

Cottonwood Lake

Site Description

Location

Water designation number (WDN)	48-0003-00
Legal description	T126N-R55W-Sec. 9, 16
County (ies)	Marshall
Location from nearest town	0.5 miles west of Lake City, SD

Survey Dates and Sampling Information

Survey dates	July 2-3, 2013 (FN, GN)
Frame net sets (n)	12
Gill net sets (n)	3

Morphometry (Figure 1)

Watershed area (acres)	34,744
Surface area (acres)	≈335
Maximum depth (ft)	12
Mean depth (ft)	9

Ownership and Public Access

Cottonwood Lake is a non-meandered lake and the fishery is managed by the SDGFP. A public access (including boat ramp) is located on the southwest shore and is maintained by the SDGFP (Figure 2). Several lake homes and cabins are present along the south shore extending from the boat ramp east to the resort; however, the majority of the shoreline is undeveloped (Figure 2). Land ownership adjacent to Cottonwood Lake includes the State of South Dakota, the USFWS and private individuals.

Watershed and Land Use

The 34,744 acre Roy Lake (HUC-12) sub-watershed encompasses Cottonwood Lake and 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 scattered shelterbelts.

Water Level Observations

No Ordinary High Water Mark has been established by the South Dakota Water Management Board on Cottonwood Lake; however, an outlet structure is present with an elevation of 1827.2 fmsl. The elevation of Cottonwood Lake on May 22, 2013 was 1827.0 fmsl and indicated an increase from the fall 2012 elevation of 1825.8 fmsl. By October 8, 2013 the water level had declined to an elevation of 1826.8 fmsl.

Fish Management Information

Primary species	Northern Pike, Yellow Perch
Other species	Black Bullhead, Black Crappie, Bluegill, Common Carp, Green Sunfish, Largemouth Bass, Smallmouth Bass, Walleye, White Sucker
Lake-specific regulations	none
Management classification	warm-water marginal
Fish consumption advisories	none



Figure 2. Map depicting geographic location of Cottonwood Lake from Lake City, Marshall County, South Dakota. Also noted is the access and standardized net locations for Cottonwood Lake. CWFN= frame net; CWGN= gill net

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length northern pike ≥ 3 , 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

Cottonwood Lake is a shallow-natural lake located northwest of Lake City, South Dakota. The lake receives surface water from Cottonwood Creek from the north and the local watershed. Water exiting Cottonwood Lake runs south into Roy Lake.

Cottonwood Lake has a history of winterkill events (most recently documented in the winter of 1985-1986). Historically, the fish community has been primarily comprised of black bullhead, northern pike, and yellow perch (species believed to be more winterkill tolerant). However, anecdotal information suggests that walleye and largemouth bass have provided a sport fishery between winterkill events. Currently, Cottonwood Lake is managed as a northern pike and yellow perch fishery.

Note: In 2013, sampling took place approximately one month later than other years.

Primary Species

Northern Pike: Northern pike typically are not sampled effectively during standardized mid-summer fish community surveys. As a result, mean gill net CPUE values are often low. Northern pike relative abundance in Cottonwood Lake has generally been considered high with mean gill net CPUE values ≥ 4.3 in each survey conducted from 2001-2009 (Table 2). In 2013, the mean gill net CPUE of stock-length northern pike was 5.3 (Table 1) and above the minimum objective (≥ 3 stock-length Northern Pike/net; Table 3). Currently, relative abundance remains high.

Gill net captured Northern Pike ranged in TL from 13 to 82 cm (5.1 to 32.3 in), had a PSD of 56, and a PSD-P of 13 (Table 1; Figure 3). The PSD was within the management objective of 30-60; while the PSD-P was above the management objective of 5-10; Table 3). However, size structure indices should be interpreted with caution as sample size was low (i.e., 17 stock-length Northern Pike).

No Northern Pike age or growth information was collected. The condition of gill net captured Northern Pike was similar to that of Northern Pike captured from other northeast South Dakota lakes (e.g., Roy, South Buffalo, and Six-Mile Lakes) with mean W_r values that ranged from 82 to 93 for all length categories (e.g., stock to quality) sampled. Stock-length Northern Pike had a mean W_r of 87 (Table 1).

