

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 miles west and 3 miles north of Eden, South Dakota.

Survey Dates and Sampling Information

Survey dates	August 17-19, 2010 (FN, GN) September 13, 2010 (EF-WAE)
Frame net sets (n)	18
Gill net sets (n)	6
Fall electrofishing-WAE (min)	60

Morphometry

Watershed area (acres)	29,465
Surface area (acres)	≈2,800
Maximum depth (ft)	unknown
Mean depth (ft)	unknown

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).

Watershed and Land Use

Land use within the 29,465 acre Cattail/Kettle Lakes sub-watershed (HUC-12) is primarily agricultural including a mix of pasture or grassland, cropland, and scattered shelterbelts.

Water Level Observations

Cattail/Kettle Lake has no established Ordinary High Water Mark and an outlet elevation was not available. On May 12, 2010 the elevation of Cattail/Kettle Lake was 1794.7 fmsl and above the fall 2009 elevation of 1792.5 fmsl. By September 29, 2010 the elevation of Cattail/Kettle Lake had declined to 1792.3 fmsl.

Aquatic Nuisance Species Monitoring

Plant Survey

Areas of emergent vegetation (primarily cattails) and submerged vegetation are present in Cattail-Kettle Lake. Submerged aquatic plant species identified during the 2010 survey include coontail, 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

Common carp was the only aquatic nuisance fish species captured during the 2010 survey.

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	NE Panfish Management Area: 10 daily; 50 possession Walleye: minimum length 15"
Management classification	warm-water marginal
Fish Consumption Advisories	none

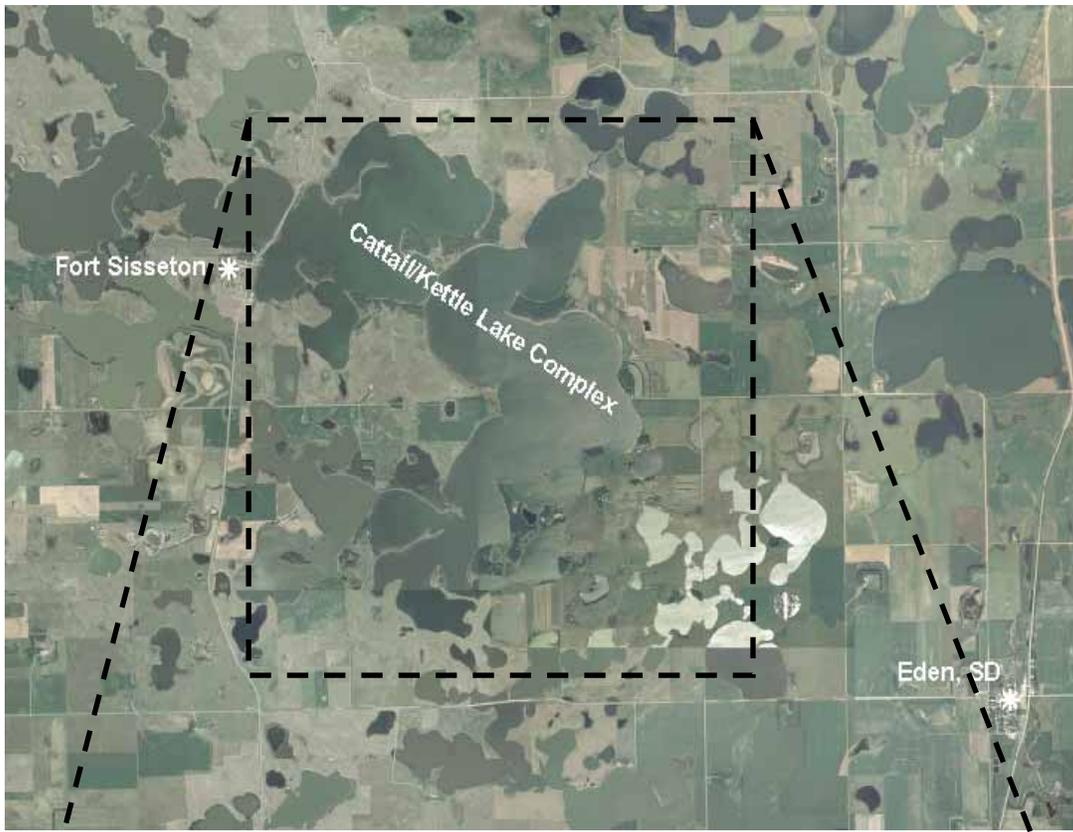


Figure 1. Map depicting location of the Cattail/Kettle Lake Complex from Eden, Marshall County, South Dakota. Also noted are standardized net locations and the access area which includes boat ramp, dock, and public toilet. CKFN = frame nets, CKGN= gill nets

