

# Blue Dog Lake

## Site Description

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### 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	½ mile north of Waubay

### Survey Dates and Netting Information

Dates of current survey	July 1-3, 2008 (FN,GN)
Date of most recent survey	June 27-29, 2006 (FN,GN)
Gill net sets (n)	6
Frame net sets (n)	18

### Morphometry (Figure 1)

Watershed area (acres)	56,840
Surface area (acres)	1,529
Maximum depth (ft)	8
Mean depth (ft)	6

### Ownership and Public Access

Blue Dog Lake is a meandered lake managed by the SDGFP. Two public access sites maintained by the SDGFP are present; one is located on the south shore off Highway 12 and the other is located on the west shore south of Blue Dog State Fish Hatchery (Figure 1). 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

Land use within the Blue Dog Lake watershed is primarily agricultural including grasslands (66%; i.e. hay, rangeland, and CRP), cropland (25%), and woodland (1%). The remaining 8% is comprised of municipalities, residential housing/cabins, and water (Stueven and Bren 1999).

### Water Level Observations

The South Dakota Water Management Board established Ordinary High Water Mark (OHWM) is 1,800.7 fmsl, and the outlet elevation of Blue Dog Lake is 1,800.3 fmsl. On May 7, 2008, Blue Dog Lake was above the outlet elevation and OHWM with an elevation of 1,801.1 fmsl, by October 21, 2008 the elevation had declined to 1,800.6 fmsl.

### Aquatic Vegetation and Exotics

Blue Dog Lake is a shallow windswept basin with limited emergent and submergent vegetation. Common carp have been the only exotic species sampled in Blue Dog Lake.

### Fish Management Information

Primary species	walleye
Other species	black crappie, common carp, emerald shiner, fathead minnow, northern pike, rock bass, smallmouth bass, spottail shiner, white bass, white sucker, yellow perch
Lake-Specific regulations	NE Panfish Management Area: 10 daily; 50 possession
Management classification	warm-water permanent
Fish Consumption Advisories	none

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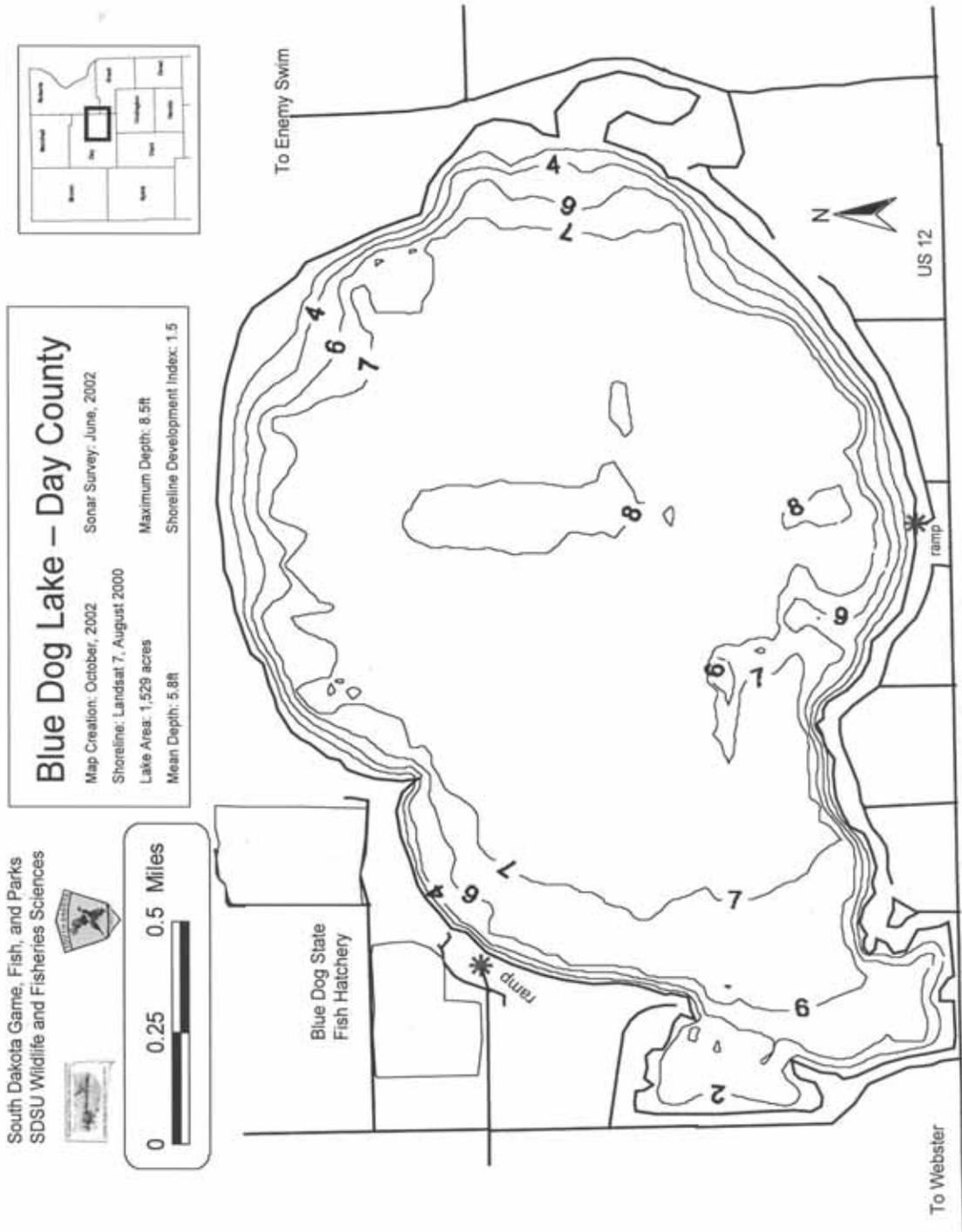