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 61.0 (Table 1) and above the minimum objective (≥ 30 stock-length Yellow Perch/net night). The 2013 mean gill net CPUE represented a substantial increase from mean gill net CPUE values observed from 2001-2009 (Table 2) and indicated high relative abundance.

Gill net captured Yellow Perch ranged in TL from 8 to 23 cm (3.1 to 9.1 in), with the majority being < quality-length (20 cm; 8 in) as indicated by low PSD and PSD-P values of 15 and 0, respectively (Table 1; Table 3; Figure 4). Both the PSD and PSD-P were below management objectives of 30-60 and 5-10 (Table 3).

Otoliths were collected from a sub-sample of gill net captured Yellow Perch. Age structure information suggested the presence of four consecutive year classes (2009-2012; Table 4). Year classes produced in 2010 and 2012 were the most represented and collectively comprised 84% of Yellow Perch in the gill net catch (Table 4).

Yellow Perch in Cottonwood Lake tend to exhibit slow growth. In 2013, the weighted mean TL at capture of age-1 and age-3 males was 96 and 172 mm (3.8 and 6.8 in); while their female counterparts had weighted mean TL at capture values of 97 and 192 mm (3.8 and 7.6 in; Table 5). Few age-2 fish were captured (Table 5). The majority (85%) of stock-length Yellow Perch in the gill net catch were in the stock-quality length category which had a mean Wr of 98.

Other Species

Black Bullhead: Black Bullheads were the most abundant species in the 2013 frame net catch (Table 1). The mean frame net CPUE of stock-length Black Bullhead was 13.3 (Table 1) and within the management objective (≤ 100 stock-length Black Bullhead/net-night; Table 3). The 2013 mean frame net CPUE represented an increase from the 2009 mean CPUE of 1.1, but was lower than the 2001 and 2006 CPUE values of 279.5 and 35.6, respectively (Table 2). Currently, relative abundance is considered moderate.

Frame net captured Black Bullheads ranged in TL from 10 to 42 cm (4.7 to 10.2 in), with the majority being < quality-length (23cm; 9 in; Figure 5). The PSD was 13 and the PSD-P was 4 (Table 1). No age and growth information was collected. Mean Wr values of Black Bullheads captured in the 2013 frame net catch ranged from 78 to 92 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length fish being 84 (Table 1). No length-related trends in condition were apparent.

Bluegill: Although relative abundance has remained low (i.e., < 6.0 stock-length fish/net night), Bluegill have consistently been sampled in Cottonwood Lake (Table 2). In 2013, 36 Bluegill that ranged in TL from 9 to 26 cm (3.5 to 10.2 in) were captured in frame nets resulting in a mean CPUE of 3.0 (Table 1; Figure 6).

No age or growth information was collected. Although sample size was low, the condition of Bluegill in the frame net catch was high with mean Wr values that were \geq

112 for all length categories (e.g., stock to quality) sampled. The mean W_r of stock-length Bluegill was 127 (Table 1) and no discernible length-related trends in condition were apparent. Seasonal influences (i.e., spawning behavior) may have influenced W_r values.

Largemouth Bass: No largemouth bass have been sampled in fish community surveys conducted from 2001-2013; however, sampling gears utilized (i.e., frame and gill nets) are not reliable at capturing largemouth bass. Spring night electrofishing is typically used to sample Largemouth Bass in northeast South Dakota. Anecdotal angler reports indicate that largemouth bass are present and at times contribute to the fishery.

Walleye: Despite relatively frequent stockings (Table 6), the relative abundance of Walleye has remained low in fish community surveys conducted from 2005-2013 (Table 2). In 2013, eight stock-length Walleye that ranged in TL from 32 to 59 cm (12.6 to 23.2 in) were captured in gill nets, which resulted in a mean gill net CPUE of 2.7 (Table 1). Few inferences can be made concerning Walleye size structure, growth, and condition due to low sample size.

