

# Antelope Lake

## Site Description

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### Location

Water designation number (WDN)	22-0007-00
Legal description	T121N-R55W-Sec. 17, 18, 19 & R56W-Sec. 13
County (ies)	Day
Location from nearest town	2 miles south and 2 miles east of Webster

### Survey Dates and Sampling Information

Dates of current survey	July 1-2, 2008
Date of most recent survey	July 5-6, 2005
Gill net sets (n)	4
Frame net sets (n)	12

### Morphometry (Figure 1)

Watershed area (acres)	---
Surface area (acres)	850
Maximum depth (ft)	≈20
Mean depth (ft)	---

### Ownership and Public Access

Antelope Lake is a meandered lake managed by the SDGFP. Antelope Lake is entirely surrounded by private land. A public access site is located on the northwest shore of Antelope Lake and is maintained by the SDGFP (Figure 1).

### Watershed and Land Use

Land-use within the Antelope Lake watershed is primarily agricultural including grass/pasture land, cropland, and scattered shelterbelts.

### Water Level Observations

Water level in Antelope Lake increased during the mid to late 1990's and provided sufficient habitat to support a sport fishery. Currently, water level is below those observed during the late 1990's, but remains sufficient to support the sport fishery.

### Aquatic Vegetation and Exotics

Aquatic vegetation in Antelope Lake has not been officially documented; however, both emergent and submergent vegetation are present. No exotic species have been reported in Antelope Lake.

### Fish Management Information

Primary species	walleye, yellow perch
Other species	bluegill, fathead minnow, northern pike, rock bass, smallmouth bass
Lake-Specific regulations	NE Panfish Management Area: 10 daily; 50 possession
Management classification	none
Fish Consumption Advisories	none

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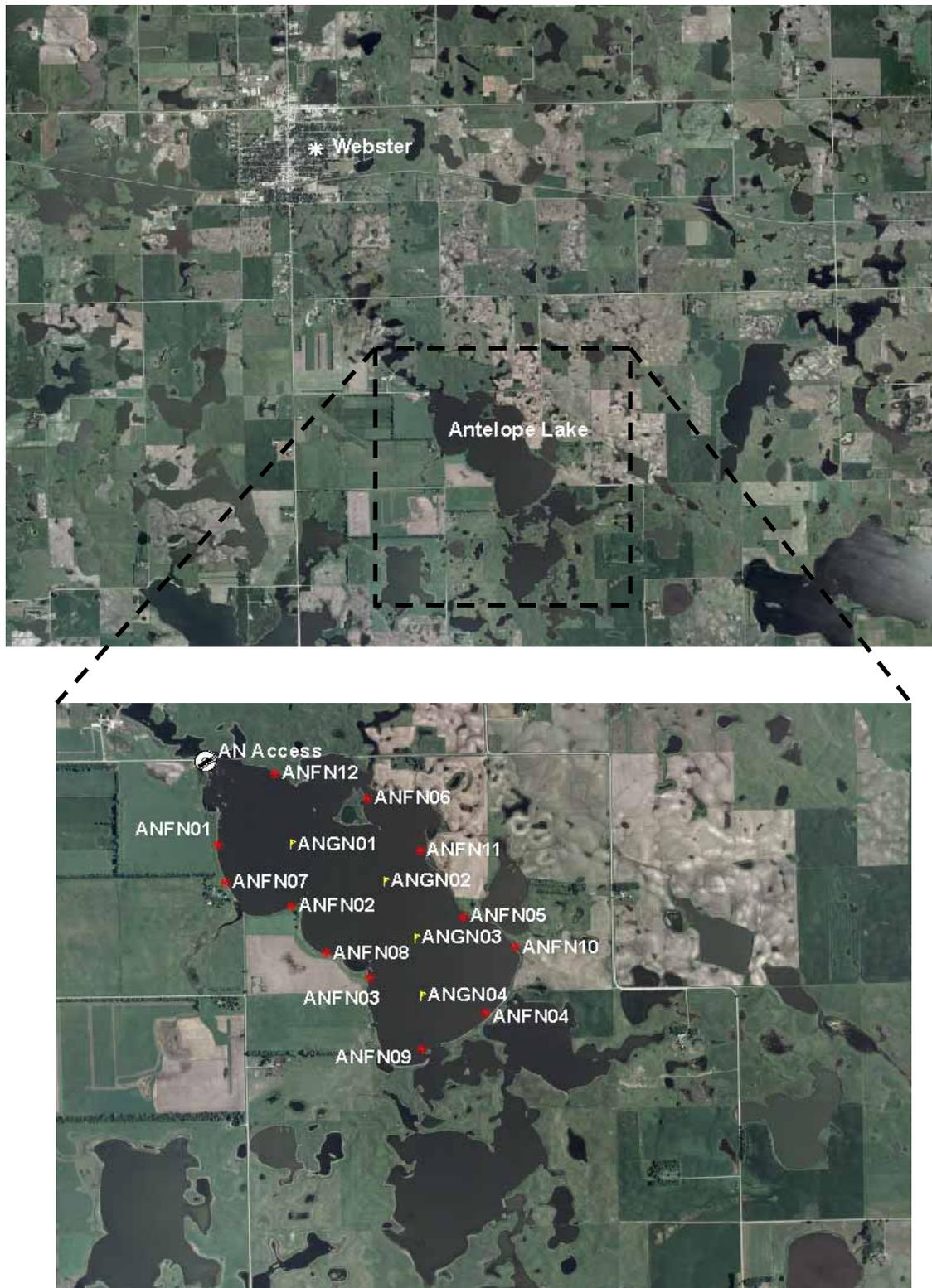


