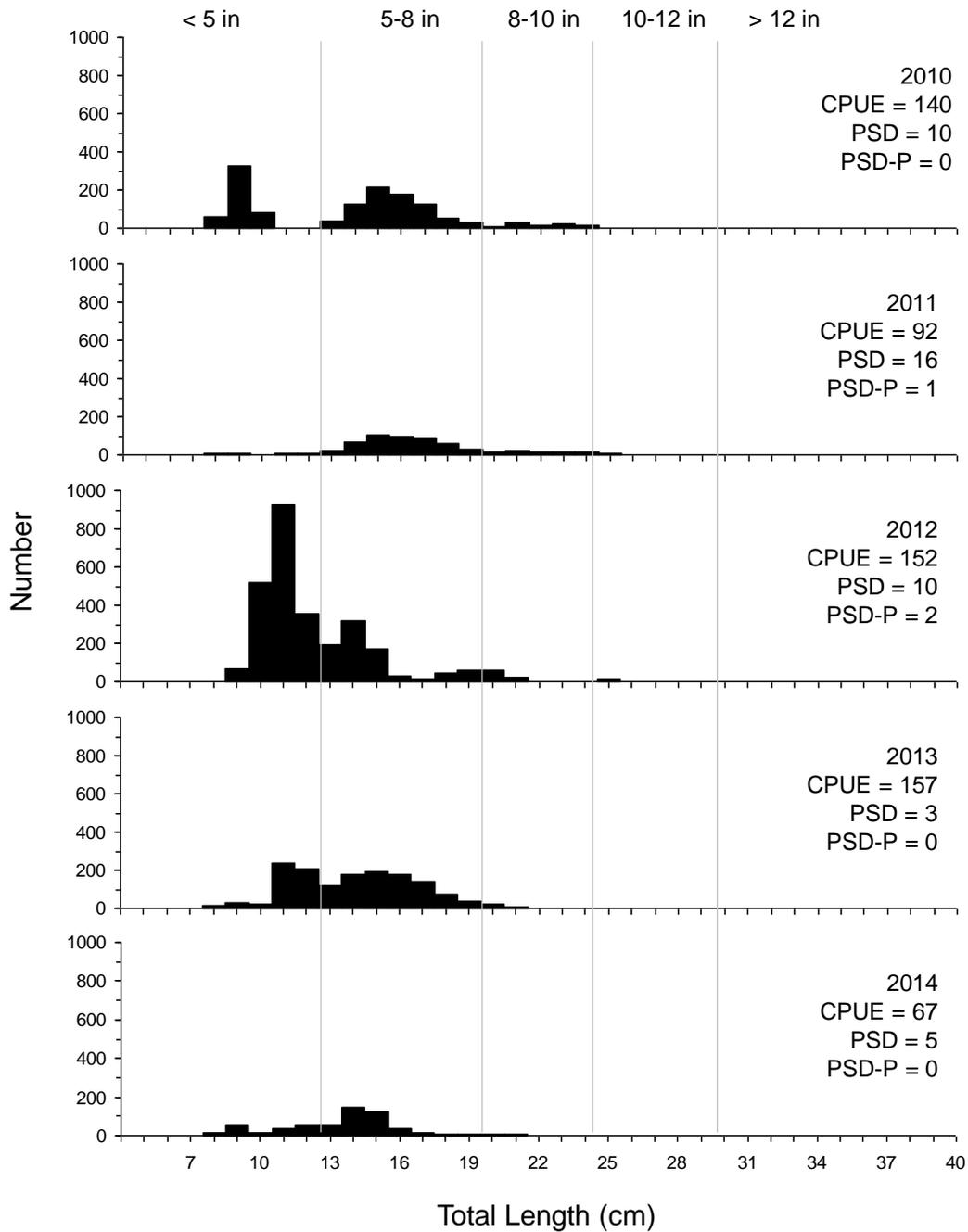


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Cattail-Kettle Lake, 2010-2014.

