

# 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 12-14, 2012 (FN, GN)
Frame net sets (n)	17
Gill net sets (n)	6

### Morphometry (Figure 1)

Watershed area (acres)	11,969
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 lake cabins are present along the southeast shore.

### Watershed and Land Use

The 11,969 acre Rush Lake sub-watershed (HUC-12) encompasses Minnewasta Lake and is located within the larger (186,967 acres) Waubay Lakes watershed. Land use within the Waubay Lakes watershed is primarily agricultural with a mix of pasture or grassland, cropland, and woodland.

### Water Level Observations

No OHWM has been established by the South Dakota Water Management Board on Minnewasta Lake. The elevation of Minnewasta Lake on May 8, 2012 was 1804.0 fmsl and indicated a slight decrease from the fall 2011 elevation of 1804.6 fmsl. The water level had declined to an elevation of 1802.4 fmsl on September 26, 2012.

### Fish Management Information

Primary species	Northern Pike, Walleye, Yellow Perch
Other species	Black Bullhead, Black Crappie, Common Carp, Orangespotted Sunfish, Rock Bass, Smallmouth Bass, White Bass, White Sucker
Lake-specific regulations	none
Management classification	warm-water semi-permanent
Fish consumption advisories	none

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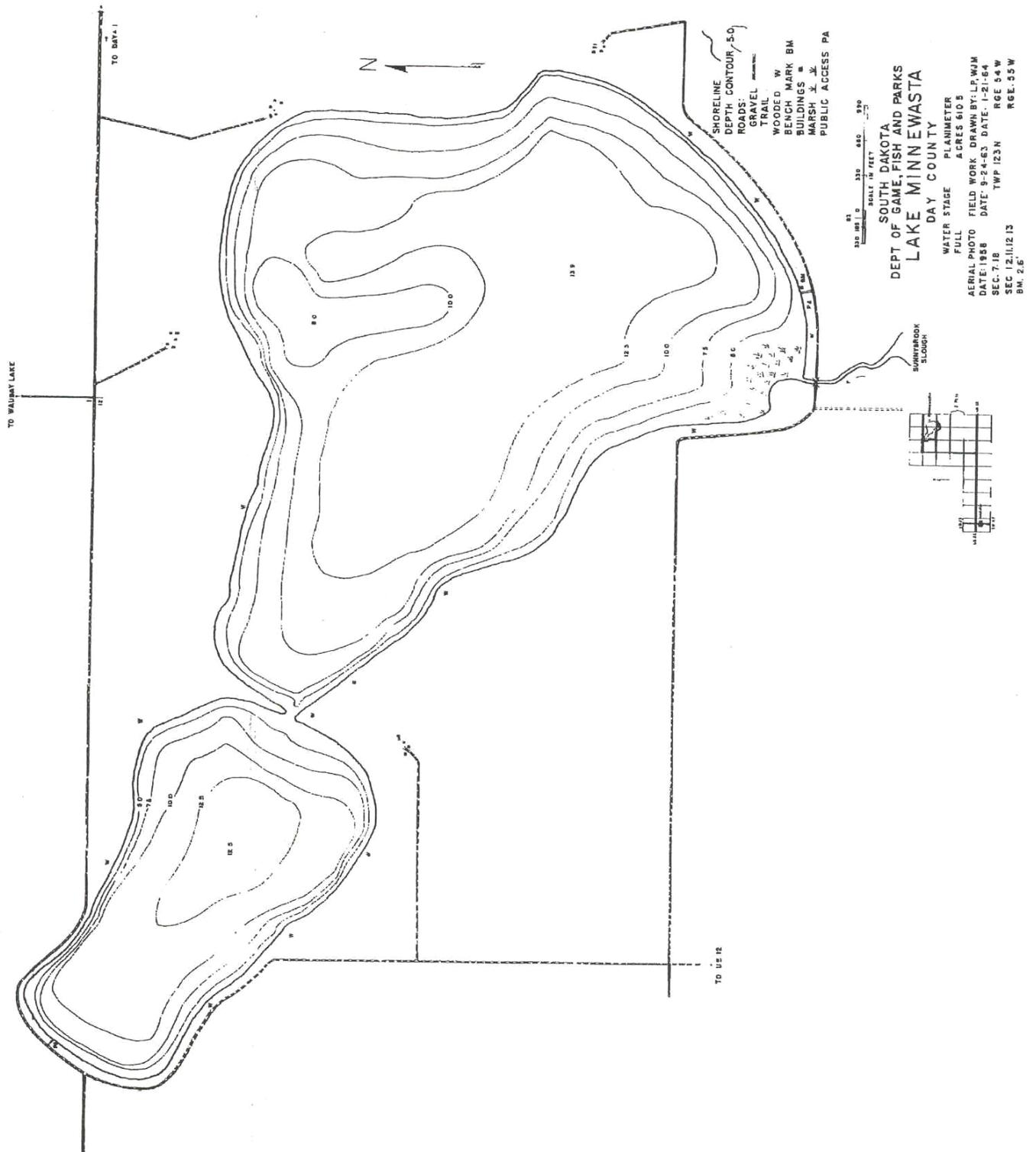


Figure 1. Contour Map of Minnewasta Lake, Day County, South Dakota.

