

# Minnewasta Lake

## Site Description

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### Location

Water designation number (WDN)	22-0004-00
Legal description	T122N-R54-55W-Sec. 1-2, 7, 11-13, 18
County (ies)	Day
Location from nearest town	2 miles west and 4 miles north of Waubay

### Survey Dates and Sampling Information

Survey dates	June 2-4, 2009 (FN, GN)
Frame net sets (n)	18
Gill net sets (n)	6

### Morphometry (Figure 1)

Watershed area (acres)	2,564
Surface area (acres)	600
Maximum depth (ft)	14
Mean depth (ft)	10

### Ownership and Public Access

Minnewasta Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. A single public boat ramp is located on the southeast shoreline and is maintained by the SDGFP (Figure 1). The majority of lakeshore is undeveloped, but several lake cabins are present along the southeast shore.

### Watershed and Land Use

The Minnewasta Lake watershed is comprised of a mix of pasture or grassland, cropland, and small shelterbelts.

### Water Level Observations

No Ordinary High Water Mark has been established by the South Dakota Water Management Board on Minnewasta Lake. The elevation of Minnewasta Lake on April 29, 2009 was 1802.6 fmsl and indicated an increase from the fall 2008 elevation of 1800.7 fmsl. By September 30, 2009 the water level had declined to an elevation of 1801.6 fmsl.

### Aquatic Nuisance Species Monitoring

#### Plant Survey

No aquatic plant species were encountered at sampling locations.

#### Macro-Invertebrate/Mussel Survey

No aquatic nuisance macro-invertebrate or mussel species were sampled.

#### Fish Community Survey

Common carp was the only aquatic nuisance fish species captured during the 2009 survey.

### Fish Management Information

Primary species	northern pike, walleye, yellow perch
Other species	black bullhead, black crappie, bluegill, common carp, orangespotted sunfish, spottail shiner, white bass, white sucker
Lake-Specific regulations	NE Panfish Management Area: 10 daily; 50 possession
Management classification	warm-water semi-permanent
Fish consumption advisories	none

