

Blue Dog Lake

Site Description

Location

Water designation number (WDN)	22-0005-00
Legal description	T122N-R53W-Sec. 9,10,15,16; T122N-R54W-Sec. 21,27,28
County (ies)	Day
Location from nearest town	0.5 miles north of Waubay, SD

Survey Dates and Sampling Information

Survey dates	July 29-31, 2014 (FN, GN)
Frame net sets (n)	18
Gill net sets (n)	6

Morphometry (Figure 1)

Watershed area (acres)	17,063
Surface area (acres)	1,529
Maximum depth (ft)	9
Mean depth (ft)	6

Ownership and Public Access

Blue Dog Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. Two public access sites maintained by the SDGFP are present; one is located on the south shore off Highway 12 (not useable in recent years due to high water) and the other is located on the west shore south of Blue Dog State Fish Hatchery (Figure 1; Figure 2). Public shore access may also be obtained through a state managed GPA located at the west shore of Blue Dog Lake. Blue Dog State Fish Hatchery (BDH) which is operated by the SDGFP is located on the northwest shore of Blue Dog Lake.

Watershed and Land Use

The 17,063 acre Blue Dog Lake sub-watershed (HUC-12) is located within the larger Waubay Lakes (HUC-10) watershed. Land use within the watershed is varied including both municipal and agricultural (e.g., pasture or grassland, cropland, etc.) uses.

Water Level Observations

The South Dakota Water Management Board established OHWM is 1,800.7 fmsl, and the outlet elevation of Blue Dog Lake is 1,800.2 fmsl. On May 6, 2014 the elevation was 1802.9 fmsl; 0.4 ft above the fall 2013 elevation of 1802.5 fmsl. The water level on October 8, 2014 was 1802.5 fmsl.

Fish Management Information

Primary species	walleye
Other species	black bullhead, black crappie, bluegill, channel catfish, common carp, emerald shiner, green sunfish; northern pike, orangespotted sunfish, rock bass, smallmouth bass, spottail shiner, white bass, white sucker, yellow perch
Lake-specific regulations	none
Management classification	warm-water permanent
Fish Consumption Advisories	none