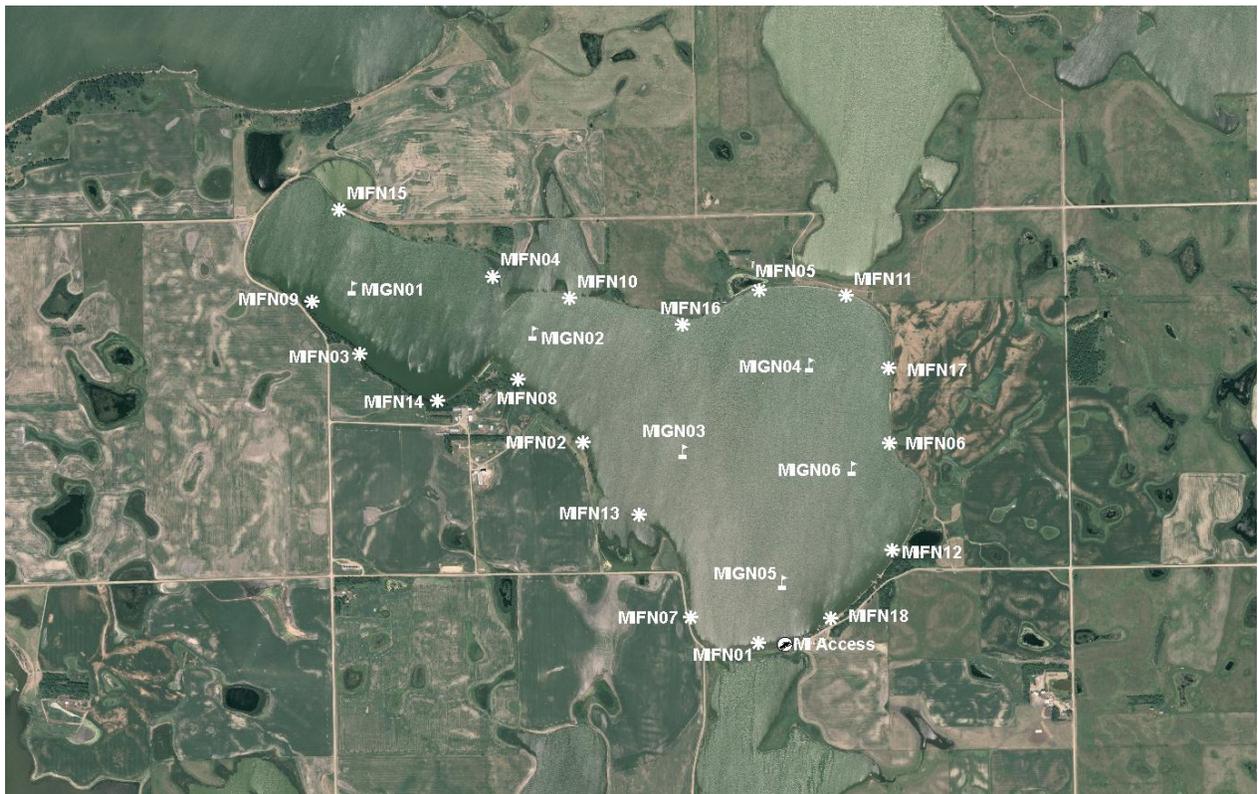
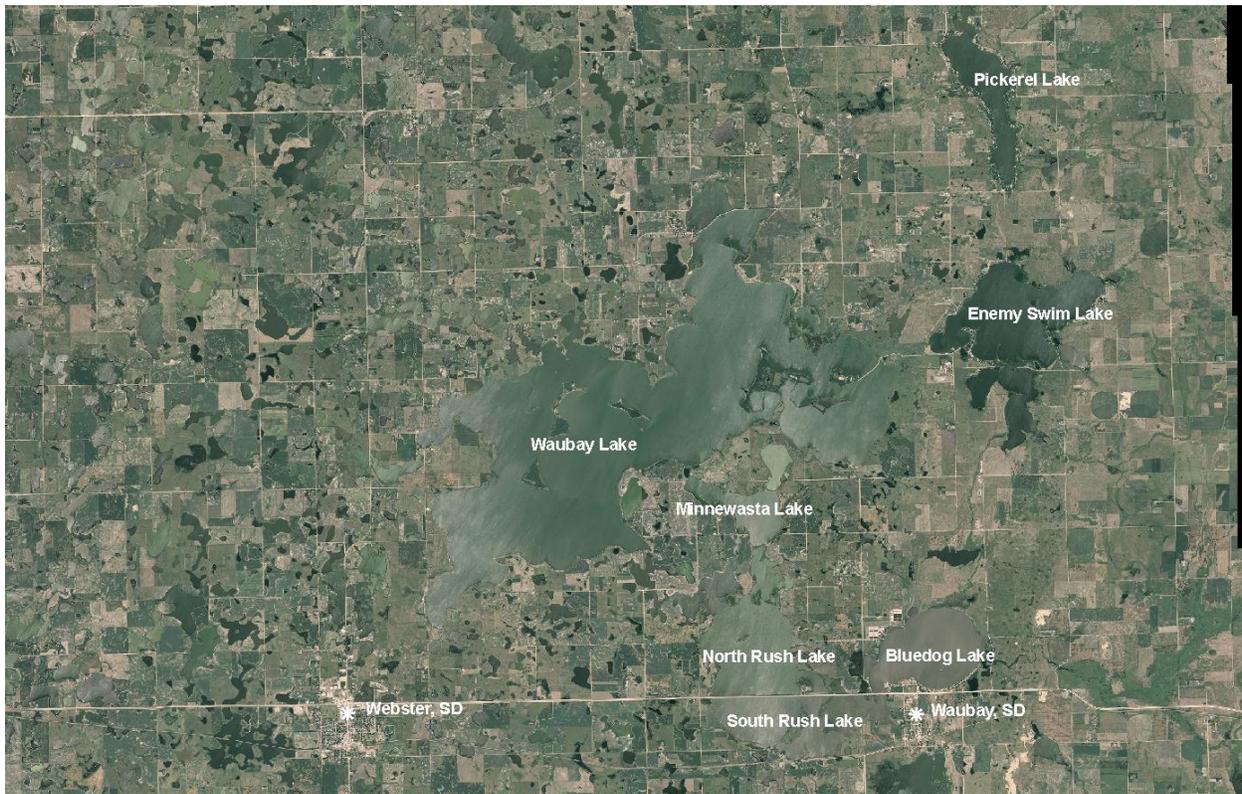