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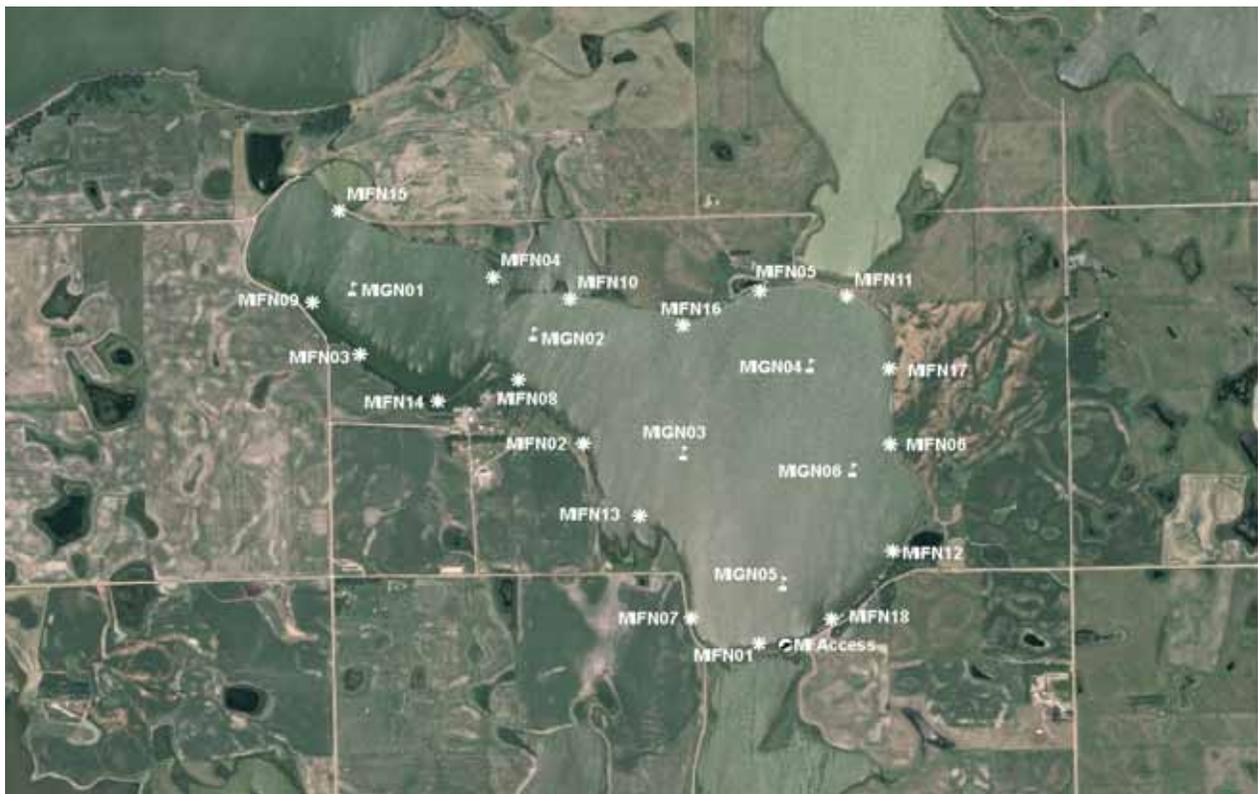
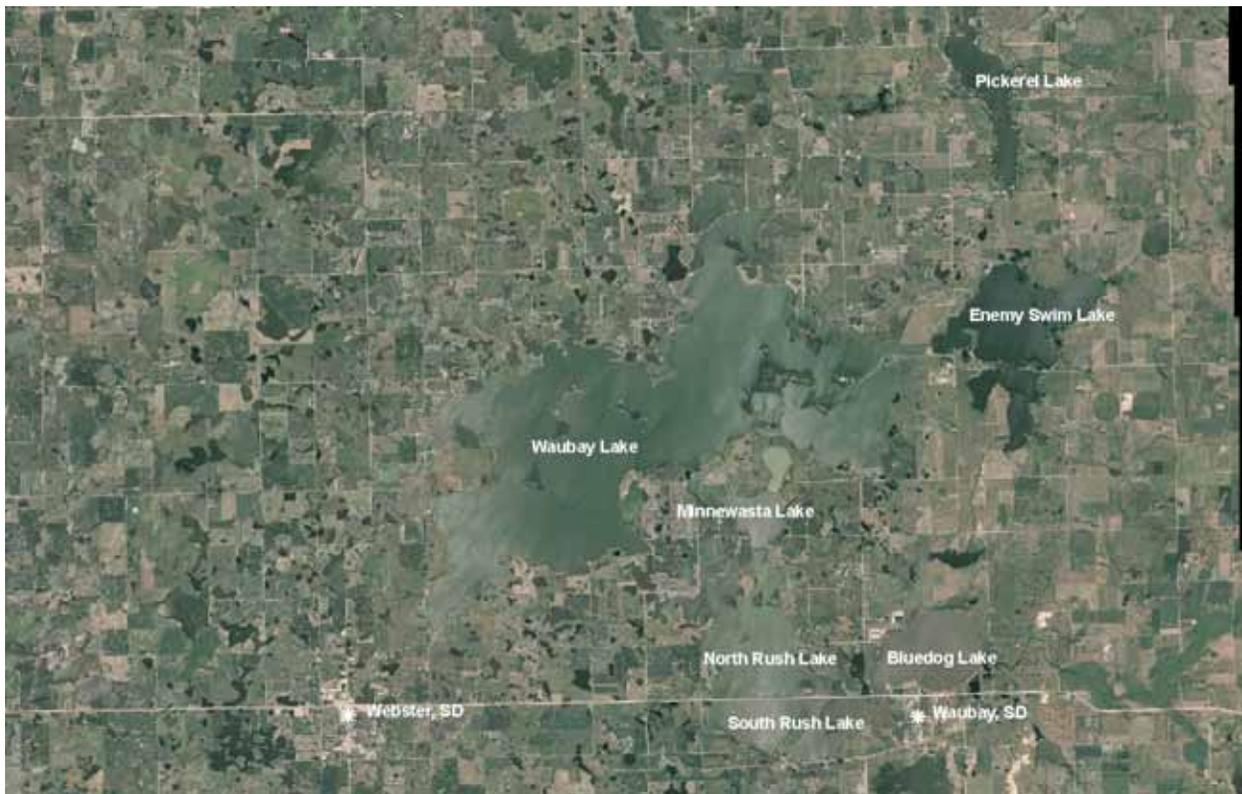