Figure 1. Map depicting location of Antelope Lake from Webster, SD; including access site, and standardized net locations. ANFN= frame nets; ANGN= gill nets

## Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length walleye  $\geq 10$ , a PSD of 30-60, and a PSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length yellow perch  $\geq 25$ , a PSD of 30-60, and a PSD-P of 5-10.

## Results and Discussion

Prior to 1992, Antelope Lake covered a surface area of only 328 acres and had a maximum depth of 5 ft. However, above normal precipitation and the resulting run-off during the mid to late 1990's provided an increase in surface area and depth of Antelope Lake. Antelope Lake has expanded to 550 acres in the main basin and when water levels are sufficient another 300 acres is connected by a channel on the southeast corner of the lake (Figure 1). Antelope Lake is currently managed as a walleye and yellow perch fishery.

### *Primary Species*

Walleye: The mean gill net CPUE of stock-length walleye during 2008 was 14.5, and indicative of moderate relative abundance (Table 1). The 2008 CPUE was the highest since 2003 and is above the minimum objective ( $\geq 10$  stock-length walleye/net night; Table 3). The increase in relative abundance in Antelope Lake during 2008 is due to the recruitment of the 2006 year-class, which comprised 80% of walleye captured in gill nets in 2008 (Table 6). The 2006 year-class coincides with a non-stocked year indicating that natural reproduction is contributing to the walleye population (Table 6).

Walleye captured in gill nets during 2008 ranged in total length from 18 to 66 cm (7.1 to 26.0 inches; Figure 2). The PSD of walleye captured in gill nets during 2008 was 14 and the PSD-P was 10 (Tables 1, 3; Figure 2). The PSD was below the objective range of 30-60; while the PSD-P was within the desired range of 5-10. The low PSD is a result of the 2006 year-class reaching stock-length and poor recruitment of historically strong year classes to the gill nets.

In 2008, the weighted mean length at capture of age-2 walleyes was 315 mm, and is the slowest growth observed since 2003 (Table 4). Condition of gill net captured walleye was good with mean  $W_r$  values ranging from 81 to 108. A decreasing trend in  $W_r$  values was observed as total length increased in 2008.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2008 was 11.5, and below the minimum objective ( $\geq 25$  fish/net night; Tables 1-3). Since 2003, relative abundance of yellow perch in Antelope Lake has remained low, with mean gill net CPUE values ranging from 2.3 to 22.5 (Table 2). Length-frequency analysis of gill net captured yellow perch in 2008 indicates relatively consistent recruitment, but generally of low magnitude (Figure 3).

During 2008, yellow perch ranged in total length from 10 to 25 cm (3.9 to 9.8 inches; Figure 3), had a PSD of 11, and a PSD-P of 2 (Tables 1-3; Figure 3). Both PSD and PSD-P values are below the objective ranges (30-60, 5-10, respectively) indicating high mortality of larger fish and some recruitment of small yellow perch into the population.

No growth information was available in 2008. The condition of yellow perch in Antelope Lake was excellent, with the mean  $W_r$  value for stock-length yellow perch being 120 (Tables 1). No length related trends in  $W_r$  were apparent during 2008.