Figure 2. Map depicting location of several Day County, South Dakota lakes including Minnewasta Lake (top). Also noted, is the public access and standardized net locations for Minnewasta Lake. MIFN= frame nets; MIGN=gill nets

## 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 2012, the mean gill net CPUE of stock-length Northern Pike was 2.8 and is below the management objective ( $\geq 3$  stock-length Northern Pike/net night; Table 1). The 2012 mean gill net CPUE is the highest observed since 2001 (Table 2). Relative abundance is considered moderate.

Gill net captured Northern Pike ranged in TL from 46 to 90 cm (18.1 to 35.4 in.; Figure 3). The PSD was 88 and PSD-P was 18 (Table 1). Both PSD and PSD-P were above the management objective ranges (30-60 and 5-10, respectively; Table 3). Condition was good with the mean  $W_r$  values ranging from 81 to 102 for all length categories sampled. The mean  $W_r$  for stock-length Northern Pike was 86 (Table 1). An increasing trend in  $W_r$  was observed as TL increased.

Walleye: The mean gill net CPUE of stock-length Walleye during 2012 was 24.0 (Table 1) and above the minimum objective ( $\geq 10$  stock-length Walleye/net night; Table 3). The 2012 gill net CPUE is the highest observed since 2001 (Table 2) and indicates high relative abundance.

Walleye captured in gill nets during 2012 ranged in TL from 19 to 61 cm (7.5 to 24.0 in), had a PSD of 13 and a PSD-P of 2 (Figure 3). Both the 2012 PSD and PSD-P were below the management objectives ranges of 30-60 and 5-10, indicating a population dominated by Walleye less than quality length (Table 3; Figure 3).

Otoliths were collected from a sub-sample of Walleye in the 2012 gill net catch. Six Walleye year classes (2005, 2007-2011) were represented, with 2010 cohort comprising approximately 86% of the gill net sample (Table 4). The 2005, 2008-2009, and 2011 year-classes coincide with fry stocking; while the strong 2010 cohort does not coincide with a stocking event in Minnewasta Lake (Table 4; Table 6). However in 2010, approximately 2.2 million Walleye fry were stocked into North and South Rush Lakes, which are connected to Minnewasta Lake (Figure 2).

Walleye in Minnewasta Lake generally attain quality-length (38 cm; 15 in) during their fourth growing season at age 3 (Table 5). In 2012, the weighted mean length at capture for age-3 Walleye was 443 mm (17.4 in; Table 5). Condition of stock-length Walleye captured in the 2012 gill net catch was good with a mean  $Wr$  of 89 (Table 1). Mean  $Wr$  values ranged from 84 to 93 for all length categories sampled, and no length related trends in  $Wr$  were observed.

Yellow Perch: The 2012 mean gill net CPUE of stock-length Yellow Perch was 4.8 (Table 1) and below the minimum objective ( $\geq 30$  stock-length Yellow 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; Table 2). The 2012 gill net CPUE represented a slight increase from 2009, but still indicated low relative abundance.

Yellow Perch captured in the 2012 gill net catch ranged in TL from 9 to 33 cm (3.5 to 13.0 in.), had a PSD of 97, and a PSD-P of 76. Both the PSD and PSD-P values were well above the objective ranges of 30-60 and 5-10 (Table 3).

Although sample sizes were low, growth of Yellow Perch in Minnewasta Lake appears to be fast. In 2012, the weighted mean TL at capture for age-3 male Yellow Perch was 244 mm (9.6 in.); while the weighted mean TL at capture for age-3 female Yellow Perch was 263 mm (10.4 in; Table 8). Condition was good with mean  $Wr$  values ranging from 93 to 116 for all length categories sampled.