Figure 2. Map depicting location of several Day County, South Dakota Lakes including Minnewasta (top). Also noted, is the public access and standardized net locations for Minnewasta Lake. MIFN= frame nets; MIGN=gill nets

## 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 gill net CPUE of stock-length yellow perch  $\geq 30$ , a PSD of 30-60, and a PSD-P of 5-10.

## Results and Discussion

Minnewasta Lake is a natural lake located between Waubay and North Rush Lakes in Day County, South Dakota (Figure 2). Prior to the 1990's, Minnewasta Lake was shallow and susceptible to periodic winter- and summer-kill events. However, above normal precipitation and the resulting run-off during the mid to late 1990's increased the depth and diminished the risk of winterkill allowing a mature fish community to develop. Currently, Minnewasta Lake is managed as a northern pike, walleye, and yellow perch fishery.

### *Primary Species*

Northern Pike: In 2009, no northern pike were captured in the gill net catch resulting in a mean gill net CPUE of 0.0 (Table 1). Frame nets captured 4 northern pike ranging from 62 to 71 cm (24.4 to 28.0 in) resulting in a mean frame net CPUE of 0.1 (Table 1). Since 2001, the mean gill net CPUE of stock-length northern pike has varied from a high of 3.7 (2001) to a low of 0.0 (2009) with the 2001-2009 average being 1.6 (Table 2). Recent high water levels in Minnewasta Lake should benefit the northern pike recruitment.

Walleye: The mean gill net CPUE of stock-length walleye during 2009 was 3.3 (Table 1) and below the minimum objective ( $\geq 10$  stock-length walleye/net night; Table 3). The 2009 gill net CPUE represents a substantial decrease from the 2006 CPUE of 10.7 (Table 2) and indicates low relative abundance.

Walleye captured in gill nets during 2009 ranged in total length from 19 to 66 cm (7.5 to 26.0 in), had a PSD of 45 and a PSD-P of 5 (Figure 3). Both the 2009 PSD and PSD-P were within the management objectives ranges of 30-60 and 5-10 (Table 3).

Otoliths were collected from walleye in the 2009 gill net catch. Six walleye year classes were present, with the 2005 and 2007 cohorts being the most represented (Table 4). The 2005 year class coincides with a fry stocking; while the 2007 year class appears to be the result of natural reproduction (Table 4). The contribution of stocked or

naturally-produced walleye to the 2005 year-classes is unknown, as stocked fry were unmarked making it impossible to differentiate stocked from naturally-produced walleye.

Walleye in Minnewasta Lake generally attain quality-length (15 inches) during their fourth growing season at age 3+ (Table 6). In 2009, the weighted mean length at capture for age-4 walleye was 428 mm (16.9 in; Table 6). Condition of stock-length walleye captured in the 2009 gill net catch was good with a mean Wr of 95 (Table 1). Mean Wr values ranged from 92 to 105 for all length categories sampled, and no length related trends in Wr values were apparent as total length increased.