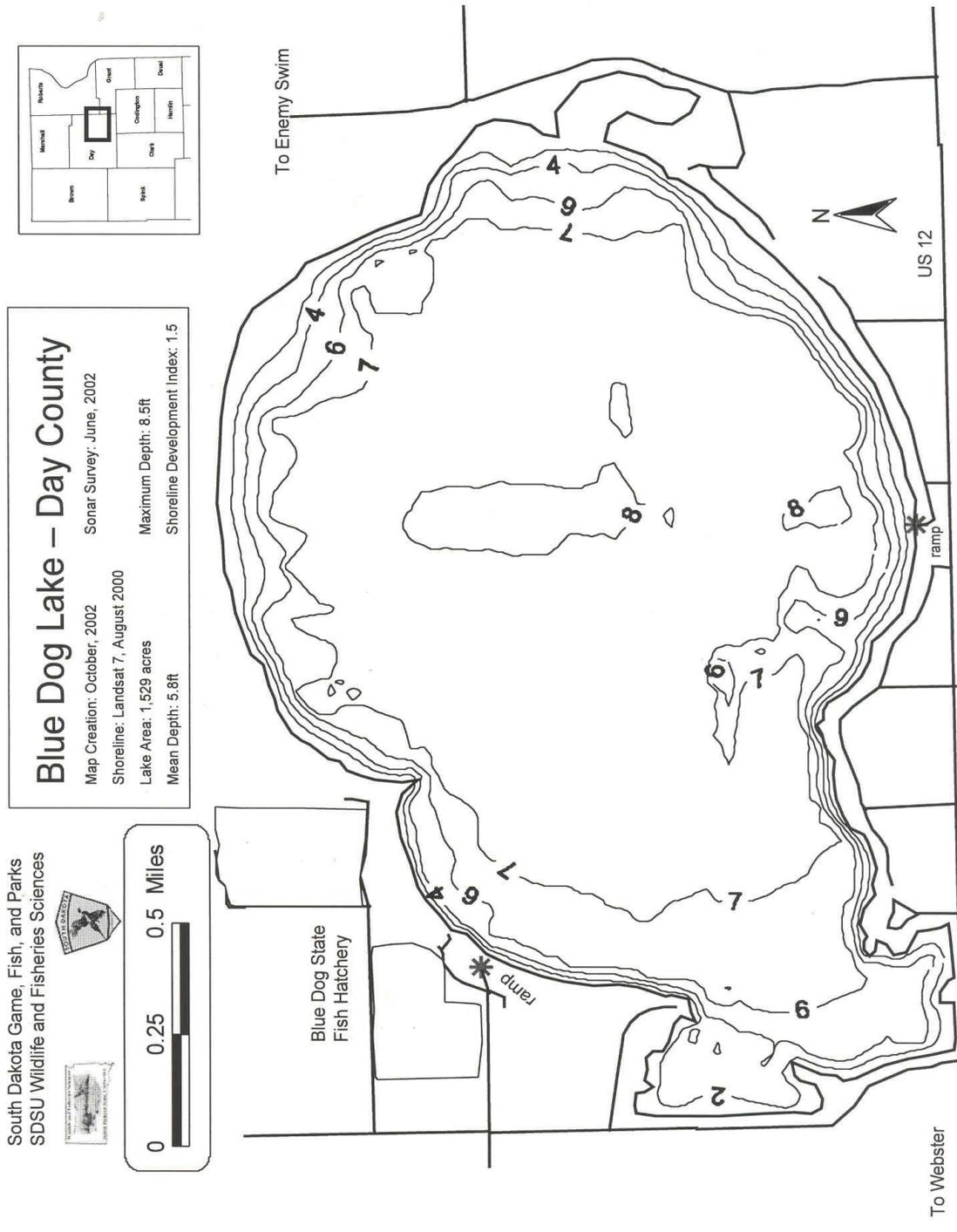


Figure 1. Depth contour map of Blue Dog Lake, Day County, South Dakota.



Figure 2. Map depicting geographic location of several Day County, South Dakota Lakes including Blue Dog Lake (top). Also noted are public access locations and standardized net locations for Blue Dog Lake. BDFN= frame nets; BDGN= 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 frame net CPUE of stock-length black bullhead ≤ 100 .

Results and Discussion

Blue Dog Lake is a natural lake situated in the Coteau des Prairie, near the city of Waubay, South Dakota. Two primary tributaries flow into Blue Dog Lake 1) Owen's Creek, which is a perennial stream originating in west-central Roberts County and 2) the outlet of Enemy Swim Lake/Campbell Slough which flows southward to Blue Dog Lake when the elevation of Enemy Swim Lake/Campbell Slough exceeds 1853.6 fmsl. Water exiting Blue Dog Lake flows into Little Rush Lake before entering a series of connected lakes including North/South Rush, Minnewasta, Waubay, and Bitter.

The southern shoreline of Blue Dog Lake is highly developed with many residential homes and cabins while much of the northern shoreline remains undeveloped. Blue Dog Lake is primarily managed as a walleye fishery. Overall, as many as 16 species of fish have been collected from Blue Dog Lake (Table 2).

Primary Species

Walleye: The mean gill net CPUE of stock-length walleye was 17.3 (Table 1) and above the minimum objective (≥ 10 stock-length walleye/net night; Table 3). Since 2002, the mean gill net CPUE has ranged from a low of 8.6 (2004) to a high of 17.5 (2008; Table 2). The 2014 gill net CPUE represented an increase from the 14.5 observed in 2008 (Table 2).

Walleye captured in the gill net catch ranged in TL from 17 to 69 cm (6.7 to 27.2 inches), had a PSD of 23 and a PSD-P of 4 (Table 1; Figure 3). The PSD and PSD-P values were below management objectives of 30-60 and 5-10, respectively (Table 3).

Otoliths were collected from a sub-sample of gill net captured walleye in 2014. Nine walleye year classes were present (2006 and 2008-2013). The 2010 and 2011 year classes represented approximately 80% of the walleye in the gill net catch (Table 4). The contribution of stocked or naturally-produced walleye to individual year classes in Blue Dog Lake is difficult to differentiate due to annual escapement of walleye fry and small fingerlings via effluent from Blue Dog State Fish Hatchery.

Since 2006, the weighted mean TL at capture for age-3 walleye has ranged from 324 to 378 mm (12.8 to 14.9 in); while the weighted mean TL at capture for age-4 walleye has ranged from 363 to 405 mm (14.3 to 15.9 in; Table 5). Walleye captured in the 2014 gill net catch had mean W_r values that ranged from 78 to 88 for all length categories (e.g., stock to quality) sampled. The mean W_r of stock-length walleye was 80 (Table 1) and no length-related trends in condition were apparent.