The shallow nature and susceptibility of Cottonwood Lake to winterkill exclude walleye from being a primary management species. However, the potential exists for occasional walleye year classes to develop and provide angling opportunities. Therefore, periodic walleye stockings should continue provided water levels are favorable (i.e., lake is full), excess walleye are available, and higher priority stockings have been completed.

Other: White sucker was the only other species captured during the 2013 fish community survey (Table 1).

Management Recommendations

- 1) Conduct fish community surveys utilizing gill nets and frame nets on an every fourth year basis (next survey scheduled in summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Continue to manage as a self-sustaining northern pike and yellow perch fishery.
- 3) Stock walleye (≈ 500 fry/acre) periodically when water levels are favorable (i.e., lake is full), extra walleye are available, and other higher priority stockings have been completed.
- 4) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.
- 5) Monitor winter and summerkill events. In cases of substantial winter/summer kill stock with northern pike and yellow perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Cottonwood Lake, 2013. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB= Black Bullhead; BLG= Bluegill; NOP= Northern Pike; 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	13.3	5.5	13	4	4	3	84	<1
BLG	3.0	0.9	42	14	14	10	127	2
NOP	1.2	0.5	43	24	7	13	86	3
WHS	0.1	0.1	100	---	100	---	115	---
YEP	8.0	4.3	27	8	0	---	91	<1
<i>Gill nets</i>								
NOP	5.3	3.3	56	22	13	15	87	3
WAE	2.7	2.3	88	24	38	35	93	4
WHS	8.3	1.7	100	0	100	0	112	3
YEP	61.0	16.3	15	4	0	---	97	1

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured by frame nets and experimental gill nets in Cottonwood Lake, 2001-2013. BLB = Black Bullhead; BLC= Black Crappie; BLG= Bluegill; GSF= Green Sunfish; NOP = Northern Pike; WAE = Walleye; WHS = White Sucker; YEP = Yellow Perch

Species	CPUE			
	2001	2005	2009	2013
<i>Frame nets</i>				
BLB	279.5	35.6	1.1	13.3
BLC	0.7	0.0	0.0	0.0
BLG	5.3	5.0	0.8	3.0
GSF	0.0	0.1	0.0	0.0
NOP	0.4	0.2	0.4	1.2
WAE	0.1	0.3	0.2	0.0
WHS	0.0	0.0	0.0	0.1
YEP	0.2	1.4	0.0	8.0
<i>Gill nets</i>				
BLB	89.7	0.7	0.0	0.0
BLC	0.0	0.7	0.0	0.0
BLG	0.3	3.0	0.0	0.0
NOP	4.3	5.3	4.3	5.3
WAE	7.3	1.3	0.0	2.7
WHS	0.7	0.0	2.0	8.3
YEP	3.3	6.0	3.3	61.0

Table 3. Mean catch rate (CPUE; gill/frame nets = 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 by frame nets and experimental gill nets in Cottonwood Lake, 2001-2013. BLB = Black Bullhead; BLG= Bluegill; NOP = Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2001	2005	2009	2013	Objective
<i>Frame nets</i>					
BLB					
CPUE	279	36	1	13	≤ 100
PSD	3	93	100	13	---
PSD-P	0	20	100	4	---
Wr	87	99	112	84	---
<i>Gill nets</i>					
NOP					
CPUE	4	5	4	5	≥ 3
PSD	38	56	85	56	30-60
PSD-P	8	0	8	13	5-10
Wr	84	92	91	87	---
YEP					
CPUE	3	6	3	61	≥ 30
PSD	70	6	0	15	30-60
PSD-P	0	0	0	0	5-10
Wr	100	99	96	97	---

Table 4. Year class distribution based on expanded age/length summary for Yellow Perch sampled in gill nets from Cottonwood Lake, 2009-2013.

Survey Year	Year Class							
	2013	2012	2011	2010	2009	2008	2007	2006
2013		60	22	147	16			
2009	---	---	---	---		2	20	1

Table 5. Weighted mean total length (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Cottonwood Lake, 2009-2013. Note: sampling was conducted approximately one month later (early-July) in 2013.