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 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 1990's combined Cattail and Kettle lakes along with several smaller sloughs into one large water 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 was a popular winter fishery for large yellow perch and northern pike during the mid-1990's. SDGFP personnel first stocked walleyes into Cattail/Kettle Lake in 1997. 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 mean gill net CPUE of stock-length walleye during 2010 was 8.5 (Table 1) and below the minimum objective (≥ 10 stock-length walleye/net night; Table 3). Since 2003, relative abundance of walleye in the gill net catch has fluctuated from a low of 5.3 (2008) to a high of 20.7 (2005) with the 2003-2010 average being 12.2 (Table 2). The 2010 gill net CPUE represented an increase from the 6.7 observed in 2009 (Table 2) and indicated moderate relative abundance.

Walleye captured in the 2010 gill net catch ranged in total length from 15 to 60 cm (5.9 to 23.6 in), had a PSD of 67 and a PSD-P of 12 (Figure 2). The 2010 PSD and PSD-P were above objective ranges of 30-60 and 5-10 (Table 3) indicating a population comprised of larger individuals. High PSD and PSD-P values can be attributed to fast growth of walleye produced in 2006 and 2008, coupled with limited recruitment of the 2009 year class (Table 4; Table 5).

Otoliths were collected from a sub-sample of gill net captured walleye in 2010. Age structure information indicated the presence of six year classes (1997, 2003, 2006, and 2008-2010; Table 4). Year classes produced in 2006 and 2008 coincide with fry stockings and combined comprise approximately 78% of walleye in the 2010 gill net

catch (Table 4; Table 6). Natural recruitment has contributed to past year classes (e.g., 2005 and 2009), but it appears that larger year classes tend to coincide with stockings (Table 4; Table 6). However, the contribution of stocked or naturally-produced walleye to year classes produced in stocked years is unknown, as stocked walleye were unmarked making it difficult to differentiate stocked from naturally-produced walleye. Six age-0 walleye were captured in the 2010 gill net catch, but none were collected during fall night electrofishing potentially indicating limited recruitment in 2010 despite the stocking of 1,350,000 walleye fry (Table 4; Table 6).

Walleye in Cattail/Kettle Lake tend to exhibit relatively fast growth with most surpassing quality-length 38 cm; 15 in) by mid-August of their fourth growing season at age-3+ (Table 5). In 2010, no age-3 walleye were captured in the 2010 gill net catch. The weighted mean length at capture of age-2 and age-4 walleye was 372 and 482 mm (14.6 and 19.0 in), respectively (Table 5). Mean Wr values of walleye captured in the 2010 gill net catch ranged from 95 to 99 for all length categories sampled with the mean Wr of stock-length walleye being 96 (Table 1). No length-related trends in walleye condition were apparent.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2010 was 140.2 (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 140.2 (2010) with the 2003-2010 average being 60.5 (Table 2). Based on the 2010 gill net catch, relative abundance is high.

Yellow perch captured in the 2010 gill net catch ranged in total length from 8 to 24 cm (3.1 to 9.4 in) with 36% being less than stock-length (Figure 3). The majority of stock-length yellow perch in the 2010 gill net catch were in the stock-quality length category resulting in low PSD and PSD-P values of 3 and 0, respectively (Table 1; Figure 3). Both the 2010 PSD and PSD-P were below the desired management objectives of 30-60 and 5-10 (Table 3).

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2010. Age structure information indicates that yellow perch in Cattail/Kettle Lake have exhibited relatively-consistent recruitment of varying magnitude in recent years (Table 7). Yellow perch from the 2008-2010 year classes comprised the entire sample with the 2009 year class being the most represented (Table 7).

The weighted mean total length at capture for age-1 and age-2 male yellow perch was 154 and 197 mm (6.1 and 7.8 in; Table 8). The weighted mean total length at capture for age-1 and age-2 female yellow perch was 163 and 228 mm (6.4 and 9.0 in; Table 8). Yellow perch in the 2010 gill net catch had mean Wr values that ranged from 88 to 102 for all length categories and no length-related trends in condition were apparent. The mean Wr of stock-length yellow perch was 102 (Table 1).