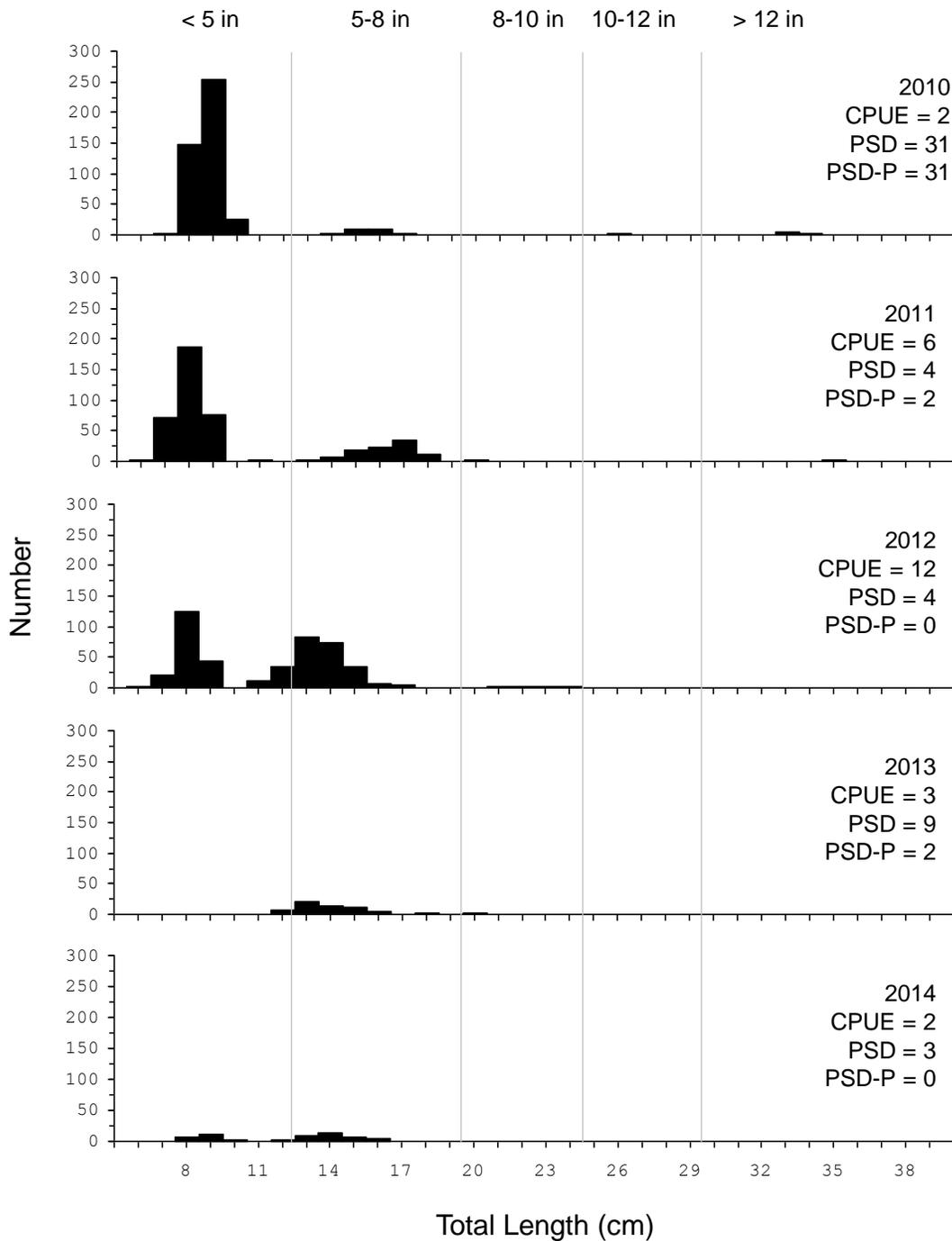


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured using frame nets in Cattail-Kettle Lake, 2010-2014.