#### *Other Species*

Northern Pike: The mean gill net CPUE of stock-length northern pike in Antelope Lake in 2008 was 2.0 (Tables 1-3). Since 2003, relative abundance of northern pike has remained low with mean gill net CPUE values ranging from 1.5 to 3.5 (Tables 2-3). During 2008, northern pike ranged in total length from 35 to 79 cm (13.8 to 31.1 inches; Figure 4). The condition of sampled northern pike during 2008 was good with a mean  $W_r$  of 95 for stock-length fish (Tables 1).

Other: Bluegill, rock bass, and smallmouth bass were other fish species captured during the 2008 survey; however, the relative abundance of these species appears to be low, and their impact on the fishery is likely minimal at this time.

### **Management Recommendations**

- 1) Conduct fish community assessment surveys every third year (next survey scheduled for summer 2011) utilizing gill nets and frame nets 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.
- 3) Stock walleye ( $\approx 1,000$  fry/acre) biennially to establish additional year classes and maintain a stable sport fishery.

Table 1. 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) of stock-length fish, for various fish species captured in experimental gill nets and frame nets in Antelope Lake, 2008. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLG= bluegill; NOP= northern pike; ROB= rock bass; SMB= smallmouth bass; WAE= walleye; 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>								
BLG	0.2	0.1	100	0	50	50	150	44
NOP	0.6	0.2	57	39	0	---	88	8
ROB	0.8	0.4	89	11	33	31	123	4
SMB	0.3	0.2	33	67	33	67	109	10
WAE	4.9	1.8	83	8	68	10	87	1
<i>Gill nets</i>								
NOP	2.0	1.2	63	34	38	34	95	7
WAE	14.5	5.4	14	7	10	7	97	1
YEP	11.5	6.8	11	8	2	4	120	<1

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured in experimental gill nets and frame nets in Antelope Lake, 2003-2008. BLG= bluegill; NOP= northern pike; ROB= rock bass; SMB= smallmouth bass; WAE= walleye; YEP= yellow perch

Species	CPUE						Mean
	2003	2004	2005	2006 <sup>1</sup>	2007 <sup>1</sup>	2008	
<i>Frame nets</i>							
BLG	7.6	---	0.1	---	---	0.2	2.6
NOP	1.7	---	1.2	---	---	0.6	1.2
ROB	0.8	---	0.3	---	---	0.8	0.6
SMB	0.1	---	0.2	---	---	0.3	0.2
WAE	5.6	---	4.9	---	---	4.9	5.1
YEP	0.2	---	0.0	---	---	0.0	0.1
<i>Gill nets</i>							
BLG	0.2	0.0	0.0	0.0	0.0	0.0	0.0
NOP	3.3	3.5	1.5	1.7	2.7	2.0	2.5
ROB	0.7	0.3	0.3	0.0	0.3	0.0	0.3
WAE	11.2	13.8	14.3	8.7	13.0	14.5	12.6
YEP	22.5	2.3	4.0	3.7	11.7	11.5	9.3

<sup>1</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

Table 3. Mean catch rate (CPUE; gill/frame nets = catch/net night), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and relative weight (Wr) for selected species captured in experimental gill nets and frame nets in Antelope Lake, 2003-2008. NOP= northern pike; WAE= walleye; YEP= yellow perch

Species	2003	2004	2005	2006 <sup>1</sup>	2007 <sup>1</sup>	2008	Average	Objective
<i>Gill nets</i>								
NOP								
CPUE	3	4	2	2	3	2	3	---
PSD	90	100	100	100	100	63	92	---
PSD-P	15	21	17	0	0	38	15	---
Wr	96	93	89	92	88	95	92	---
WAE								
CPUE	11	14	14	9	13	15	13	≥ 10
PSD	66	95	30	96	26	14	55	30-60
PSD-P	37	62	7	77	18	10	35	5-10
Wr	99	93	98	89	91	97	95	---
YEP								
CPUE	23	2	4	4	12	12	10	≥ 25
PSD	57	22	13	9	54	11	28	30-60
PSD-P	13	22	0	9	17	2	11	5-10
Wr	104	106	108	109	114	120	110	---

<sup>1</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill nets in Antelope Lake, 2003-2008. Note: sampling was conducted one-month later in 2002; other years sampling was conducted in mid-June.