Year	Age			
	1	2	3	4
2013				
Male	96 (29)	139 (6)	172 (57)	190 (5)
Female	97 (21)	145 (10)	192 (98)	226 (2)
Combined	96 (60)	147 (22)	185 (147)	196 (16)
2009				
Male	---	114 (6)	---	---
Female	88 (2)	123 (14)	188 (1)	---
Combined	88 (2)	120 (20)	188 (1)	---

Table 6. Stocking history including size and number for fishes stocked into Cottonwood Lake, 2000-2013.

Year	Species	Size	Number
2001	WAE	fry	300,000
2002	WAE	large fingerling	2,249
2003	WAE	small fingerling	37,380
2004	WAE	fry	350,000
2005	WAE	large fingerling	8,114
2008	WAE	large fingerling	5,015
2010	WAE	fry	350,000
2012	WAE	fry	175,000

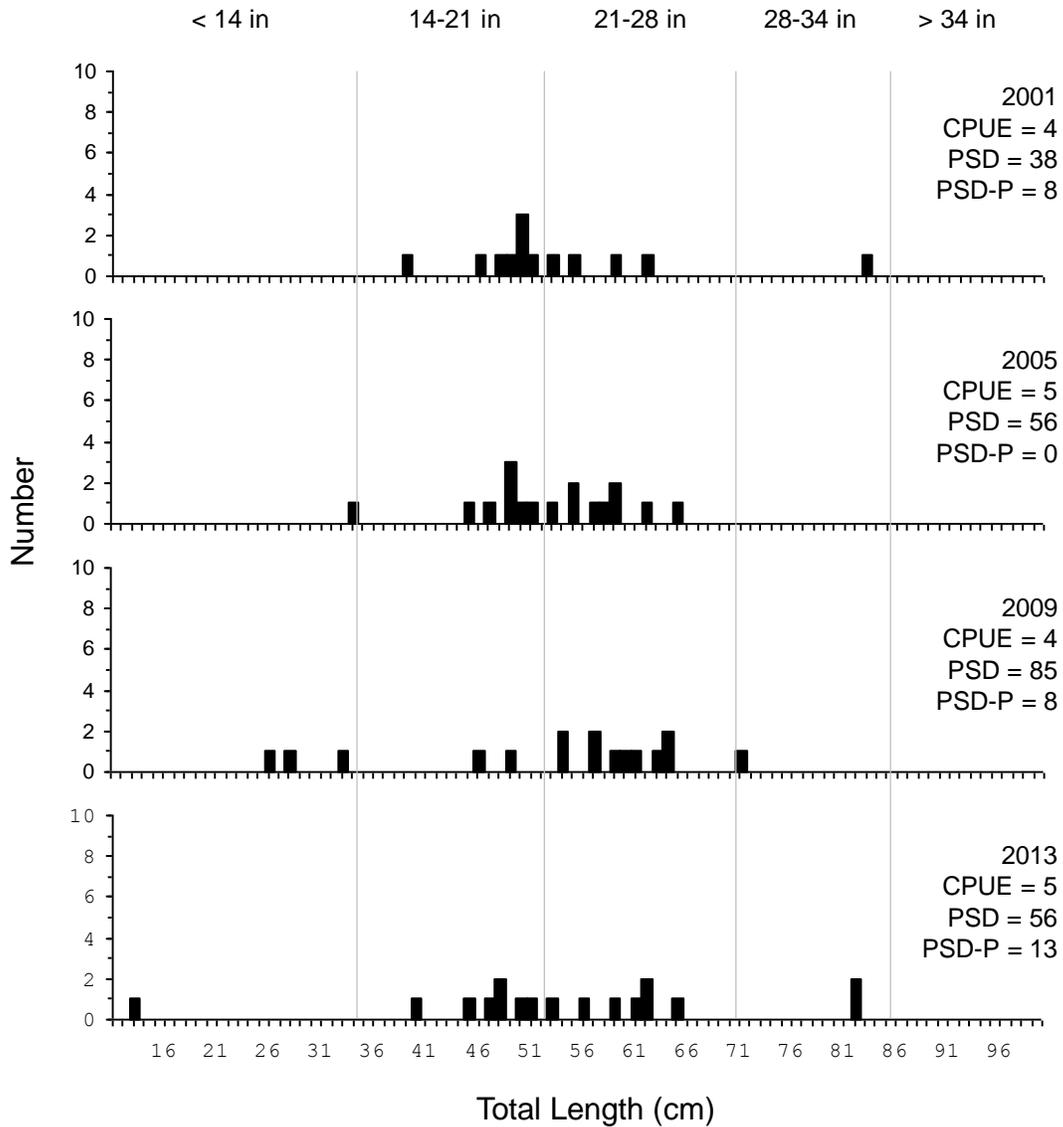


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using experimental gill nets in Cottonwood Lake, 2001-2013.

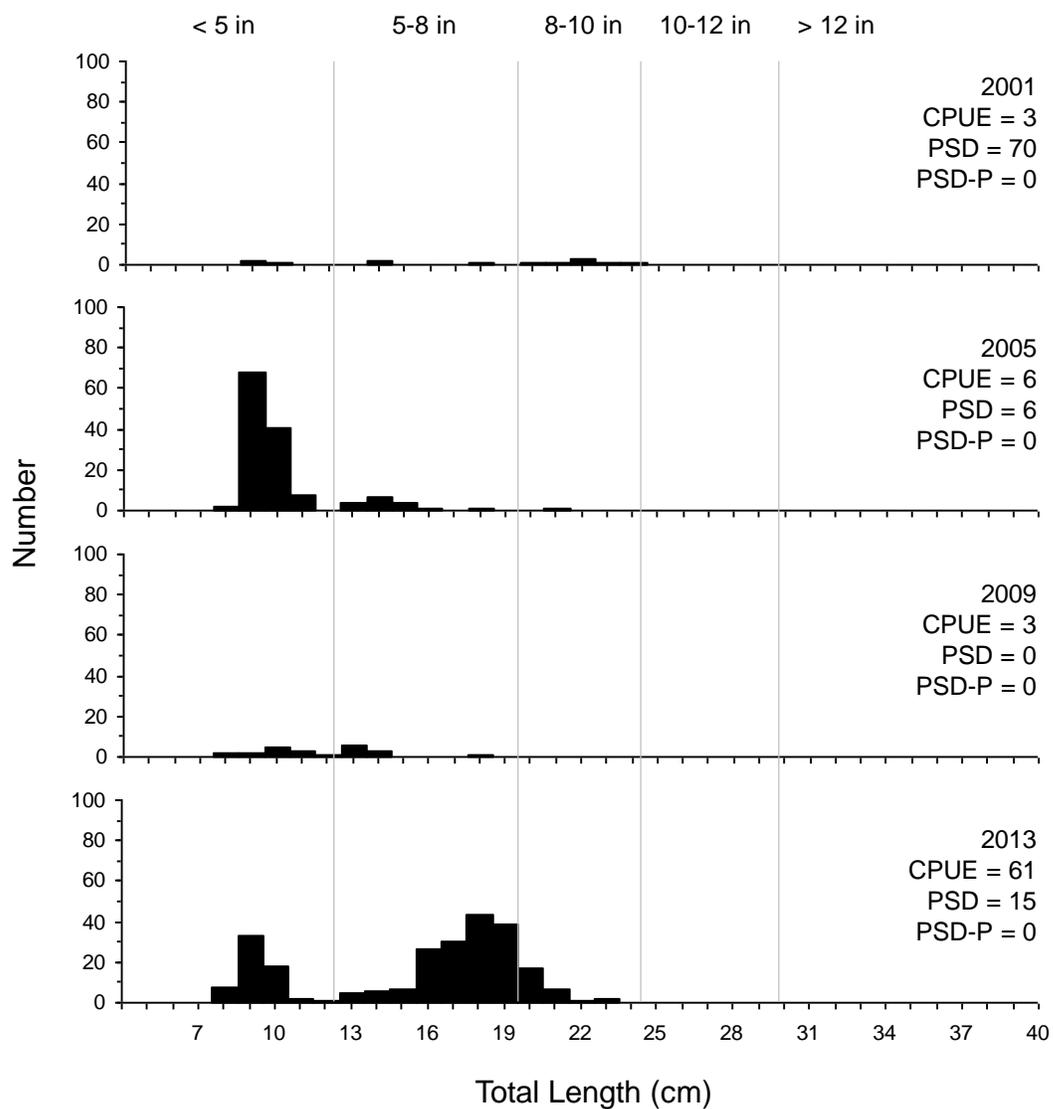


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Cottonwood Lake, 2001-2013.