Other Species

Black bullhead: The mean frame net CPUE of stock-length black bullhead during 2014 was 2.1 (Table 1) and within the objective range (≤ 100 stock-length black bullhead/net night; Table 3). Since 2002, the mean frame net CPUE has ranged from a low of 0.5 (2011) to a high of 23.5 (2004; Table 2). Currently, black bullhead relative abundance is low.

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 Blue Dog Lake has generally been considered moderate to high with mean gill net CPUE values that ranged from 1.0 to 6.3 from 2002-2011 (Table 2). In 2014, the mean gill net CPUE of stock-length northern pike was 1.2 (Table 1) and relative abundance appears to be moderate.

Northern pike captured in the gill net catch ranged in TL from 55 to 95 cm (21.7 to 37.4 in), had a PSD of 100, and a PSD-P of 43 (Table 1; Figure 4). No northern pike growth information was collected.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch of 17.8 (Table 1) represents a decline from the 2011 CPUE of 31.2 (Table 2). Currently relative abundance appears to be moderate.

Yellow perch sampled in the 2014 gill net catch ranged in TL from 10 to 33 cm (3.9 to 13.0 in), had a PSD of 79 and a PSD-P of 36 (Table 1; Table 3; Figure 5). Otoliths collected from a sub-sample of gill net captured yellow perch in 2014 indicated the presence of seven year classes (2007-2013; Table 7). Increased relative abundance in each of the past two surveys (2011 and 2014) can be attributed to consistent recruitment in recent years (Table 7), likely related to high water conditions in Blue Dog Lake. Similar to walleye, year classes produced during 2010 and 2011 were the most represented and comprised the majority (64%) of yellow perch in the gill net catch (Table 7).

The weighted mean TL at capture for age-1, age-2, and age-3 male yellow perch was 105, 145, and 193 mm (4.1, 5.7 and 7.6 in), respectively (Table 8). The weighted mean TL at capture for age-1, age-2, and age-3 female yellow perch was 136, 164, and 236 mm (5.4, 6.5, and 9.3 in; Table 8). Stock-length yellow perch had high condition with a mean W_r of 97 (Table 1).

Other: Black crappie, common carp, green sunfish, rock bass, smallmouth bass, spottail shiner, white bass, and white sucker were other fish species captured in low numbers during the 2014 survey (Table 1).

Management Recommendations

- 1) Conduct fish community assessment surveys utilizing gill nets and frame nets every third year (next survey scheduled in summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.

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 in frame nets and experimental gill nets in Blue Dog Lake, 2014. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB= black bullhead; BLC= black crappie; COC= common carp; GSF= green sunfish; NOP= northern pike; ROB= rock bass; SMB= smallmouth bass; SPS= spottail shiner; WAE= walleye; WHB= white bass; 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	2.1	0.7	100	0	92	8	82	1
BLC	1.7	0.6	100	0	87	11	104	1
COC	0.1	0.1	100	0	100	0	---	---
NOP	0.5	0.2	44	33	33	31	75	4
ROB	1.9	0.9	85	10	9	8	109	1
SMB	0.4	0.2	71	36	57	39	106	6
WAE	1.6	0.5	54	16	46	16	81	2
WHB	1.4	0.4	100	0	100	0	93	1
YEP	0.6	0.3	90	18	40	30	98	3
<i>Gill nets</i>								
BLC	0.7	0.5	100	0	75	59	110	6
COC	0.7	0.3	100	0	50	50	90	3
GSF	0.2	0.2	100	---	0	---	121	---
NOP	1.2	0.6	100	0	43	39	76	7
SPS [†]	0.3	0.3	---	---	---	---	---	---
WAE	17.3	1.2	23	7	4	3	80	<1
WHB	1.5	1.2	100	0	100	0	90	2
WHS	1.7	0.7	100	0	100	0	98	3
YEP	17.8	5.0	79	7	36	8	97	1

[†] All fish sizes.