Other Species

Black bullhead: No black bullheads were captured in gill nets or frame nets during the 2010 survey (Table 2). Since 2003, the mean frame net CPUE of black bullhead has ranged from 548.7 (2003) to 0.0 (2009, 2010) with the 2003-2010 average being 71.7 (Table 2). Poor recruitment of black bullheads in many northeastern South Dakota lakes has been common in recent years limiting their abundance.

Black Crappie: The majority of black crappie captured in the 2010 frame net catch were less than stock-length (i.e., <13 cm; 5 in) resulting in a mean frame net CPUE for all sizes of black crappie of 25.8. The mean frame net CPUE of stock-length crappie was 1.9 (Table 1) and indicated low relative abundance.

Black crappie in the 2010 frame net catch ranged in total length from 7 to 34 cm (2.8 to 13.4 in) with the majority ranging in total length from 7 to 10 cm (2.6 to 3.9 in; Figure 4). The high proportion of black crappie less than stock-length 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.

No growth information was collected during 2010, but black crappie sampled in the 2010 frame net catch were in good condition with mean W_r values near or above 100 for all length categories sampled.

Largemouth Bass: Largemouth bass are present in Cattail/Kettle Lake, but densities are believed to be low. However, spring night electrofishing over suitable habitat, the primary technique utilized to monitor largemouth bass populations in northeast South Dakota glacial lakes, has not been conducted in Cattail/Kettle Lake.

In 2010, high numbers of largemouth bass ranging in total length from 11 to 14 cm (4.3 to 5.5 in) were captured in frame nets indicating successful reproduction likely during 2010. However, recruitment of these bass to the fishery is currently unknown and will be assessed in future surveys.

Northern Pike: Northern pike typically are not sampled effectively using standard lake survey methods; therefore, reported values may not accurately represent the at-large population. Neumann and Willis (1995) reported the most reliable time to sample northern pike with gill nets was late spring following the spawn.

Three northern pike ranging in total length from 34 to 72 cm (13.4 to 28.3 in) were captured by gill nets in Cattail/Kettle Lake during 2010, resulting in a CPUE of 0.3 (Table 1). Northern pike relative abundance, as indexed by mean gill net CPUE has varied from a low of 0.0 (2006) to a high of 1.7 (2007) with the 2003-2010 average being 0.9 (Table 2). Recent high water levels in Cattail/Kettle Lake should benefit the northern pike population, as northern pike depend heavily on flooded vegetation for spawning and recruitment, and tend to have improved recruitment during springs that have rising water levels in northeastern South Dakota lakes.

Other: Bluegill, common carp, smallmouth bass, and white sucker were other fish species captured in low numbers during the 2010 survey (Table 1).

Management Recommendations

- 1) Conduct annual fish community assessment surveys utilizing fame nets, experimental gill nets, and electrofishing (next survey scheduled in summer 2011) 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 (\approx 500 fry/acre; 50% OTC marked) 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 < 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) Maintain the 381-mm (15 in) minimum length limit on walleye to benefit the population and comply with tool box options (Lucchesi and Blackwell 2009).

6) Table 1. 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) of stock-length fish, for various fish species captured using frame nets, experimental gill nets or electrofishing from Cattail/Kettle Lake, 2010. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLC= black crappie; BLG= bluegill; COC= common carp; 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>								
BLC	1.9	1.1	31	13	31	13	115	2
BLG	0.7	0.7	0	---	0	---	110	3
COC	0.5	0.3	100	0	100	0	99	8
NOP	0.3	0.2	100	0	0	---	94	5
SMB	0.7	0.2	17	20	17	20	120	1
WAE	0.3	0.2	100	0	60	52	88	8
WHS	0.1	0.1	100	0	100	0	98	60
YEP	18.7	5.2	0	---	0	---	94	<1
<i>Gill nets</i>								
BLC	30.7	8.8	0	---	0	---	125	5
COC	0.3	0.3	100	0	100	0	95	5
NOP	0.3	0.3	50	50	50	50	91	16
SMB	3.7	2.8	5	8	0	---	119	1
WAE	8.5	5.3	67	11	12	8	96	1
WHS	0.5	0.5	67	67	33	67	108	17
YEP	140.2	12.1	10	2	0	---	102	<1
<i>Electrofishing</i>								
WAE ¹	0.0	---	---	---	---	---	---	---

