White Lake

Site Description

Location

Water designation number (WDN)	48-0031-00
Legal description	T128N-R57W-Sec.25,36
County (ies)	Marshall
Location from nearest town	6 miles east and 4 miles north of Britton, SD

Survey Dates and Sampling Information

Survey dates	June 5-6, 2012 (FN, GN)
Frame net sets (n)	12
Gill net sets (n)	3

Morphometry

Watershed area (acres)	21,184
Surface area (acres)	187
Maximum depth (ft)	20
Mean depth (ft)	8

Ownership and Public Access

White Lake is an impoundment created by The Works Progress Administration (WPA) in 1938 and is managed by the SDGFP. A public access site is located on the western shore off Highway 27, just south of the dam and is maintained by the SDGFP (Figure 1; Figure 2). Lands adjacent to White Lake are under state and private ownership.

Watershed and Land Use

Land use within the White Lake watershed primarily is agricultural including pasture (70%), cropland (20%), and scattered shelterbelts (10%; Hanson et al. 2005).

Water Level Observations

Water levels on White Lake are not monitored by SDDENR.

Fish Management Information

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

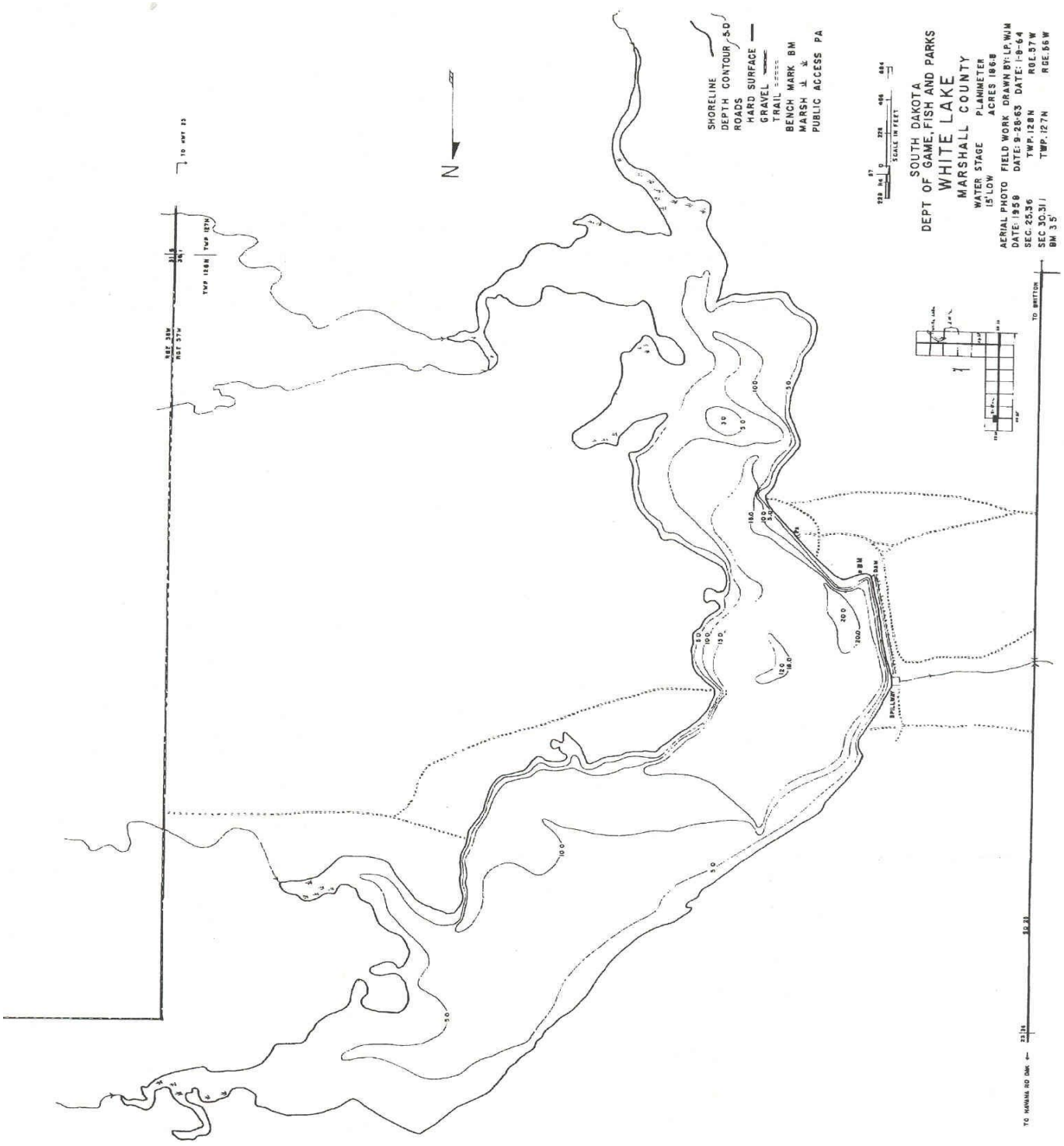

Figure 1. Map depicting depth contours of White Lake, Marshall County, South Dakota.