Figure 1. Depth contour map of Blue Dog Lake, Day County, South Dakota.



Figure 2. Map depicting access sites and standardized net locations for Blue Dog Lake, Day County, South Dakota. BDFN= frame nets, BDGN= gill nets

## Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length northern pike  $\geq 3$ , a PSD of 30-60, and a PSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length walleye  $\geq 10$ , a PSD of 30-60, and a PSD-P of 5-10.
- 3) Maintain a mean frame net CPUE of stock-length bullhead  $\leq 100$ .

## Results and Discussion

Blue Dog Lake is a 1502-acre natural lake situated in the Coteau des Prairie, near the town 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 13 species of fish contribute to the fishery in Blue Dog Lake.

### *Primary Species*

Walleye: The mean gill net CPUE of stock-length walleye during 2008 was 14.5 and above the objective ( $\geq 10$  stock length fish/net night) for walleye in Blue Dog Lake (Table 1). Since 2002, walleye relative abundance based on gill net CPUE has ranged from 8.6 (2004) to 17.5 (2002) stock-length walleye/net night with an average of 13.2 (Tables 2-3). The gill net CPUE of stock-length walleye during 2008 indicated moderate density.

Walleye captured in gill nets during 2008 ranged in total length from 13 to 53 cm (5.1 to 20.9 inches; Figure 3). The PSD of the 2008 gill net sample was 30 and the PSD-P was 2 (Tables 1, 3; Figure 3). The PSD was within the objective range (30-60) and the PSD-P was below the objective range (5-10) indicating a population dominated by stock-length walleye.

Walleye from 10 year classes were represented in the 2008 gill net catch (Tables 4, 6). Most year classes present at the time of this survey were relatively small resulting in the moderate density. The contribution of stocked fish to the walleye population in Blue Dog Lake is relatively unknown due to the escapement of walleye from Blue Dog State Fish Hatchery through the effluent. Walleye natural reproduction in Blue Dog Lake is unknown due to annual escapement of unmarked walleye from the hatchery.

Growth of walleye during 2008 was similar to growth observed in 2006. Age-3 walleye captured in gill nets had a weighted mean length at capture of 325 mm in 2008 and 324 mm in 2006 (Table 4). However, the growth in 2006 and 2008 was slower than was observed in previous surveys (Table 4). Condition of stock-length walleye captured in gill nets in 2008 was acceptable with a mean  $W_r$  value of 84. No length related trends in  $W_r$  were observed in 2008.