### *Other Species*

Black Bullhead: The 2012 mean frame net CPUE of stock-length Black Bullhead was 13.2 (Table 1) and is the highest observed since 2001 (Table 2). Relative abundance is considered moderate. Black Bullhead captured in the frame net sample ranged in TL from 10 to 38 cm (3.9 to 15.0 in.; Figure 6).

Black Crappie: The 2012 mean frame net CPUE of stock-length Black Crappie was 3.4 (Table 1) and is the highest observed since 2001 (Table 2). Relative abundance is considered low to moderate. Although relative abundance is low to moderate, adult Black Crappie are present and the possibility exists for the population to expand. Black Crappie captured in the frame net sample ranged in TL from 18 to 35 cm (7.1 to 13.8 in.; Figure 7).

Other: Common Carp, Rock Bass, Smallmouth Bass, White Bass, and White Sucker were other fish species captured during the 2012 survey (Table 1).

## **Management Recommendations**

- 1) Conduct fish population assessment surveys on an every third year basis (next survey scheduled in summer 2015) 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 fry on a biennial basis ( $\approx 500$  fry/acre) to establish additional year classes.
- 4) Collect otoliths from Walleye and Yellow Perch to assess age structure and growth rates.
- 5) Monitor winter and summer kill events. In cases of substantial winter/summer Northern Pike, Walleye, and Yellow Perch should be stocked 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, 2012. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90). BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP=Northern Pike; ROB= Rock Bass; SMB= Smallmouth 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	13.2	4.8	82	4	8	3	113	1
BLC	3.4	1.6	88	7	26	10	116	2
COC	0.1	0.1	100	---	0	---	128	---
NOP	0.5	0.3	75	31	38	35	87	5
ROB	0.2	0.1	67	67	0	---	116	7
SMB	0.1	0.1	50	50	0	---	127	10
WAE	5.6	1.6	27	8	15	6	88	1
WHB	2.8	1.2	100	0	73	11	102	1
WHS	0.5	0.3	100	0	100	0	102	5
YEP	0.4	0.2	100	0	83	34	106	6
<i>Gill Nets</i>								
BLB	3.0	1.1	33	20	0	---	113	3
BLC	0.2	0.2	0	---	0	---	133	---
COC	0.2	0.2	100	---	100	---	97	---
NOP	2.8	0.6	88	14	18	17	86	3
WAE	24.0	7.4	13	5	2	2	89	<1
WHS	1.7	0.7	100	0	90	18	110	5
YEP	4.8	2.8	97	6	76	14	112	2

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, 2001-2012. BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP=Northern Pike; OSF= Orangespotted Sunfish; ROB= Rock Bass; SMB= Smallmouth Bass; SPS= Spottail Shiner; WAE= Walleye; WHB= White Bass; WHS= White Sucker; YEP= Yellow Perch

Species	CPUE			
	2001	2006 <sup>2</sup>	2009	2012
<i>Frame nets</i>				
BLB	2.3	1.3	1.3	13.2
BLC	0.1	2.4	0.0	3.4
COC	0.0	0.1	0.2	0.1
NOP	0.1	0.7	0.2	0.5
OSF <sup>1</sup>	0.0	0.2	0.1	0.0
ROB	0.0	0.0	0.0	0.2
SMB	0.0	0.0	0.0	0.1
WAE	0.1	1.9	0.3	5.6
WHB	0.0	0.2	0.1	2.8
WHS	0.1	0.8	0.5	0.5
YEP	0.0	0.3	0.1	0.4
<i>Gill Nets</i>				
BLB	0.0	0.2	0.2	3.0
BLC	0.0	0.0	0.0	0.2
COC	0.0	0.0	0.3	0.2
NOP	3.7	1.2	0.0	2.8
OSF <sup>1</sup>	0.0	0.2	0.2	0.0
SPS <sup>1</sup>	0.0	0.0	0.2	0.0
WAE	7.8	10.7	3.3	24.0
WHB	0.0	0.0	0.2	0.0
WHS	2.7	2.5	0.7	1.7
YEP	11.0	2.5	3.2	4.8

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

<sup>2</sup> Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

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, 2001-2012. NOP= Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2001	2006 <sup>1</sup>	2009	2012	Objective
<i>Gill nets</i>					
NOP					
CPUE	4	1	0	3	≥ 3
PSD	95	100	---	88	30-60
PSD-P	18	43	---	18	5-10
Wr	83	83	---	86	---
WAE					
CPUE	8	11	3	24	≥ 10
PSD	47	31	45	13	30-60
PSD-P	19	5	5	2	5-10
Wr	95	98	95	89	---
YEP					
CPUE	11	3	3	5	≥ 30
PSD	11	80	71	97	30-60
PSD-P	3	33	6	76	5-10
Wr	96	110	103	112	---

<sup>1</sup> Monofilament gill net mesh size (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 1,000) from Minnewasta Lake, 2006-2012.

Survey Year	Year Class														
	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
2012		3	126	3	12	1		2							
2009	---	---	---	---	2	10	1	7	1						1
2006 <sup>1,2</sup>	---	---	---	---	---	---		13	69	13	4	1		1	1
# stocked															
fry		300		350	700			800	1000	1000		900			
sm. fingerling									34						
lg. fingerling												2			1

<sup>1</sup> Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

<sup>2</sup> Older Walleye were sampled, but are not reported in this table

Table 5. 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, 2006-2012. 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
2012	193(3)	318(126)	443(3)	454(12)	493(1)	---	571(2)	---	---	---
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)	---

Table 6. Stocking history including size and number for fishes stocked into Minnewasta Lake, 1998-2012. WAE=Walleye, YEP=Yellow Perch

Year	Species	Size	Number
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
2011	WAE	fry	300,000

Table 7. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from Minnewasta Lake, 2009-2012.