Year	N	Age											
		1	2	3	4	5	6	7	8	9	10	11	12
2008 <sup>1</sup>	60	234	315	410	---	500	---	---	---	---	660	543	549
2007 <sup>1</sup>	102	230	350	---	478	516	---	---	---	570	---	616	---
2006 <sup>1</sup>	31	247	395	447	523	---	---	---	594	---	595	---	---
2005 <sup>1</sup>	73	236	356	405	465	---	---	529	522	594	---	---	---
2004	74	232	388	442	479	---	540	569	586	---	---	---	---
2003	67	277	356	443	---	515	534	569	---	---	---	---	---

<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 Antelope Lake, 1995-2008.

Year	Species	Size	Number
1996	WAE	fry	500,000
1997	NOP	fry	1,550,000
1997	WAE	fingerling	6,000
1998	WAE	small fingerling	121,800
2000	WAE	fry	1,000,000
2001	WAE	fry	2,800,000
2003	WAE	small fingerling	114,920
2005	WAE	small fingerling	200,100
2007	WAE	fry	1,200,000

Table 6. Numbers of walleye sampled using gill nets (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Antelope Lake, 2003-2008.

Survey Year	Year Class												
	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
2008 <sup>1</sup>		5	48	1		1					1	1	3
2007 <sup>1,2</sup>	---		72	20		2	4				3		1
2006 <sup>1,2</sup>	---	---		6	2	3	1				6		13
2005 <sup>1</sup>	---	---	---		19	39	6	5			1	2	1
2004	---	---	---	---		19	4	13	1		6	17	14
2003	---	---	---	---	---		4	22	6		13	13	9
Number stocked													
fry		1,200						2,800	1,000				500
small fingerling				200		115					122	6	
large fingerling													

<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"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