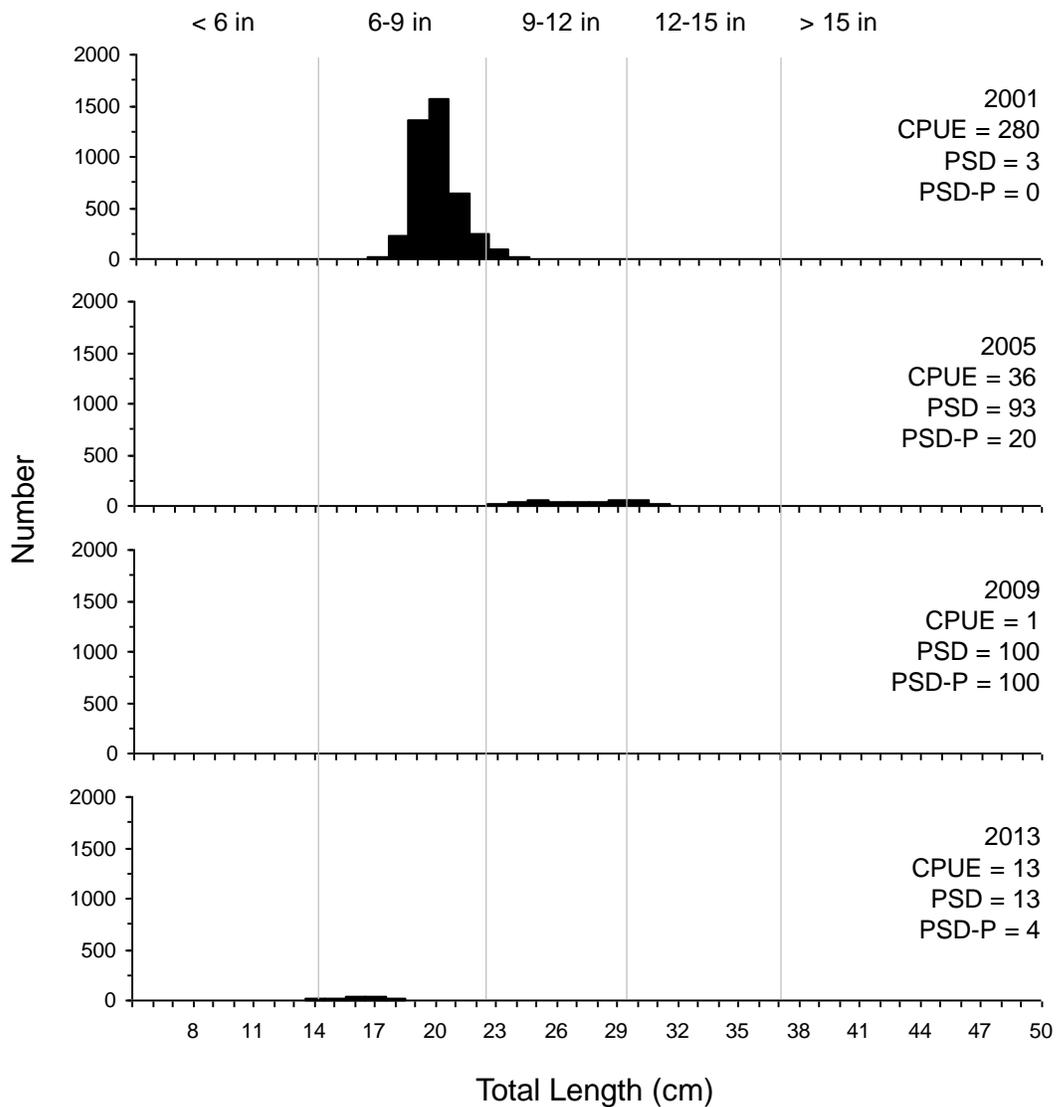


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in Cottonwood Lake, 2001-2013.