### *Other Species*

Black bullhead: The mean frame net CPUE of stock length black bullhead during 2008 was 1.8 and within the objective range ( $\leq 100$ /net night; Tables 1, 3). Dating back to 2002, black bullhead relative abundance in Blue Dog Lake has been considered low as the CPUE has not exceeded 25 stock-length fish/net night (Tables 2-3).

Black bullhead captured in frame nets during 2008 ranged in total length from 19 to 40 cm (7.5 to 15.7 inches; Figure 4). The PSD of black bullhead captured in frame nets during 2008 was 97 and the PSD-P was 94 (Tables 1, 3; Figure 4). The high PSD and PSD-P indicate a population dominated by quality-and preferred-length black bullhead which is likely the result of poor recruitment resulting from high predator densities. The condition of stock-length black bullhead in Blue Dog Lake during 2008 was adequate with a mean  $W_r$  of 88 (Tables 1; Figure 4).

Northern Pike: The mean gill net CPUE of stock-length northern pike in Blue Dog Lake during 2008 was 3.5 (Table 1). Northern pike typically are not sampled consistently using standard lake survey methods; however, northern pike in Blue Dog Lake have generally been considered moderate density with a 2002-2008 mean gill net CPUE of 2.7 stock-length fish (Table 2). In 2008, northern pike ranged in total length from 30 to 82 cm (11.8 to 32.3 inches; Figure 5). The PSD was 43 and the PSD-P was 10 (Table 1). The PSD and PSD-P were within the objective ranges (30-60 and 5-10, respectively) indicating a balanced population. No growth information was available; however, stock-length northern pike were in good condition with a mean  $W_r$  of 85 (Table 1).

Other: Black crappie, common carp, rock bass, white bass, white sucker, and yellow perch were other fish species captured during the 2008 survey; however, the abundance of these fish species was considered moderate or low density (Tables 1-2). The contribution of these species to the fishery at the time of this survey was likely minimal. Emerald shiners were also captured; however abundance is unknown as the sampling methods utilized are typically ineffective at capturing shiners.

## **Management Recommendations**

- 1) Conduct fish population assessment surveys on a biennial basis (next survey scheduled in summer 2010) to monitor fish abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye to assess the age structure and growth rate of the 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 gill nets in Blue Dog Lake, 2008. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= black bullhead; BLC= black crappie; COC= common carp; EMS= emerald shiner; NOP= northern pike; ROB=rock bass; 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	1.8	0.6	97	3	94	6	88	<1
BLC	0.8	0.8	60	23	20	19	95	5
COC	0.4	0.4	63	34	13	23	103	8
NOP	0.4	0.2	71	29	14	28	89	5
ROB	0.3	0.3	100	0	17	33	105	4
WAE	3.7	1.1	45	11	23	8	85	2
WHB	0.7	0.3	92	8	75	23	92	2
WHS	0.5	0.2	100	0	100	0	94	3
YEP	0.7	0.4	54	25	0	---	100	3
<i>Gill nets</i>								
EMS <sup>†</sup>	0.2	0.2	---	---	---	---	---	---
NOP	3.5	1.3	43	19	10	11	85	2
WAE	14.5	1.7	30	8	2	3	84	1
WHB	0.2	0.2	0	---	0	---	99	---
WHS	1.0	0.7	83	17	50	45	99	7
YEP	2.5	0.6	87	13	47	23	96	3

<sup>†</sup> all fish sizes.