¹ Fall electrofishing-WAE; catch rate (CPUE) represents age-0 walleye/hour

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, 2003-2010. BLB = black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; LMB= largemouth bass; NOP = northern pike; SMB = smallmouth bass; WAE = walleye; WHS = white sucker; YEP = yellow perch

Species	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	Mean
<i>Frame nets</i>									
BLB	548.7	5.4	1.3	15.1	2.9	0.1	0.0	0.0	71.7
BLC	0.9	0.6	1.3	10.3	7.1	2.5	0.4	1.9	3.1
BLG	0.0	0.0	0.0	0.0	0.0	1.8	0.1	0.7	0.3
COC	0.6	0.4	1.7	4.2	3.2	0.9	0.4	0.5	1.5
LMB	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.1
NOP	1.9	1.1	1.3	0.8	0.2	1.3	0.6	0.3	0.9
SMB	0.3	0.0	0.0	0.8	0.0	0.8	0.2	0.7	0.4
WAE	4.1	2.3	5.4	3.8	2.3	2.0	1.2	0.3	2.7
WHS	0.9	0.4	3.9	0.8	0.1	0.2	0.1	0.1	0.8
YEP	0.7	0.9	0.6	2.7	1.9	3.2	5.6	18.7	4.3
<i>Gill nets</i>									
BLB	42.2	6.2	1.3	38.0	2.8	0.0	0.0	0.0	11.3
BLC	0.8	0.5	0.8	9.7	4.7	0.3	0.7	30.7	6.0
COC	0.0	0.0	0.0	2.5	8.5	2.0	1.5	0.3	1.9
NOP	0.7	1.5	0.5	0.0	1.7	1.3	0.8	0.3	0.9
SMB	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.7	0.5
WAE	15.5	15.0	20.7	10.8	15.0	5.3	6.7	8.5	12.2
WHS	1.3	0.5	0.0	0.2	0.2	0.2	0.3	0.5	0.4
YEP	42.3	42.5	23.5	21.5	72.5	58.7	83.0	140.2	60.5
<i>Electrofishing</i>									
WAE ²	---	---	---	---	---	295.1	---	0.0	147.6

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, 2003-2010. BLB = black bullhead; BLC= black crappie; NOP = northern pike; WAE = walleye; YEP = yellow perch

Species	2003	2004	2005	2006 ¹	2007 ¹	2008	2009	2010	Average	Objective
<i>Frame nets</i>										
BLB										
CPUE	549	5	1	15	3	<1	0	0	72	≤ 100
PSD	8	87	100	53	71	100	---	---	70	---
RSD-P	8	83	92	39	6	100	---	---	55	---
Wr	88	100	98	95	91	85	---	---	93	---
BLC										
CPUE	1	1	1	10	7	3	<1	2	3	---
PSD	71	70	4	4	84	78	57	31	50	---
RSD-P	71	60	4	0	9	64	57	31	37	---
Wr	98	112	121	112	111	111	112	115	112	---
<i>Gill nets</i>										
NOP										
CPUE	1	2	1	0	2	1	1	<1	1	---
PSD	100	100	100	---	90	100	100	50	91	---
RSD-P	50	11	33	---	20	0	20	50	26	---
Wr	78	85	92	---	88	84	83	91	86	---
WAE										
CPUE	16	15	21	11	15	5	7	9	12	≥ 10
PSD	88	51	71	95	53	16	90	67	66	30-60
RSD-P	23	12	15	18	27	9	3	12	15	5 – 10
Wr	90	94	97	97	89	87	88	96	92	---
YEP										
CPUE	42	43	24	22	73	59	83	140	61	≥ 30
PSD	16	19	11	72	24	26	3	10	23	30-60
RSD-P	0	7	3	17	6	2	0	0	4	5-10
Wr	106	99	101	98	103	107	105	102	103	---

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 (Number stocked x 1,000) from Cattail/Kettle Lake, 2006-2010.