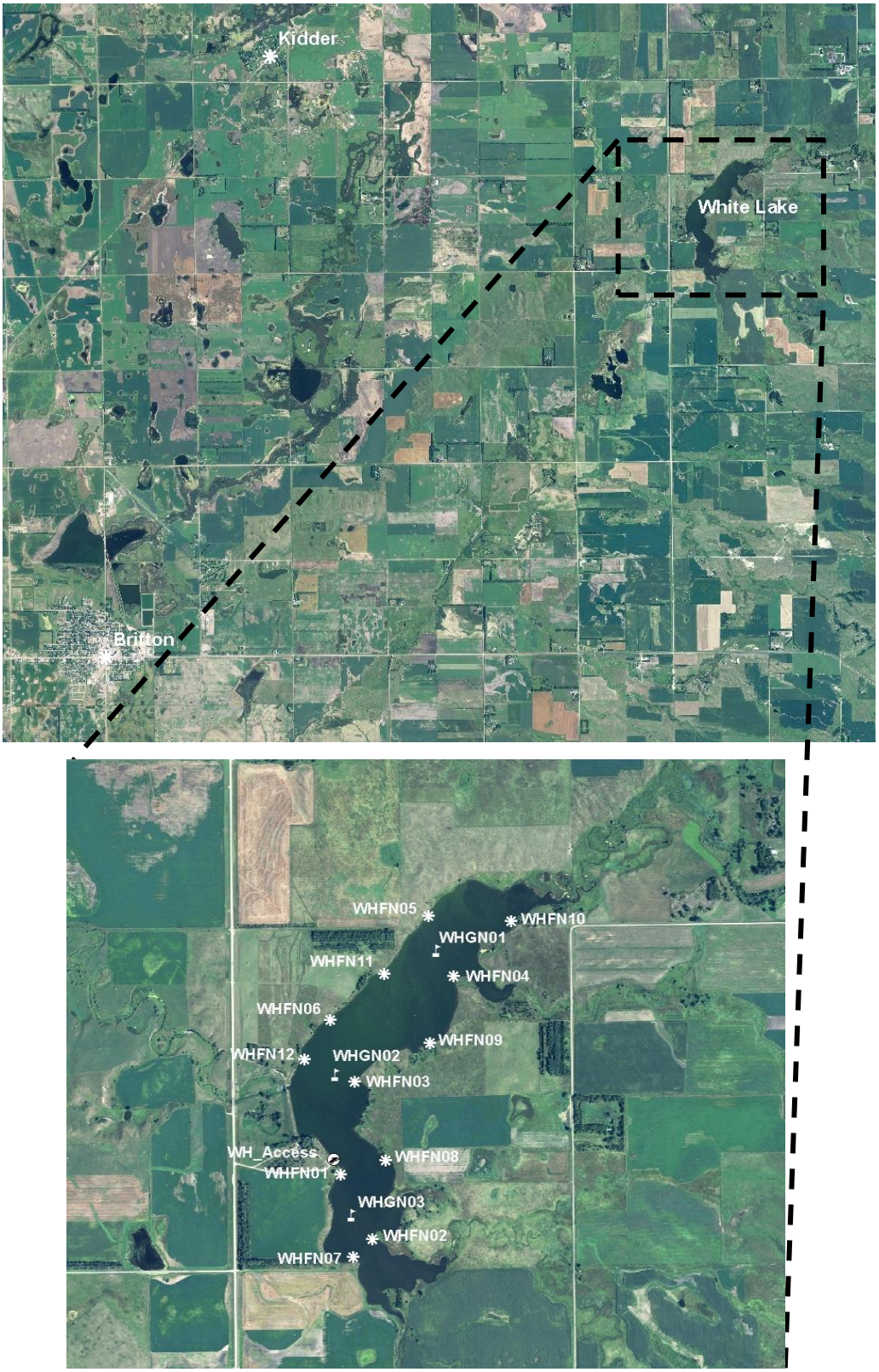

Figure 2. Map depicting geographic location of White Lake from Britton, Marshall County, South Dakota (top). Also noted are access and standardized net locations for White Lake (bottom). WHFN= frame net; WHGN= gill net

Management Objectives

1) Maintain a mean frame net CPUE of stock-length Black Crappie ≥ 10, a PSD of 30-60, and a PSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock-length Walleye ≥ 10, a PSD of 30-60, and a PD-P of 5-10.

3) Maintain a mean gill net CPUE of stock-length Yellow Perch ≥ 25, a PSD of 30-60, and a PSD-P of 5-10.

4) Maintain a mean frame net CPUE of stock-length Black Bullhead ≤ 100.

Results and Discussion

White Lake is an impoundment on the Wild Rice River in northeast South Dakota. The dam creating White Lake was constructed by the WPA in 1938 and was built to help control flooding on lower portions of the Wild Rice River. Water exiting White Lake enters the Wild Rice River which is a tributary of the Red River of the North. Currently, White Lake is managed as a Black Crappie, Walleye, and Yellow Perch fishery.