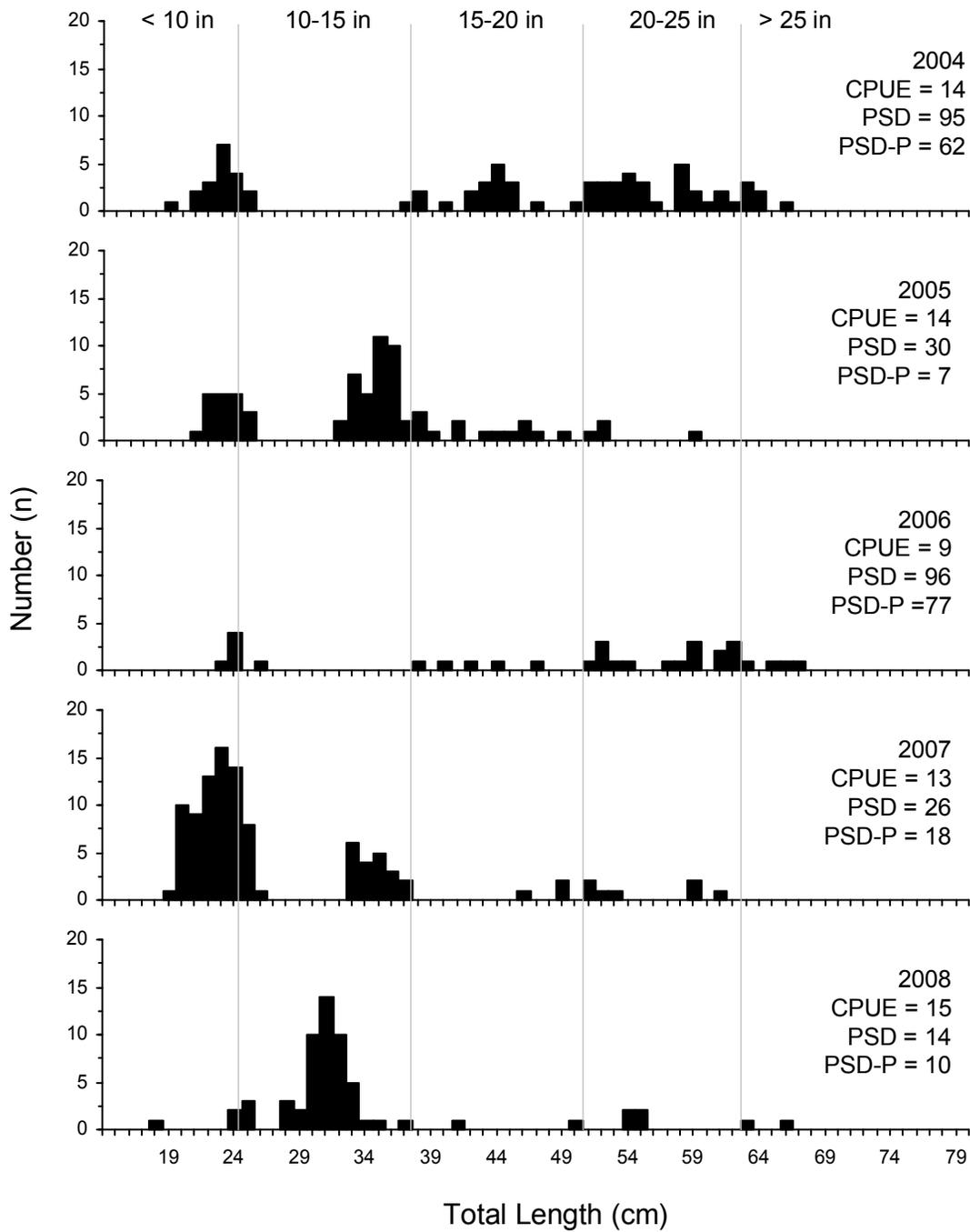


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Antelope Lake, 2004-2008.

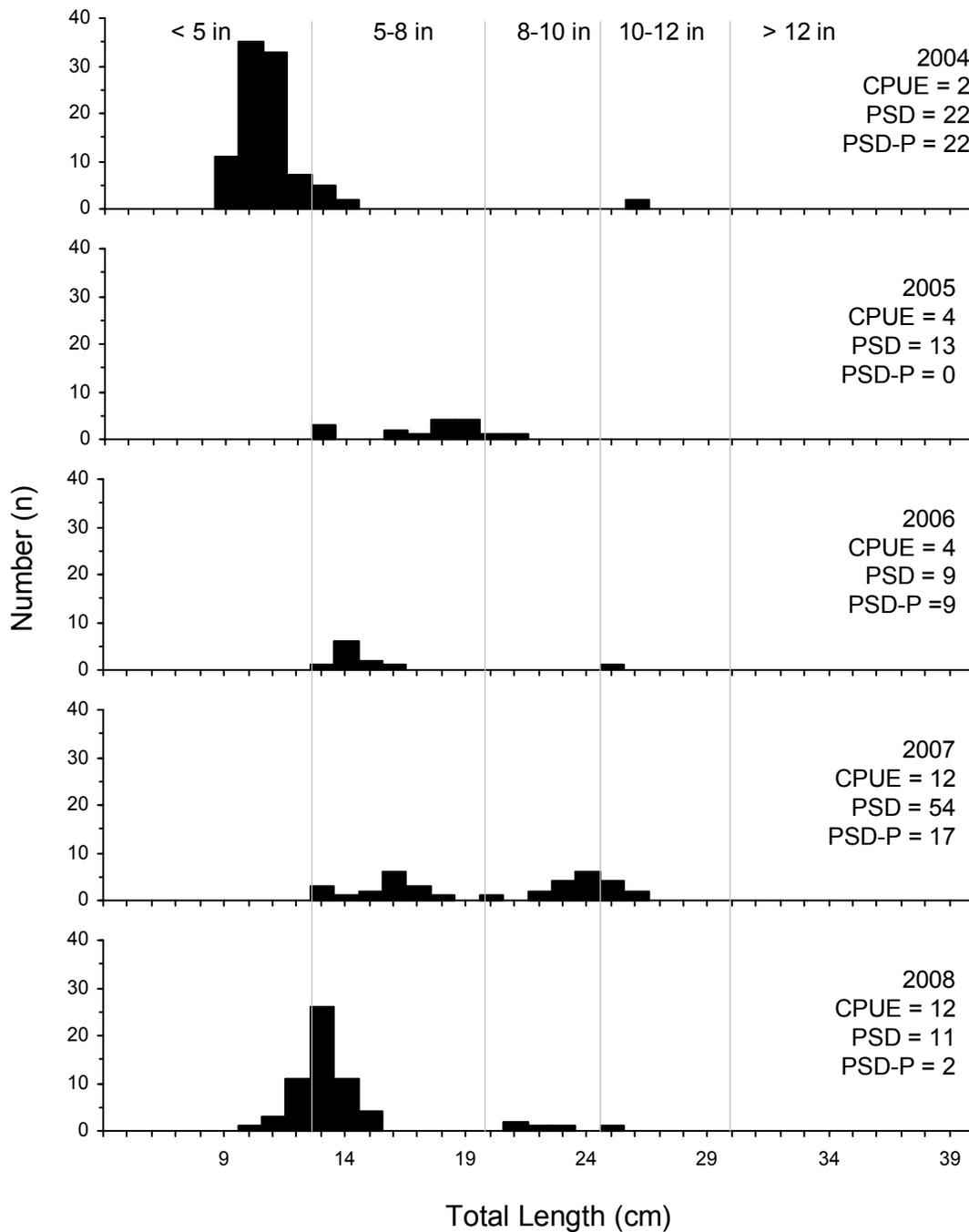


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Antelope Lake, 2004-2008.