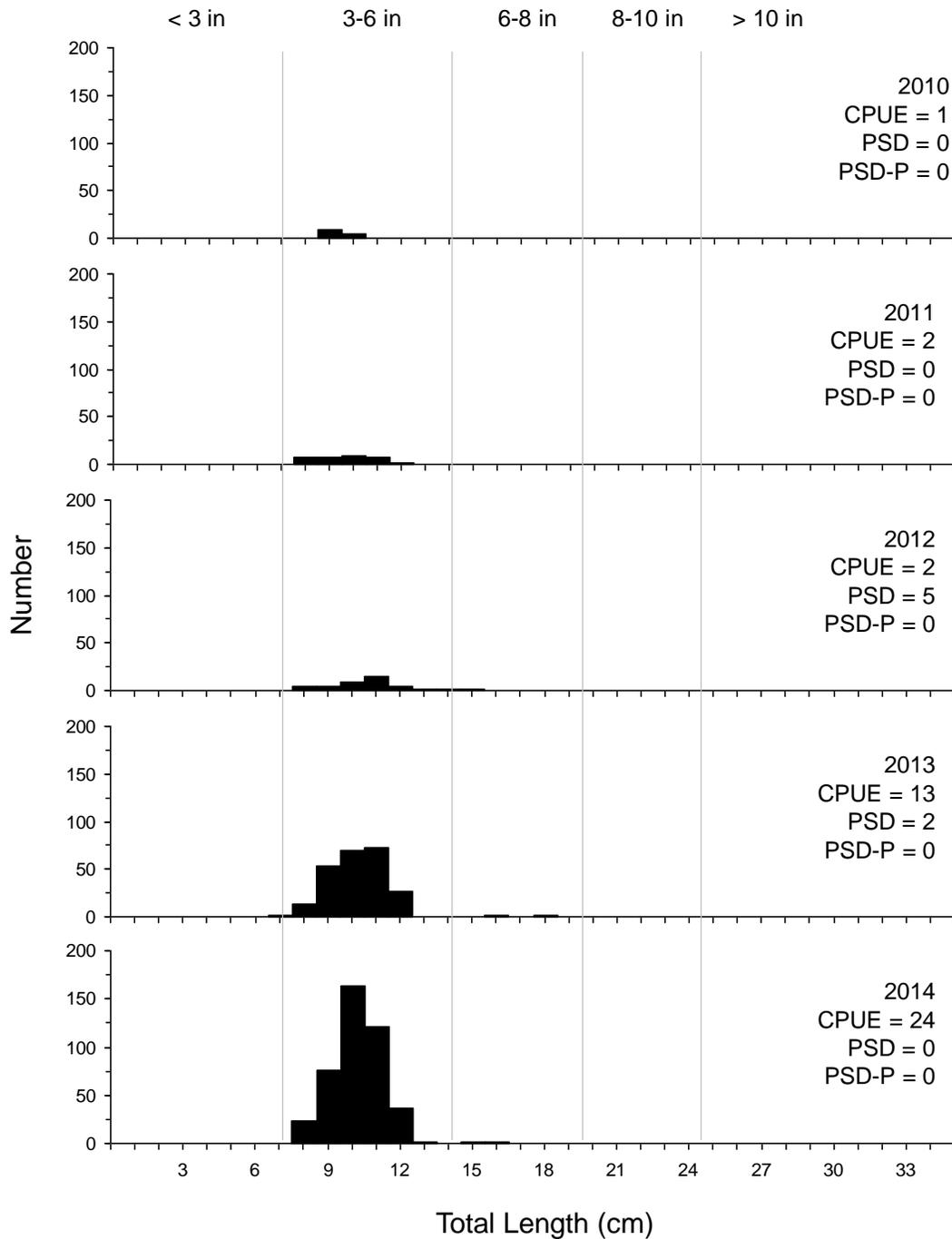


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for bluegill captured using frame nets in Cattail-Kettle Lake, 2010-2014.