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Blue Dog Lake, 2002-2014. BLB= black bullhead; BLC= black crappie; BLG= bluegill; CCF= channel catfish; COC= common carp; EMS= emerald shiner; GSF= green sunfish; NOP= northern pike; OSF= orangespotted sunfish; ROB= rock bass; SMB= smallmouth bass; WAE= walleye; WHB= white bass; WHS= white sucker; YEP= yellow perch

Species	CPUE					
	2002	2004	2006 ¹	2008	2011	2014
<i>Frame nets</i>						
BLB	15.4	23.5	6.1	1.8	0.5	2.1
BLC	9.5	0.3	0.6	0.8	1.1	1.7
BLG	0.9	0.1	0.2	0.0	0.0	0.0
CCF	0.0	0.0	0.0	0.0	0.1	0.0
COC	0.0	0.2	0.2	0.4	0.1	0.1
NOP	0.7	0.6	1.1	0.4	0.7	0.5
OSF ²	0.0	0.0	0.0	0.0	0.1	0.0
ROB	2.2	1.6	0.4	0.3	1.2	1.9
SMB	0.4	0.1	0.4	0.0	0.1	0.4
WAE	0.3	1.9	3.2	3.7	1.2	1.6
WHB	1.8	2.1	2.8	0.7	0.6	1.4
WHS	0.6	0.5	0.7	0.5	0.1	0.0
YEP	1.2	0.2	0.0	0.7	1.6	0.6
<i>Gill nets</i>						
BLB	3.5	2.0	0.2	0.0	0.0	0.0
BLC	0.5	0.0	0.0	0.0	0.0	0.7
COC	0.0	0.4	1.7	0.0	0.2	0.7
EMS ²	0.0	0.6	0.0	0.2	0.0	0.0
GSF	0.0	0.0	0.0	0.0	0.0	0.2
NOP	3.3	2.8	1.0	3.5	6.3	1.2
ROB	0.0	0.0	0.0	0.0	0.2	0.0
SPS ²	0.0	0.0	0.0	0.0	2.0	0.3
WAE	17.5	8.6	12.2	14.5	12.0	17.3
WHB	0.0	0.0	1.2	0.2	1.0	1.5
WHS	3.0	2.8	0.7	1.0	5.2	1.7
YEP	5.5	0.4	0.7	2.5	31.2	17.8

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

² All fish sizes

Table 3. Mean catch rate (CPUE; catch/net night), 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 Blue Dog Lake, 2002-2014. BLB= black bullhead; NOP= northern pike; WAE= walleye; YEP= yellow perch

Species	2002	2004	2006 ¹	2008	2011	2014	Objective
<i>Frame nets</i>							
BLB							
CPUE	15	24	6	2	1	2	≤ 100
PSD	94	82	100	97	89	100	---
PSD-P	30	13	94	94	33	92	---
Wr	89	84	88	88	95	82	---
<i>Gill nets</i>							
NOP							
CPUE	3	3	1	4	6	1	---
PSD	45	100	50	43	45	100	---
PSD-P	15	7	0	10	3	43	---
Wr	84	81	87	85	87	76	---
WAE							
CPUE	18	9	12	15	12	17	≥ 10
PSD	85	86	42	30	50	23	30-60
PSD-P	13	30	18	2	7	4	5-10
Wr	91	85	86	84	89	80	---
YEP							
CPUE	6	<1	1	3	31	18	---
PSD	21	50	75	87	34	79	---
PSD-P	12	0	25	47	9	36	---
Wr	104	84	96	96	111	97	---

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 (#stocked x 1000) from Blue Dog Lake, 2008-2014.

Survey Year	Year Class														
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	
2014 ¹		12	5	46	45	4	1		2						
2011	---	---	---		71	7	17	20	8	5	1	3			
2008 ¹	---	---	---	---	---	---		6	19	49	6	17	1	1	
# stocked															
fry										1000		1000			
sm. fingerling								7					2		
lg. fingerling															

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

Table 5. Weighted mean total length at capture (mm) for age-1 to age-10 walleye sampled in experimental gill nets (expanded sample size) from Blue Dog Lake, 2006-2014. Note: sampling was conducted during late-June/early-July from 2002-2011; sampling occurred in late-July in 2014.

Year	Age									
	1	2	3	4	5	6	7	8	9	10
2014 ¹	189(12)	273(5)	301(46)	372(45)	424(4)	560(1)	---	505(2)	---	---
2011	219(71)	309(7)	378(17)	405(20)	439(8)	461(5)	600(1)	504(3)	---	---
2008 ¹	163(6)	254(19)	325(49)	393(6)	415(17)	441(1)	480(1)	520(1)	---	511(2)
2006 ¹	---	266(17)	324(27)	363(5)	425(4)	---	---	515(5)	515(6)	533(8)

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

Table 6. Stocking history including size and number for fishes stocked into Blue Dog Lake, 2001-2014. BLG= bluegill; WAE= walleye;

Year	Species	Size	Number
2002	BLG	adult	200
2003	WAE	fry	1,000,000
	WAE	fingerling	2,160
2005	WAE	fry	1,000,000
2007	WAE	small fingerling	7,200

Table 7. Year class distribution based on the expanded age/length summary for yellow perch sampled in gill nets from Blue Dog Lake, 2011 and 2014.