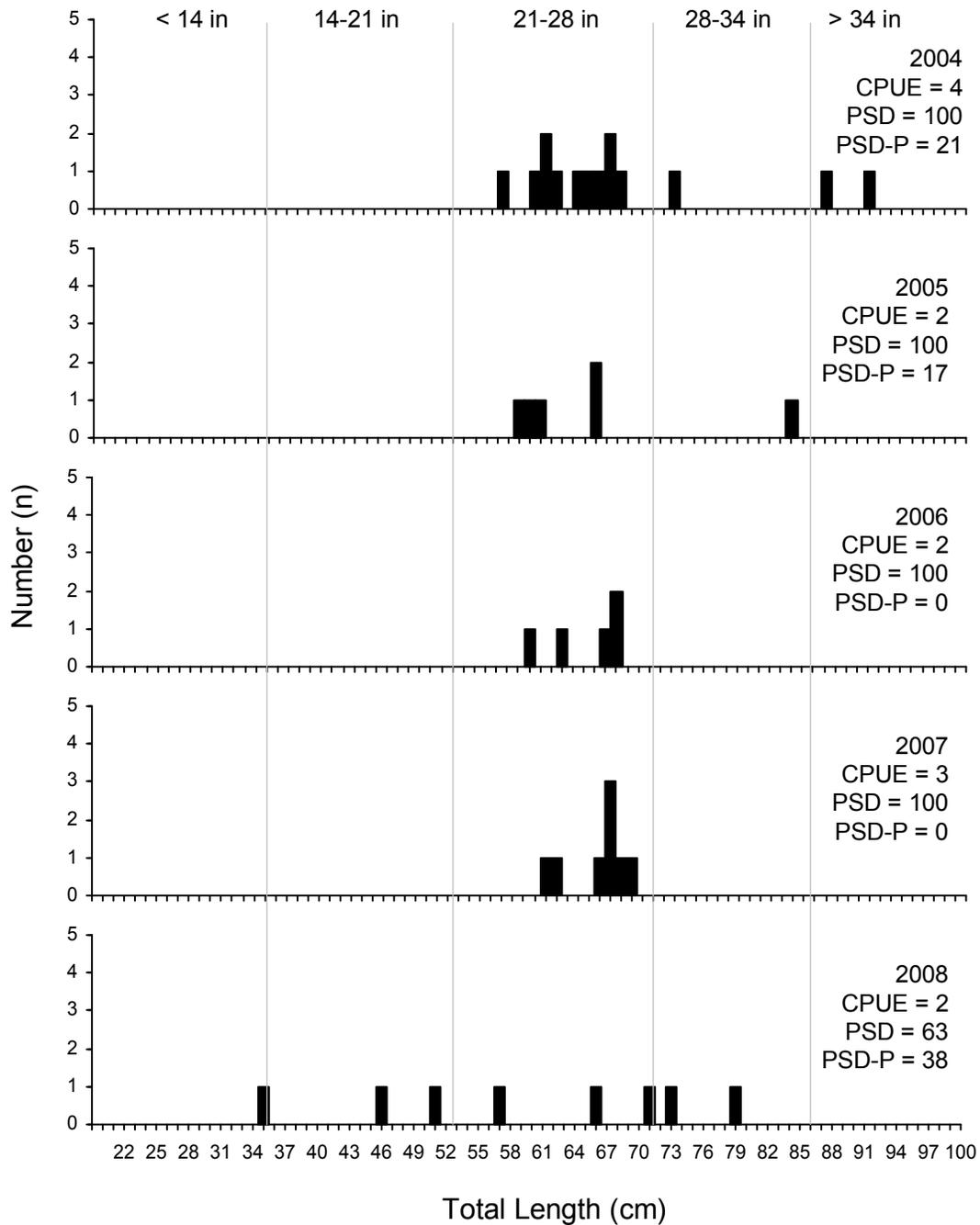


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using experimental gill nets in Antelope Lake, 2004-2008.