Survey Year	Year Class							
	2012	2011	2010	2009	2008	2007	2006	2005
2012		14	4	8	11	5		1
2009	---	---	---		1	16		

Table 8. Weighted mean TL (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Minnewasta Lake, 2009-2012.

Year	Age						
	1	2	3	4	5	6	7
2012							
Male	117 (1)	---	244 (2)	---	288 (1)	---	---
Female	100 (13)	213 (4)	263 (6)	300 (11)	310 (4)	---	339 (1)
Combined	101 (14)	213 (4)	258 (8)	300 (11)	305 (5)	---	339 (1)
2009							
Male	---	198 (2)	---	---	---		
Female	112 (1)	212 (14)	---	---	---		
Combined	112 (1)	210 (16)	---	---	---		

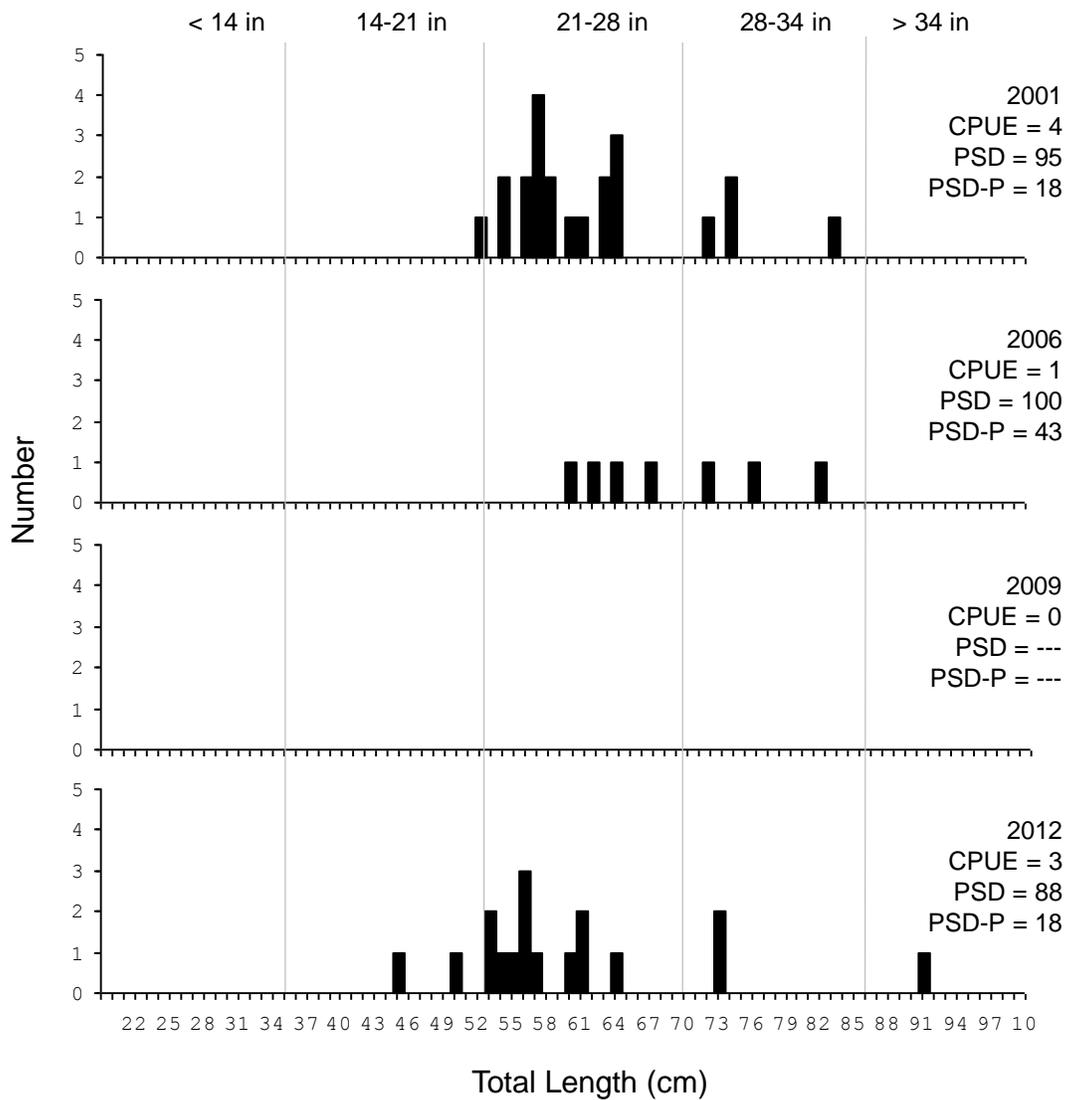


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using gill nets in Minnewasta Lake, 2001-2012.