Survey Year	Year Class													
	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
2010	6	6	20		22			1						2
2009	---	13	11		35	1								
2008	---	---	29	2	26			1				1		2
2007	---	---	---		62	10	7	5	1	2	3	7		13
2006 ^{1,2}	---	---	---	---	15	2	3	49	1	1	1	4	4	1
# stocked														
fry	1,350		4,000		2,700					3,000	3,000	3,900		
small fingerling								300				200		244
large 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 length at capture (mm) for walleye age-0 through age-10 captured in experimental gill nets (expanded sample size) from Cattail/Kettle 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	168(6)	299(6)	372(20)	---	482(22)	---	---	608(1)	---	---	---
2009	135(13)	242(11)	---	411(35)	438(1)	---	---	---	---	---	---
2008	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)	---	---

Table 6. Stocking history including size and number for fishes stocked into Cattail/Kettle Lake, 1997-2010.

Year	Species	Size	Number
1997	WAE	fingerling	243,900
1999	WAE	fry	3,900,000
	WAE	fingerling	200,000
2000	WAE	fry	3,000,000
2001	WAE	fry	3,000,000
2003	WAE	fingerling	300,290
2006	WAE	fry	2,700,000
2008	WAE	fry	4,000,000
2010	WAE	fry	1,350,000

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

Survey Year	Year Class				
	2010	2009	2008	2007	2006
2010	463	710	131	---	---
2009	---	9	488	17	1

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

Year	Age			
	0	1	2	3
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)