Yellow Perch: The 2009 mean gill net CPUE of stock-length yellow perch was 3.2 (Table 1) and below the minimum objective ( $\geq 30$  stock-length perch/net night). Since 2001, the gill net CPUE of stock-length yellow perch has fluctuated from a low of 2.5 (2006) to a high of 11.0 (2001), with the 2001-2009 average being 5.6 (Table 2). The 2009 gill net CPUE represented a slight increase from 2006, but still indicated low relative abundance.

Yellow perch captured in the 2009 gill net catch ranged in total length from 11 to 31 cm (4.3 to 12.2 in), had a PSD of 71, and a PSD-P of 6. The 2009 PSD and PSD-P values were above the objective ranges of 30-60 and 5-10 (Table 3). Otoliths collected from gill net captured yellow perch indicated that the 2007 year class currently dominates the size structure and most individuals exceed quality-length resulting in the high PSD (Table 7; Figure 4).

Although sample sizes were low, growth of yellow perch in Minnewasta Lake appears to be fast. In 2009, the weighted mean total length at capture for age-2 male yellow perch was 198 (7.8 in); while the weighted mean total length at capture for age-2 female yellow perch was 212 (8.3 in; Table 8). The majority of yellow perch sampled were in the quality-preferred length category which had a mean Wr of 102.

Other: Black bullhead, common carp, orangespotted sunfish, spottail shiner, white bass, and white sucker were other fish species captured in low numbers during the 2009 survey (Table 1).

### **Management Recommendations**

- 1) Conduct fish population assessment surveys on an every third year basis (next survey scheduled in summer 2012) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye and yellow perch to assess age structure and growth rates.
- 3) Stock walleye fry on a biennial basis (1,000 fry/acre) to establish additional year classes.
- 4) Monitor winterkill and summerkill events. In cases of substantial winter/summerkill stock with northern pike, walleye 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 experimental gill nets from Minnewasta Lake, 2009. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= black bullhead; COC= common carp; NOP=northern pike; OSF= orangespotted sunfish; 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	1.3	0.4	70	16	52	18	105	1
COC	0.2	0.1	100	0	100	0	97	29
NOP	0.2	0.2	100	0	25	59	83	7
OSF <sup>1</sup>	0.1	0.0	---	---	---	---	---	---
WAE	0.3	0.3	83	17	17	33	93	4
WHB	0.1	0.0	100	---	100	---	96	---
WHS	0.5	0.2	100	0	100	0	102	4
YEP	0.1	0.1	100	0	0	---	110	<1
<i>Gill Nets</i>								
BLB	0.2	0.2	0	---	0	---	87	---
COC	0.3	0.3	100	0	100	0	105	---
OSF <sup>1</sup>	0.2	0.2	---	---	---	---	---	---
SPS <sup>1</sup>	0.2	0.2	---	---	---	---	---	---
WAE	3.3	1.3	45	20	5	9	95	1
WHB	0.2	0.2	100	---	0	---	103	---
WHS	0.7	0.5	100	0	50	50	108	6
YEP	3.2	0.7	71	19	6	10	103	2

<sup>1</sup> 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 Minnewasta Lake, 2001-2009. BLB= black bullhead; BLC= black crappie; COC= common carp; NOP=northern pike; OSF= orangespotted sunfish; SPS= spottail shiner; WAE= walleye; WHB= white bass; WHS= white sucker; YEP= yellow perch

Species	CPUE			Mean
	2001	2006 <sup>1</sup>	2009	
<i>Frame nets</i>				
BLB	2.3	1.3	1.3	1.6
BLC	0.1	2.4	0.0	0.8
COC	0.0	0.1	0.2	0.1
NOP	0.1	0.7	0.2	0.3
OSF <sup>2</sup>	0.0	0.2	0.1	0.1
WAE	0.1	1.9	0.3	0.8
WHB	0.0	0.2	0.1	0.1
WHS	0.1	0.8	0.5	0.5
YEP	0.0	0.3	0.1	0.1
<i>Gill Nets</i>				
BLB	0.0	0.2	0.2	0.1
COC	0.0	0.0	0.3	0.1
NOP	3.7	1.2	0.0	1.6
OSF <sup>2</sup>	0.0	0.2	0.2	0.1
SPS <sup>2</sup>	0.0	0.0	0.2	0.1
WAE	7.8	10.7	3.3	7.3
WHB	0.0	0.0	0.2	0.1
WHS	2.7	2.5	0.7	2.0
YEP	11.0	2.5	3.2	5.6

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

<sup>2</sup> All fish sizes.