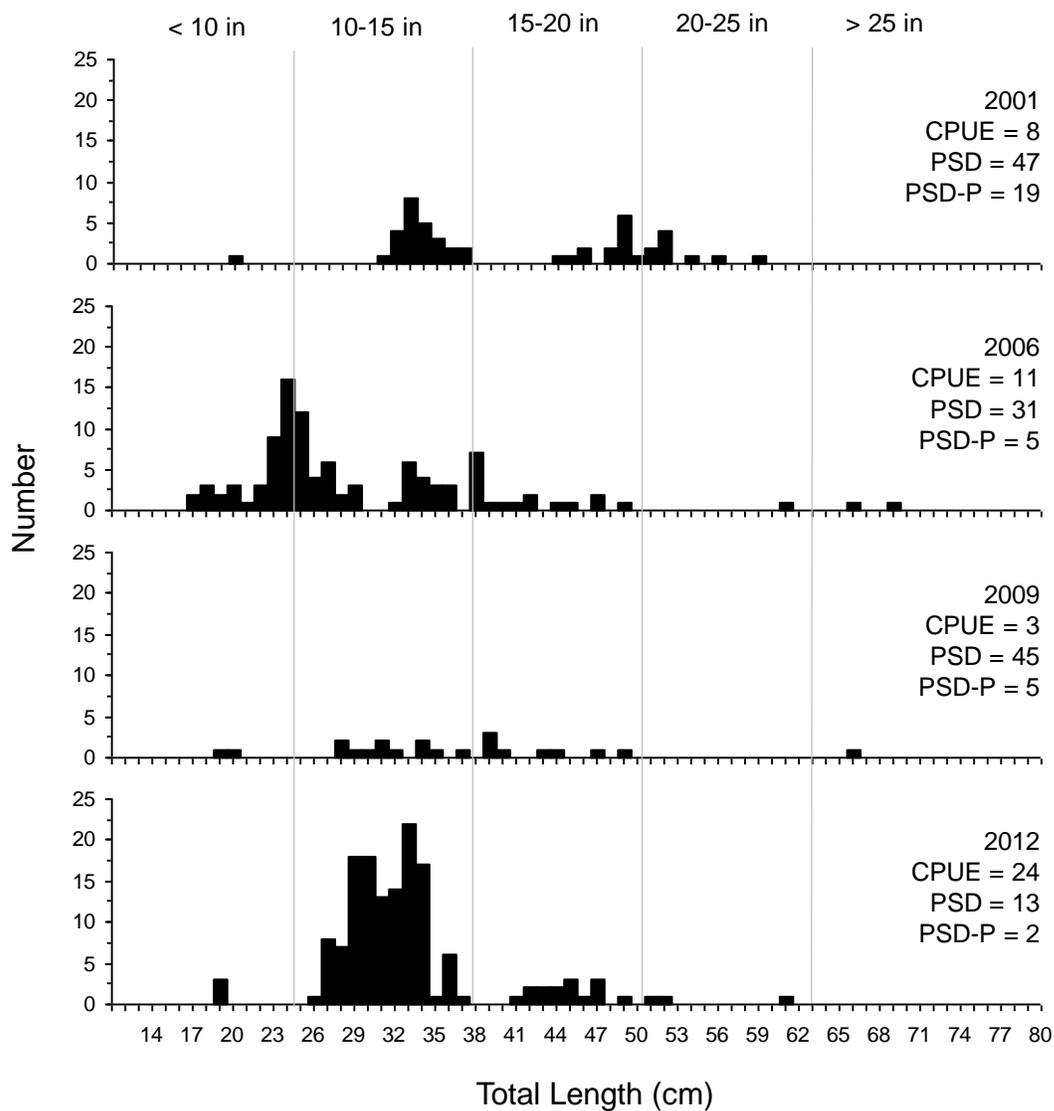


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in Minnewasta Lake, 2001-2012.