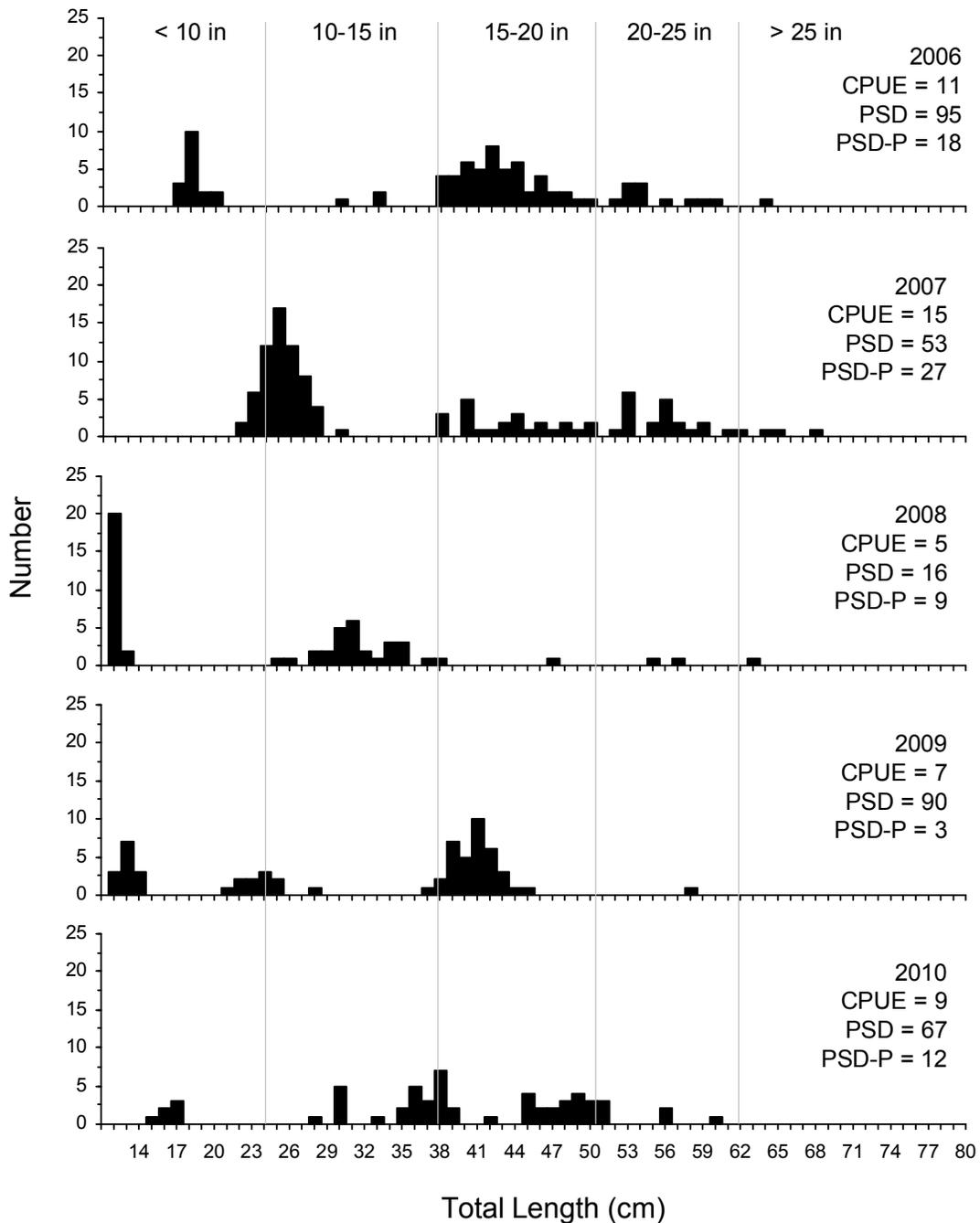


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Cattail/Kettle Lake, 2006-2010.

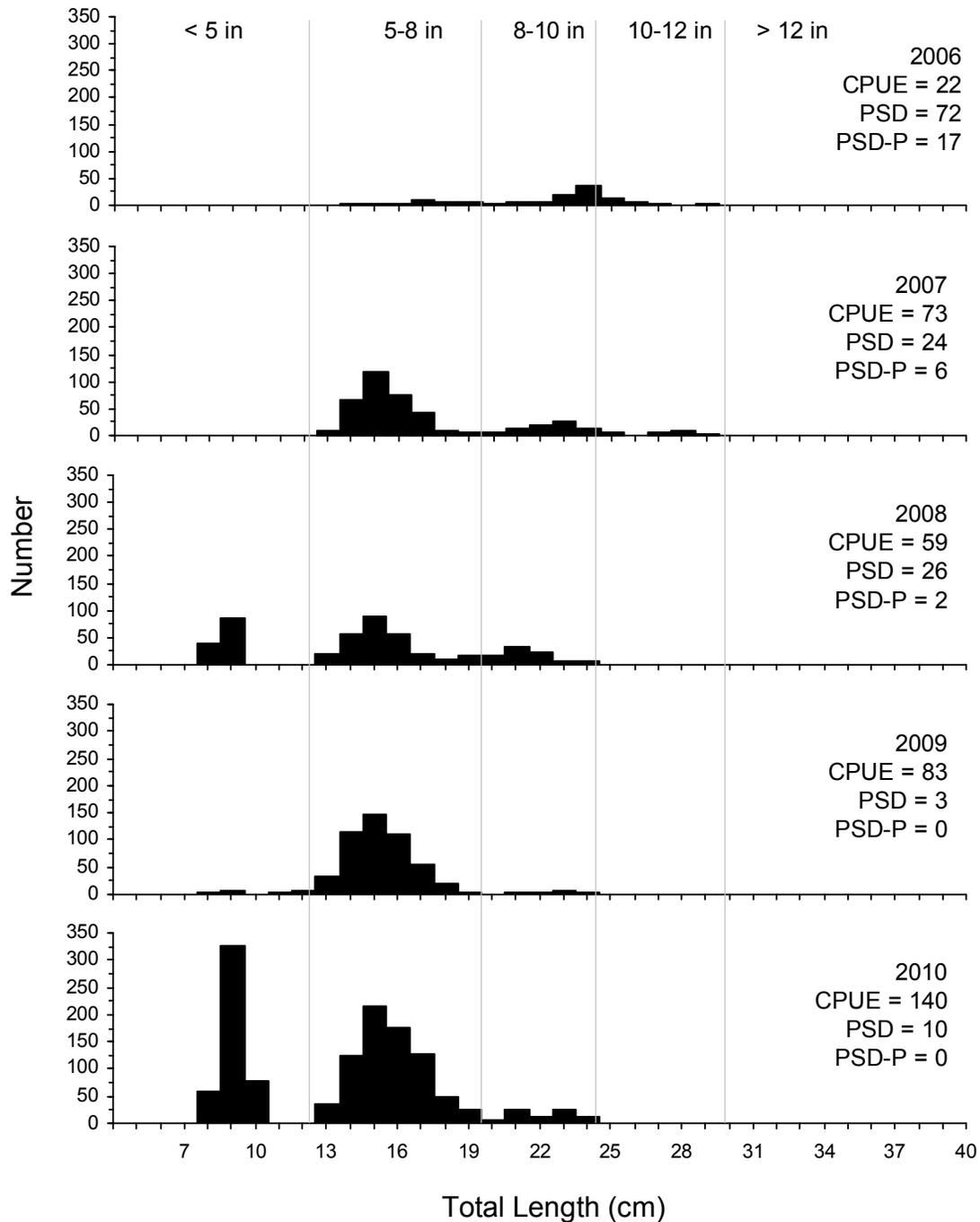


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Cattail-Kettle Lake, 2006-2010.