Survey Year	Year Class							
	2014	2013	2012	2011	2010	2009	2008	2007
2014	---	4	18	34	36	11	2	3
2011	---	---	---	---	81	79	44	13

Table 8. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from Blue Dog Lake, 2011 and 2014. Note: sampling was conducted later in the year during 2014 (late-July) than 2011 (late-June).

Year	Age						
	1	2	3	4	5	6	7
2014							
Male	105(1)	145(8)	193(6)	251(3)	252(4)	279(1)	295(2)
Female	136(3)	164(10)	236(31)	252(33)	263(6)	336(1)	311(1)
Combined	129(4)	156(18)	227(34)	252(36)	257(11)	308(2)	300(3)
2011							
Male	130(26)	183(21)	162(8)	---	---	---	---
Female	133(29)	198(46)	218(33)	293(13)	---	---	---
Combined	130(81)	191(79)	205(44)	293(13)	---	---	---

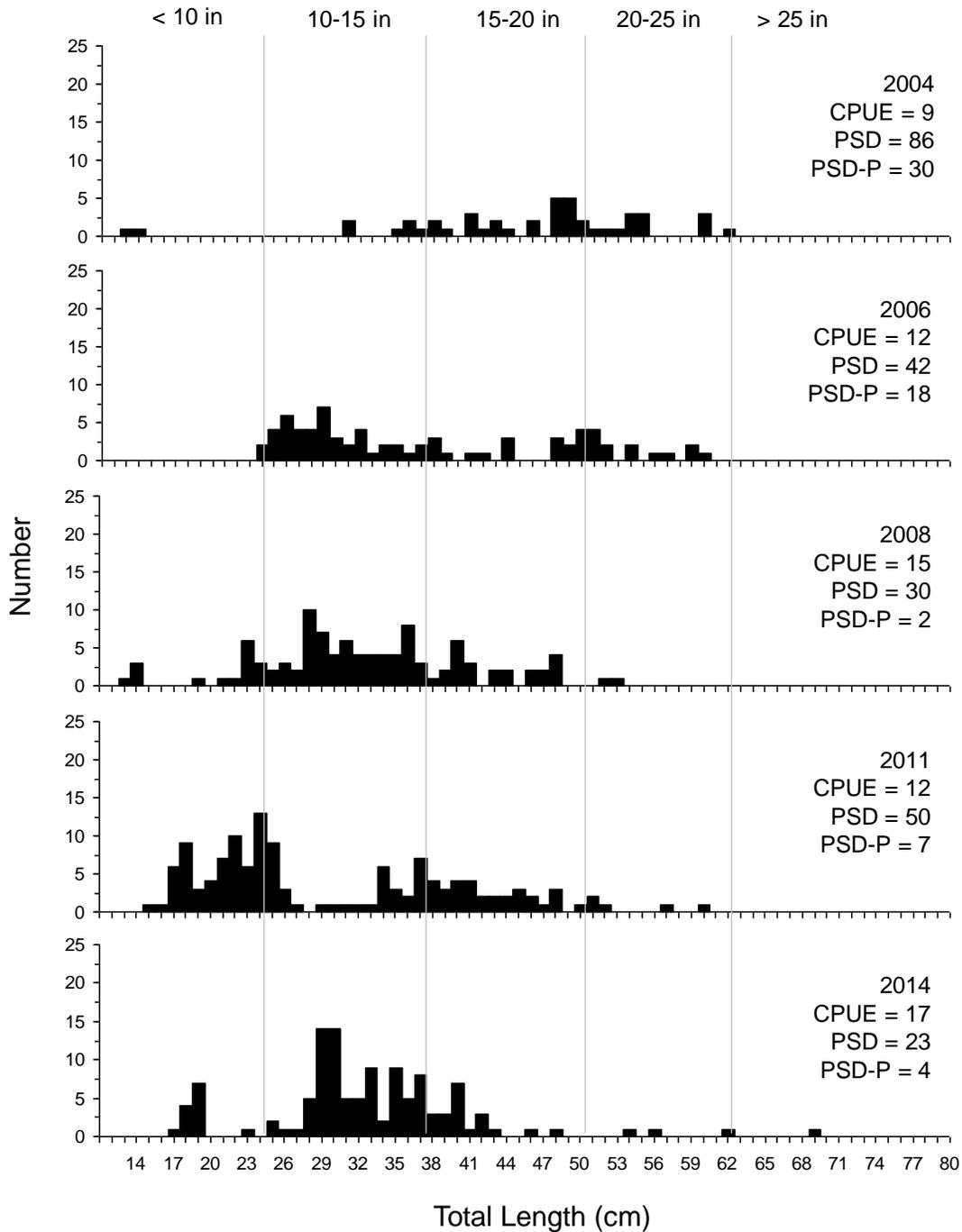


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Blue Dog Lake, 2004-2014.

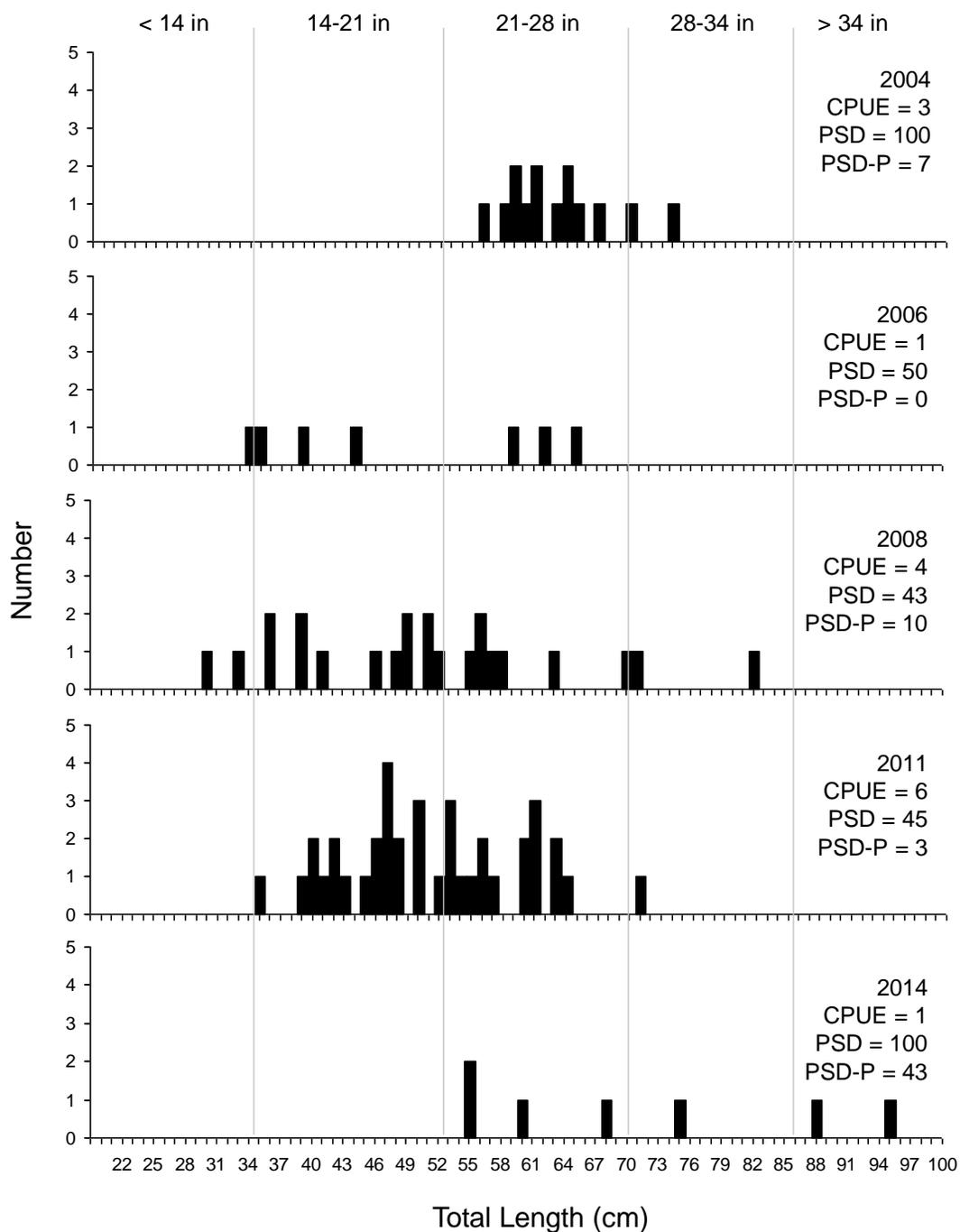


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using experimental gill nets in Blue Dog Lake, 2004-2014