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in gill nets and frame nets in Blue Dog Lake, 2002-2008. BLB=black bullhead; BLC=black crappie; BLG=bluegill; COC=common carp; EMS=emerald shiner; NOP=northern pike; ROB=rock bass; SMB=smallmouth bass; SPS=spottail shiner; WAE=walleye; WHB=white bass; WHS=white sucker; YEP=yellow perch

Species	CPUE							Mean
	2002	2003	2004	2005	2006 <sup>2</sup>	2007 <sup>2</sup>	2008	
<i>Frame nets</i>								
BLB	15.4	---	23.5	---	6.1	---	1.8	11.7
BLC	9.5	---	0.3	---	0.6	---	0.8	2.8
BLG	0.9	---	0.1	---	0.2	---	0.0	0.3
COC	0.0	---	0.2	---	0.2	---	0.4	0.2
NOP	0.7	---	0.6	---	1.1	---	0.4	0.7
ROB	2.2	---	1.6	---	0.4	---	0.3	1.1
SMB	0.4	---	0.1	---	0.4	---	0.0	0.2
WAE	0.3	---	1.9	---	3.2	---	3.7	2.3
WHB	1.8	---	2.1	---	2.8	---	0.7	1.9
WHS	0.6	---	0.5	---	0.7	---	0.5	0.6
YEP	1.2	---	0.2	---	0.0	---	0.7	0.5
<i>Gill nets</i>								
BLB	3.5	---	2.0	---	0.2	---	0.0	1.4
BLC	0.5	---	0.0	---	0.0	---	0.0	0.1
COC	0.0	---	0.4	---	1.7	---	0.0	0.5
EMS <sup>1</sup>	0.0	---	0.6	---	0.0	---	0.2	0.2
NOP	3.3	---	2.8	---	1.0	---	3.5	2.7
SPS	0.0	---	0.0	---	0.0	---	0.0	0.0
WAE	17.5	---	8.6	---	12.2	---	14.5	13.2
WHB	0.0	---	0.0	---	1.2	---	0.2	0.4
WHS	3.0	---	2.8	---	0.7	---	1.0	1.9
YEP	5.5	---	0.4	---	0.7	---	2.5	2.3

<sup>1</sup> All fish sizes.

<sup>2</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

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 using experimental gill nets and frame nets in Blue Dog Lake, 2002-2008. BLB=black bullhead; NOP=northern pike; WAE=walleye

Species	2002	2003	2004	2005	2006 <sup>1</sup>	2007 <sup>1</sup>	2008	Average	Objective
<i>Frame nets</i>									
BLB									
CPUE	15	---	24	---	6	---	2	12	≤ 100
PSD	94	---	82	---	100	---	97	93	---
PSD-P	30	---	13	---	94	---	94	58	---
Wr	89	---	84	---	88	---	88	87	---
<i>Gill nets</i>									
NOP									
CPUE	3	---	3	---	1	---	4	3	≥ 3
PSD	45	---	100	---	50	---	43	60	30-60
PSD-P	15	---	7	---	0	---	10	8	5-10
Wr	84	---	81	---	87	---	85	84	---
WAE									
CPUE	18	---	9	---	12	---	15	14	≥ 10
PSD	85	---	86	---	42	---	30	61	30-60
PSD-P	13	---	30	---	18	---	2	16	5-10
Wr	91	---	85	---	86	---	84	87	---

<sup>1</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill nets in Blue Dog Lake, 2002-2008. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	N	Age											
		1	2	3	4	5	6	7	8	9	10	11	12
2008 <sup>1</sup>	103	163	254	325	393	415	441	480	520	---	511	---	474
2006 <sup>1</sup>	72	---	266	324	363	425	---	---	515	515	533	---	---
2004	46	136	315	382	440	489	512	535	564	---	---	---	---
2002	113	186	316	396	433	460	490	495	609	---	---	---	---

<sup>1</sup> Age assignments made using otoliths; scales were used in previous years.

Table 5. Stocking history including size and number for fishes stocked into Blue Dog Lake, 1996-2008. BLG=bluegill; SXW=saugeye; WAE=walleye

Year	Species	Size	Number
1997	WAE	fingerling	552
1998	SXW	fingerling	171
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 6. Numbers of walleye sampled (n), by year class, and associated stocking history (Number stocked x 1,000) for walleye captured in Blue Dog Lake, 2002-2008. Note: the actual number of fry and small fingerlings stocked into Blue Dog Lake are unknown because uncounted numbers of walleye escape Blue Dog State Fish Hatchery through the effluent and enter Blue Dog Lake.