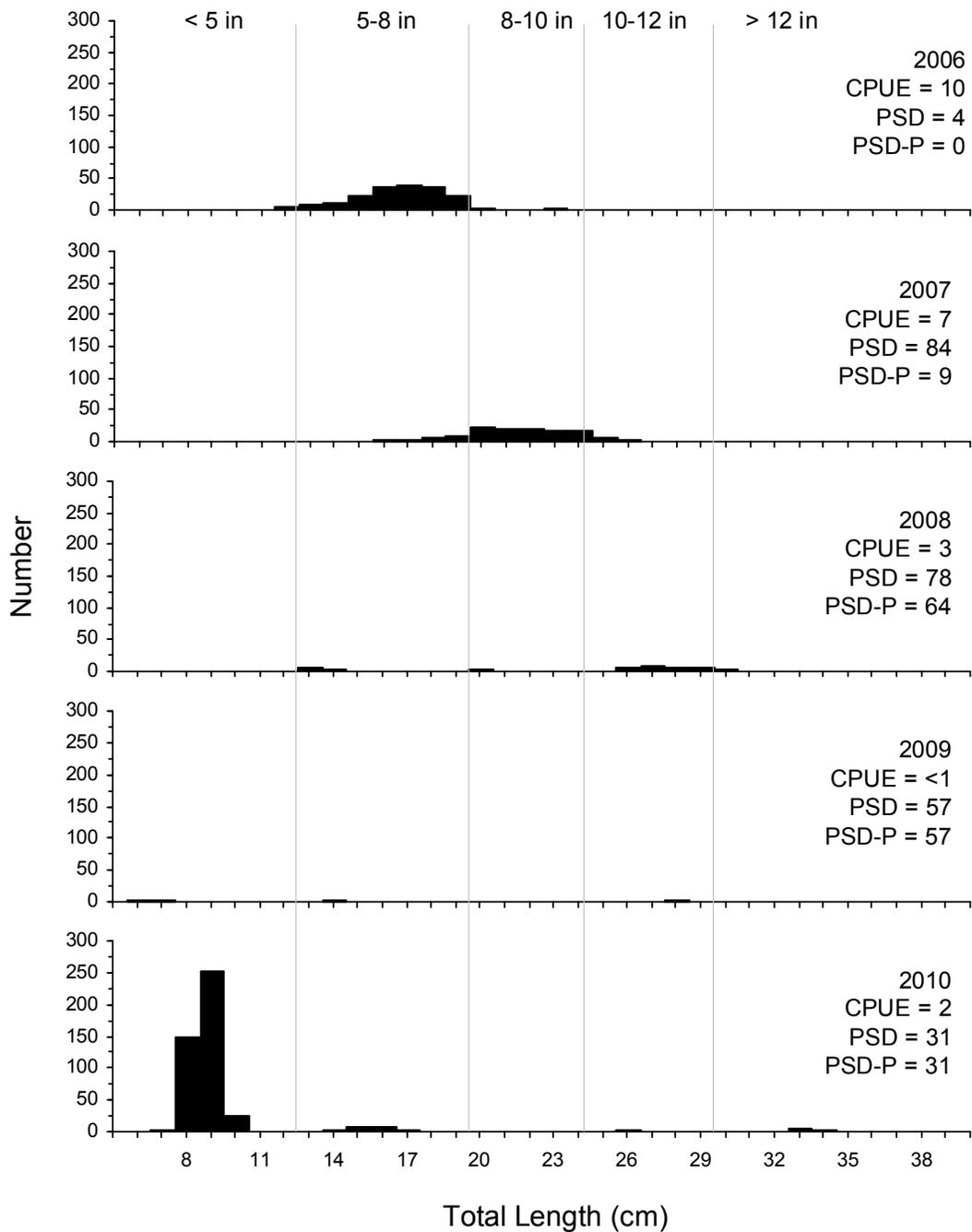


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured using frame nets in Cattail-Kettle Lake, 2006-2010.