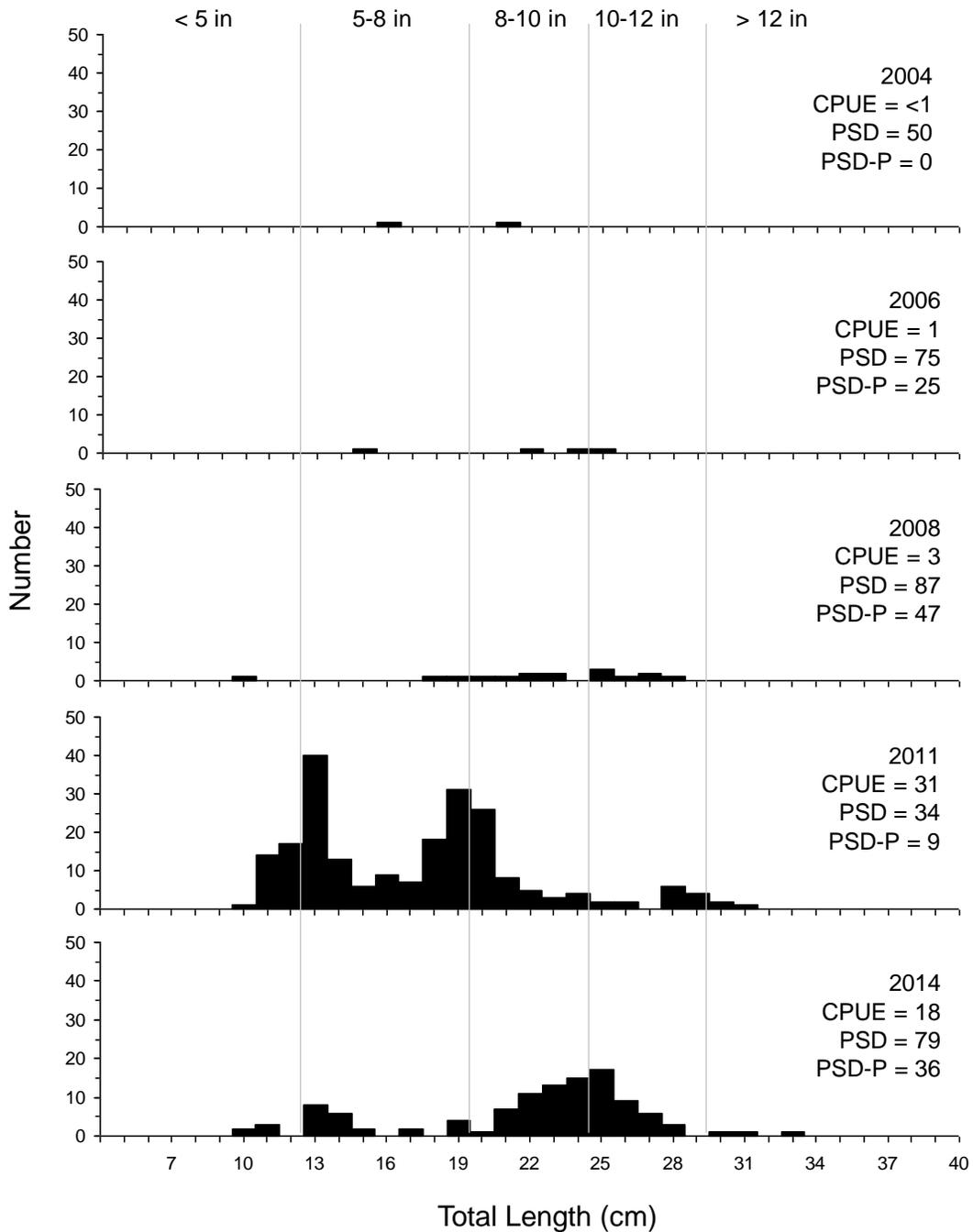


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Blue Dog Lake, 2004-2014.