Survey Year	Year Class												
	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
2008 <sup>1,2</sup>		6	19	49	6	17	1	1	1		2		1
2006 <sup>1,2</sup>	---	---			17	27	5	4			5	6	8
2004	---	---	---	---	---	2	2	9	7	1	10	10	5
2002	---	---	---	---	---	---	---	7	11	14	18	28	16
Number stocked <sup>1</sup>													
fry				1,000		1,000							
small fingerling		7				2							
large fingerling											< 1	< 1	

<sup>1</sup> Age assignments made using otoliths; scales were used in previous years

<sup>2</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5")

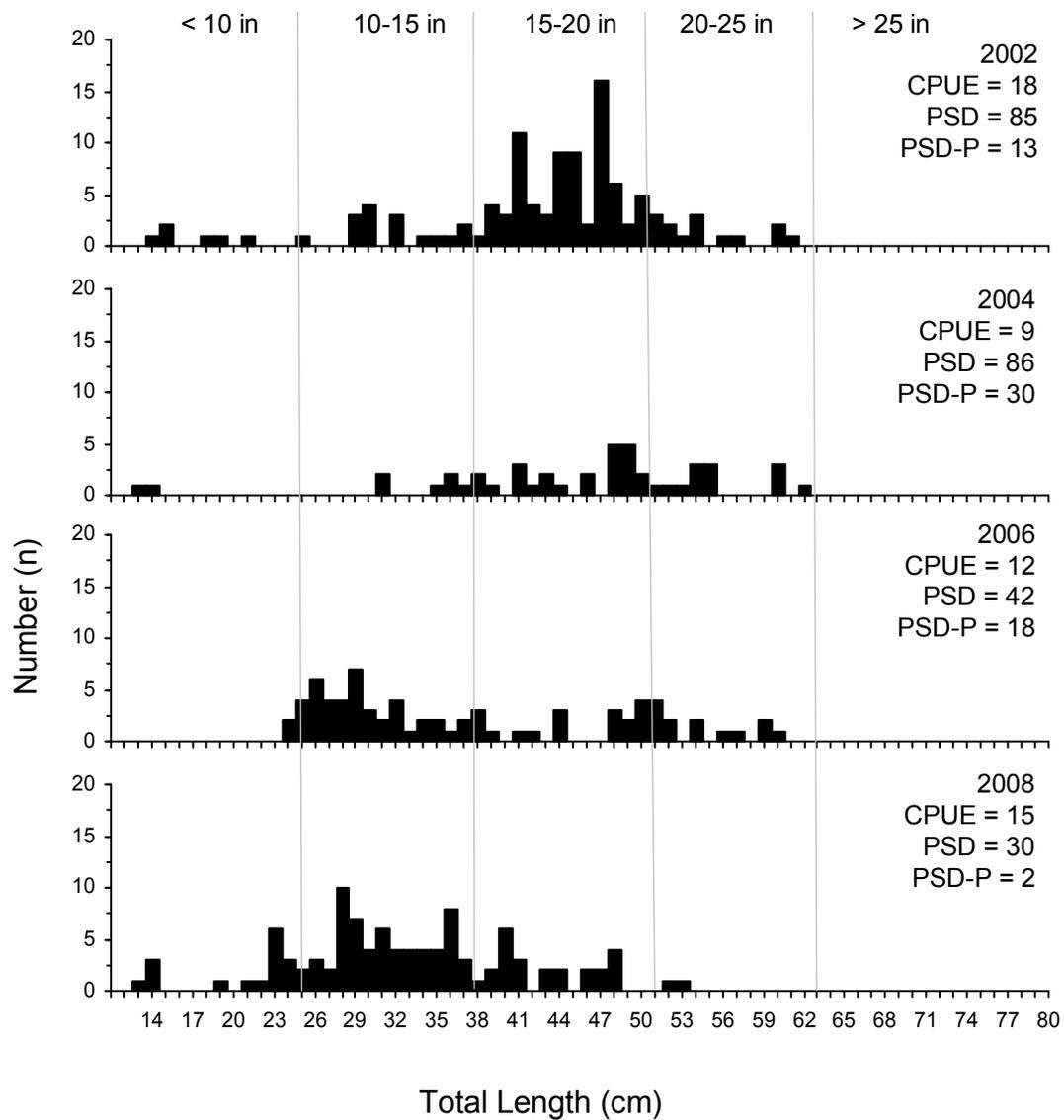


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using gill nets in Blue Dog Lake, 2002-2008.