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 experimental gill nets from Minnewasta Lake, 2001-2009. NOP= northern pike; WAE = walleye; YEP = yellow perch

Species	2001	2006 <sup>1</sup>	2009	Average	Objective
<i>Gill nets</i>					
NOP					
CPUE	4	1	0	2	≥ 3
PSD	95	100	---	98	30-60
PSD-P	18	43	---	31	5-10
Wr	83	83	---	83	---
WAE					
CPUE	8	11	3	7	≥ 10
PSD	47	31	45	41	30-60
PSD-P	19	5	5	10	5-10
Wr	95	98	95	96	---
YEP					
CPUE	11	3	3	6	≥ 30
PSD	11	80	71	54	30-60
PSD-P	3	33	6	14	5-10
Wr	96	110	103	103	---

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

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 Minnewasta Lake, 2005-2009.

Survey Year	Year Class														
	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
2009		2	10	1	7	1					1				
2006 <sup>1</sup>	---	---	---		13	69	13	4	1		1	1	1		
2005 <sup>2</sup>	---	---	---	---		1	8	18	4	14	3				
# stocked															
fry	350	700			800	1000	1000		900						1900
sm. fingerling						34									16
lg. fingerling									2		1				

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

<sup>2</sup> Age estimates obtained from scales; otoliths used other years

Table 5. Stocking history including size and number for fishes stocked into Minnewasta Lake, 1995-2009.

Year	Species	Size	Number
1995	WAE	fry	1,900,000
1996	WAE	small fingerling	16,000
1999	WAE	large fingerling	1,200
2001	WAE	fry	900,000
2001	WAE	large fingerling	1,500
2003	WAE	fry	1,000,000
2004	WAE	fry	1,000,000
2004	WAE	small fingerling	34,000
2005	WAE	fry	800,000
2006	YEP	fingerling	5,440
2008	WAE	fry	700,000
2009	WAE	fry	350,000
2009	YEP	small fingerling	9,690

Table 6. Weighted mean length at capture (mm) for walleye age-1 through age-10 captured in experimental gill net sets (expanded sample size) from Minnewasta Lake, 2006-2009. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age									
	1	2	3	4	5	6	7	8	9	10
2009	202(2)	318(10)	375(1)	428(7)	442(1)	---	---	---	---	662(1)
2006	196(13)	279(69)	379(13)	442(4)	473(1)	---	619(1)	691(1)	660(1)	---
2001 <sup>1</sup>	204(1)	328(8)	355(18)	474(4)	509(14)	544(3)	---	---	---	---

<sup>1</sup> Age estimates obtained from scales; otoliths used other years

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

Survey Year	Year Class					
	2009	2008	2007	2006	2005	2004
2009		1	16			

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

Year	Age				
	1	2	3	4	5
2009					
Male	---	198 (2)	---	---	---
Female	112 (1)	212 (14)	---	---	---
Combined	112 (1)	210 (16)	---	---	---