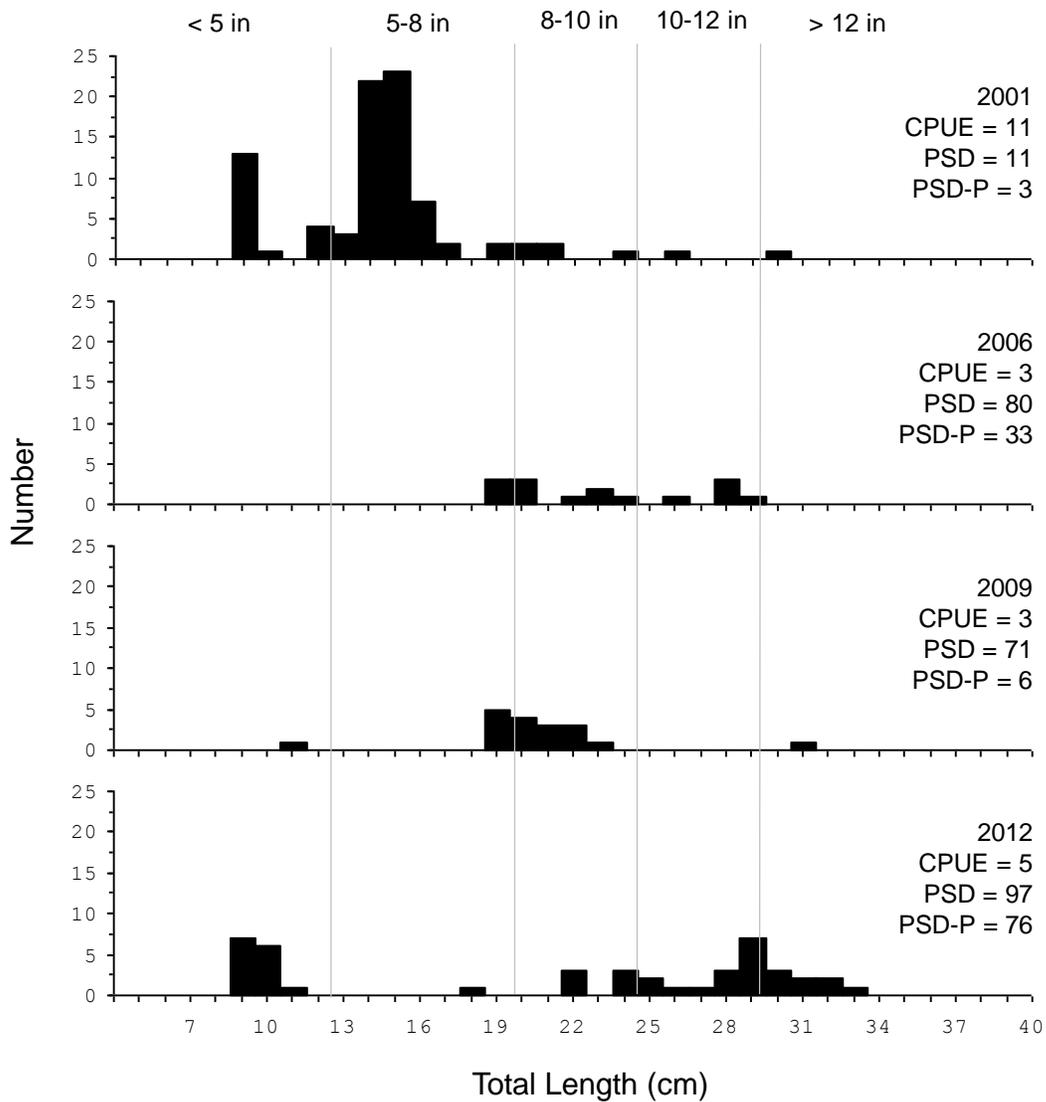


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Minnewasta Lake, 2001-2012.