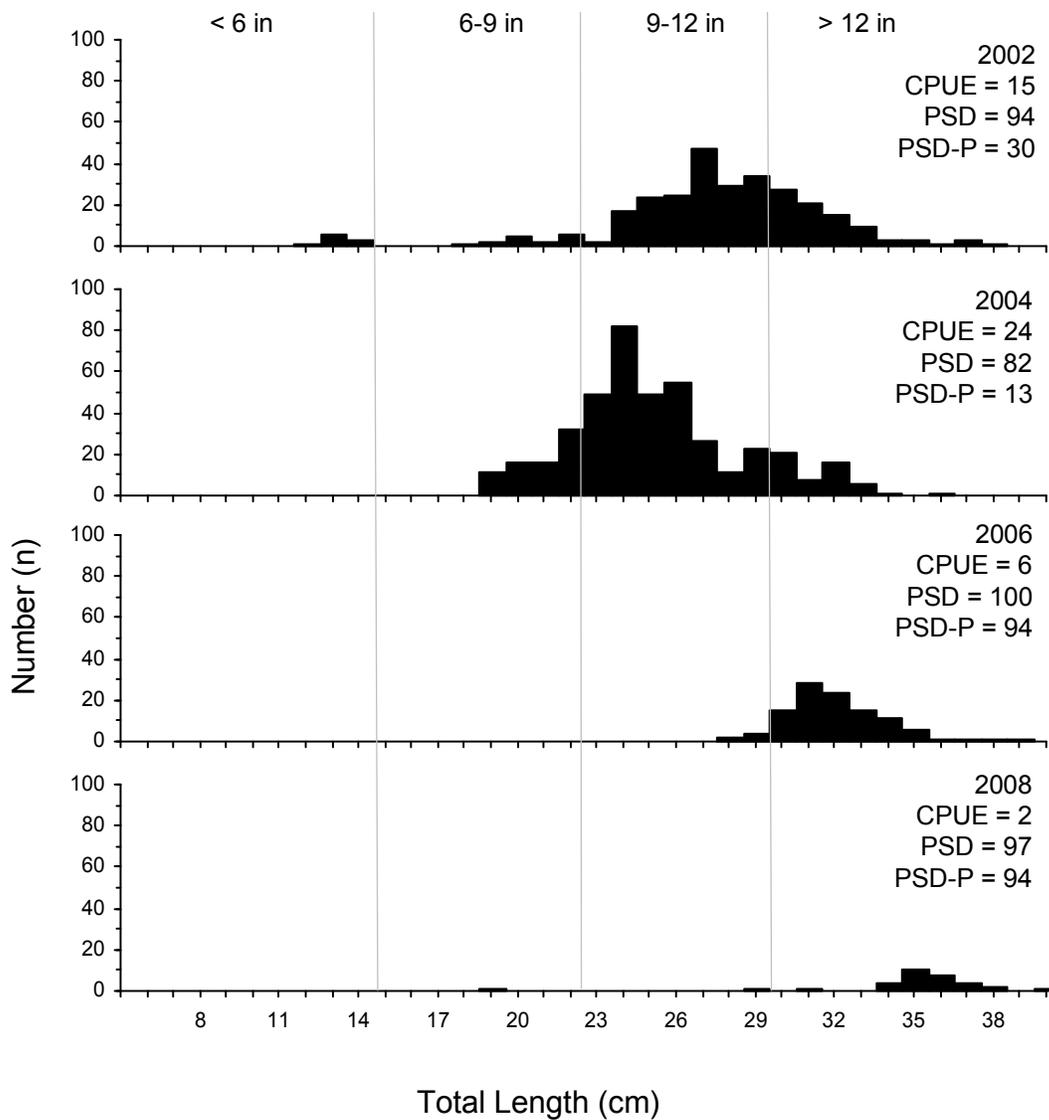


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black bullhead captured using frame nets in Blue Dog Lake, 2002-2008.