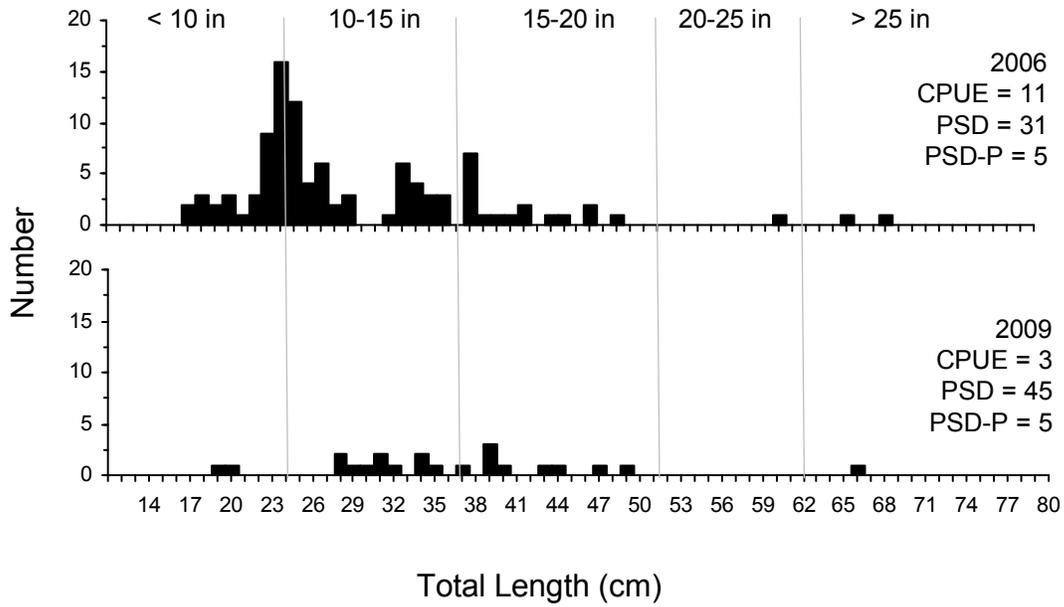


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured by gill nets in Minnewasta Lake, 2006 and 2009.

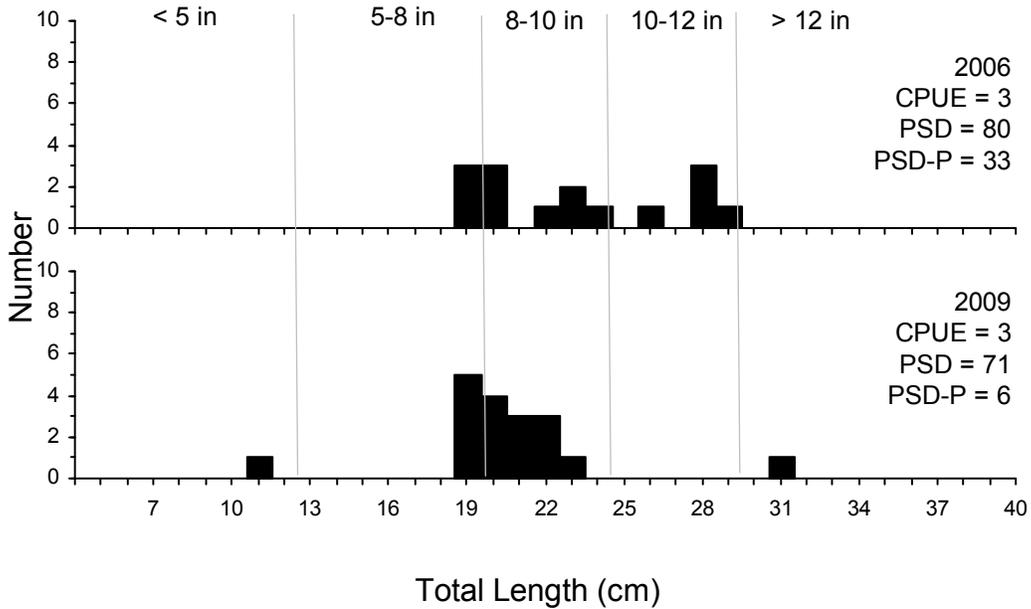


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured by gill nets in Minnewasta Lake, 2006 and 2009.