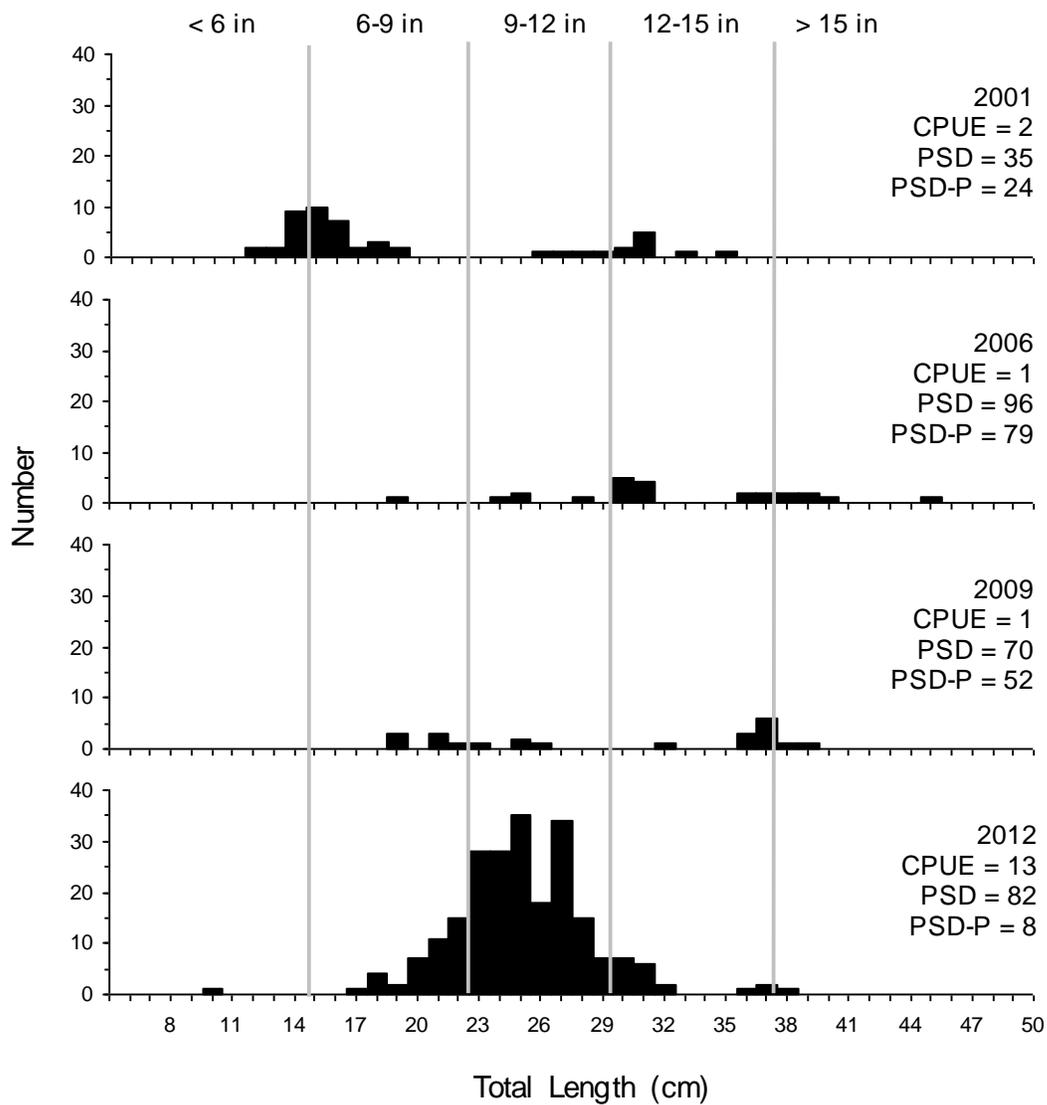


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in Minnewasta Lake, 2001-2012.

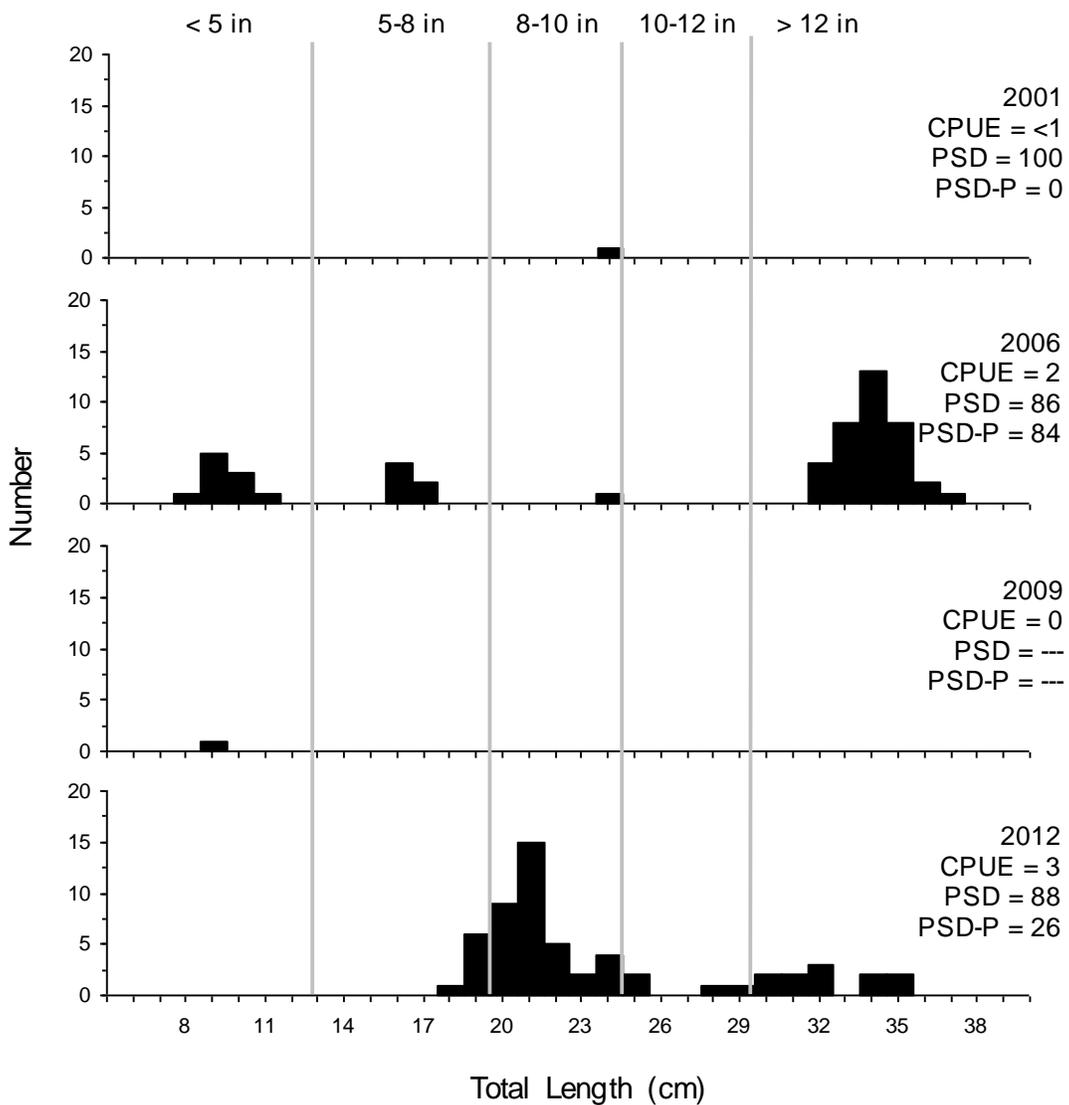


Figure 7. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Crappie captured using frame nets in Minnewasta Lake, 2001-2012.