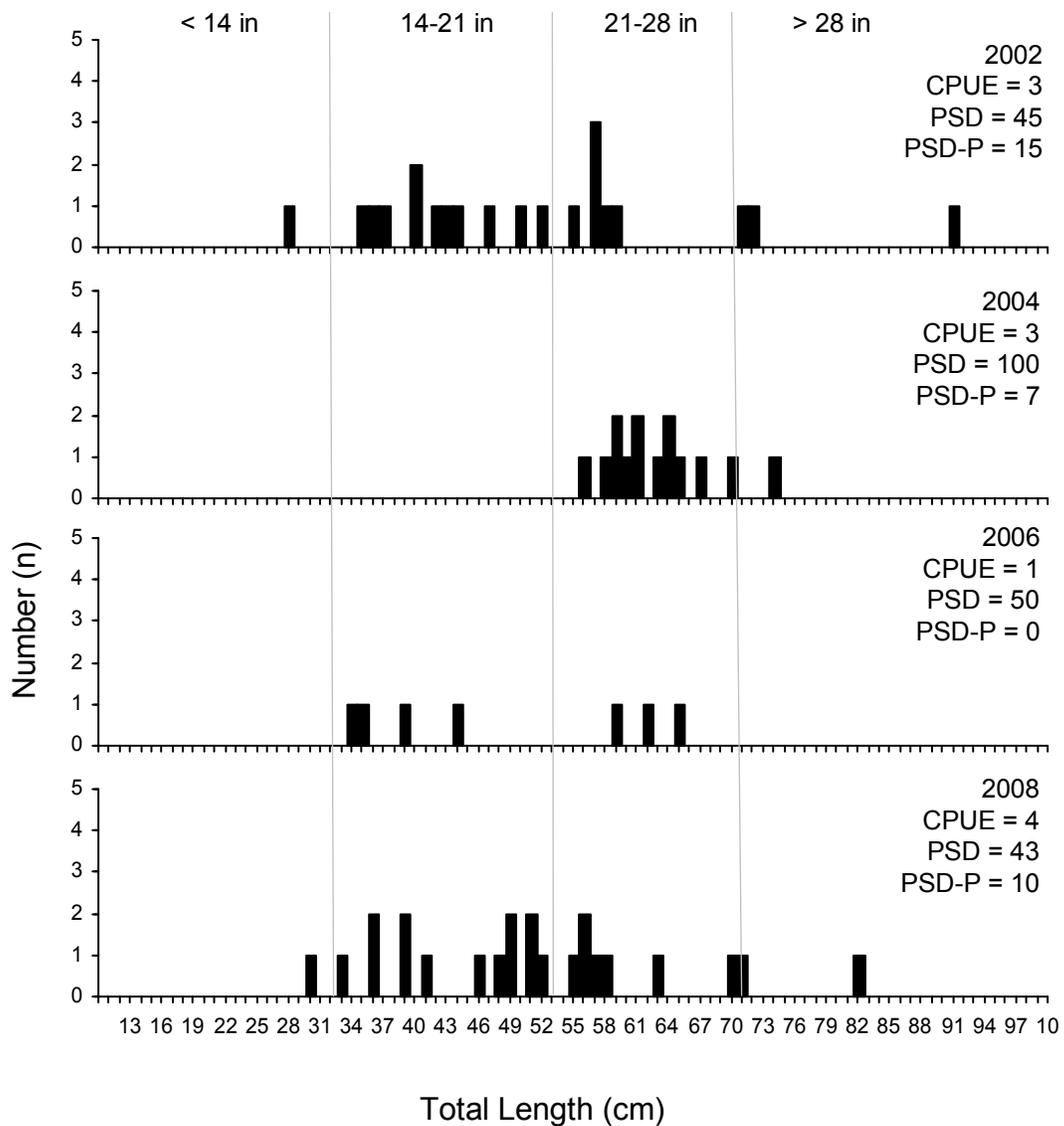


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using gill nets in Blue Dog Lake, 2002-2008.