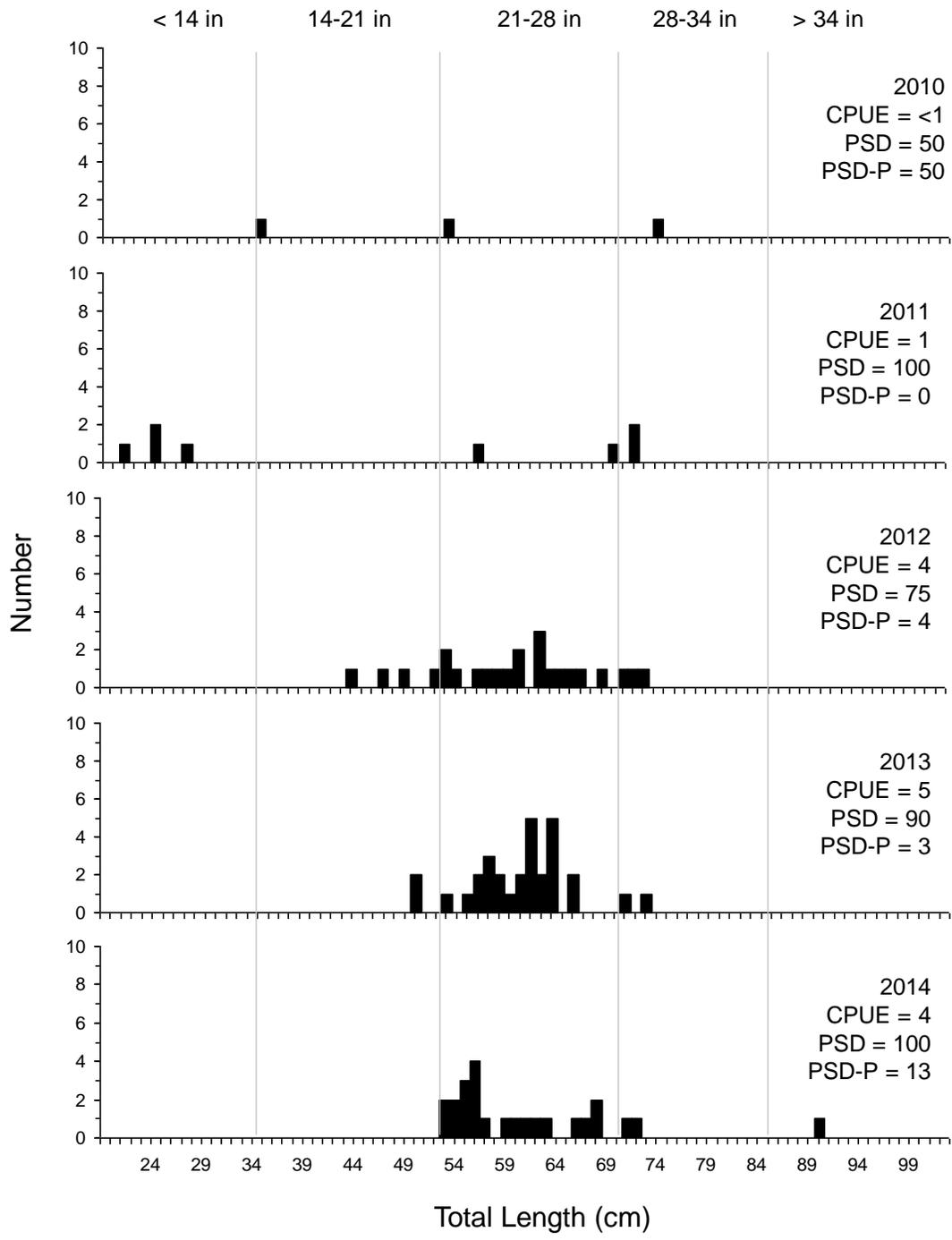


Figure 7. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using gill nets in Cattail-Kettle Lake, 2010-2014.