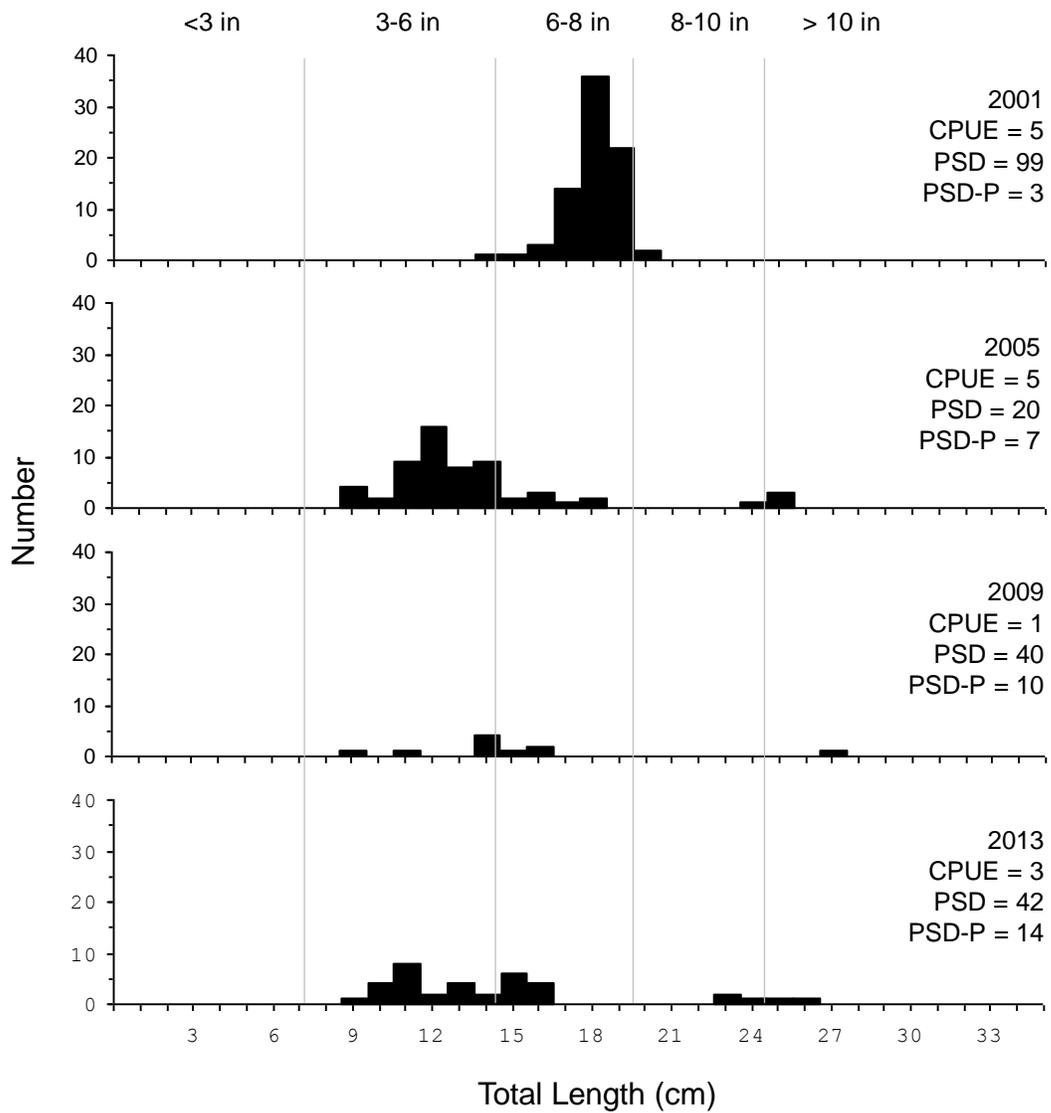


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Bluegill captured using frame nets in Cottonwood Lake, 2001-2013.