Primary Species

Black Crappie: The mean frame net CPUE for stock-length Black Crappie in 2012 was 166.7 and well above the minimum objective (≥ 10 stock-length Black Crappie/ net night; Table 3). Mean frame net CPUE values from 2003 to 2012 have ranged from 47.3 (2008) to 166.9 (2012) indicating consistently high relative abundance (Table 2).

Frame net captured Black Crappie ranged in TL from 16 to 33 cm (6.3 to 13.0 in; Figure 3). The PSD of 40 was within the management objective (30-60) and PSD-P of 17 was slightly above the management objective (5-10; Table 3) indicating a relatively balanced population.

Otoliths were collected from a sub-sample of frame net captured Black Crappie. Six year-classes (2003-2007, 2010) were present (Table 4). The 2010 year class was the best represented comprising approximately 83% of the frame net catch (Table 4). The absence of the 2008 and 2009 year-classes from the sample indicates some inconsistency among recruitment (Table 4). However, strong recruitment most years appears to maintain the population abundance well above management goals.

Growth and condition appears to be good in spite of high abundance. The weighted mean TL at capture for age-2 and age-5 Black Crappie was 194 and 290 mm, respectively (7.6 and 11.4 in; Table 5). Condition was excellent with mean Wr values ranging from 92 to 120 for all length categories (e.g., stock to quality) sampled. However, mean Wr values may have been influenced by seasonal sampling bias (i.e.,

spawning behavior) during 2012. A decreasing trend in Wr was observed as TL increased.

Walleye: The mean gill net CPUE of stock-length Walleye was 5.3 (Table 1) and below the minimum objective (≥ 10 stock-length Walleye/net night; Table 3). Since 2003, mean gill net CPUE values for stock-length Walleye have ranged from 1.7 (2007) to 10.0 (2008; Table 2). The 2012 gill net CPUE indicates moderate relative abundance.

Gill net captured Walleye ranged in TL from 32 to 52 cm (12.6 to 20.5 in; Figure 4). The PSD of 75 was above the management objective (30-60) and PSD-P of 6 was within the management objective (5-10; Table 3, Figure 4).

Otoliths were collected from a sub-sample of gill net captured Walleye. Five year classes (2005, 2007-2010) were present in the gill net sample (Table 6). The 2005, 2008 and 2010 year classes coincide with stocking events (Table 6). The 2007 and 2009 year classes were naturally produced (Table 6). The contribution of stocked or naturally-produced Walleye to year classes produced during stocked years is unknown, as stocked Walleye were unmarked making it difficult to differentiate stocked from naturally-produced Walleye.

The weighted mean TL at capture for age-2 and age-3 Walleye was 333 and 411 mm, respectively (13.1 and 16.2 in; Table 7). Gill net captured Walleye were in good condition with mean Wr values ranging from 78 to 92 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Walleye was 89 (Table 1) and no length-related trends in condition were apparent.

Yellow Perch: The mean gill net CPUE for Yellow Perch in 2012 was 17.7 and was below the minimum objective (≥ 30 stock-length Yellow Perch/net night; Tables 1, 3). Mean gill net CPUE values from 2003 to 2012 ranged from 7.7 (2007) to 81.0 (2003; Table 2). Currently, relative abundance is considered moderate.

Gill net captured Yellow Perch ranged in TL from 10 to 26 cm (3.9 to 10.2 in), had a PSD of 70 and PSD-P of 2 (Tables 1,3; Figure 5). The PSD was above the management objective of 30-60; while the PSD-P was below the management objective range of 5-10, indicating a population comprised of a high proportion of small (i.e., <20 cm; 8 in) Yellow Perch (Table 3; Figure 5). Based on age estimates made using otoliths, four consecutive year classes (2008-2011) were represented in the gill net catch indicating consistent recruitment (Table 9).

The weighted mean TL at capture for age-2 and age-3 male Yellow Perch was 189 and 214 mm (7.4 and 8.4 in); while the weighted mean TL at capture for age-2 and age-3 female Yellow Perch was 197 and 226 mm (7.8 and 8.9 in; Table 10). Gill net captured Yellow Perch had high condition, with mean Wr values that ranged from 94 to 120 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Yellow Perch was 107 (Table 1) and a decreasing trend in Wr was observed as TL increased in 2012.

Other Species

Black Bullhead: The mean frame net CPUE for Black Bullhead in 2012 was 114.4 and was a substantial increase from the 14.5 observed in 2008 (Tables 1, 2). The mean frame net CPUE was above the management objective (≤ 100 stock-length Black Bullhead/ net night; Table 3). Relative abundance of Black Bullhead in White Lake is considered high.

Northern Pike: The mean gill net CPUE in 2012 was 0.7 (Table 1). From 2003 to 2012 the mean gill net CPUE ranged from 0.7 (2006, 2012) to 2.7 (2005; Table 2). Relative abundance of Northern Pike in White Lake is considered low.

Other: Both Common Carp and White Sucker were captured in 2012 survey (Table 1).

Management Recommendations

1) Conduct fish community assessment surveys utilizing gill nets and frame nets every four years (next survey scheduled in summer 2016) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from Black Crappie, Walleye and Yellow Perch to assess the age structure and growth rates of each population.

3) Stock walleye provided water levels are favorable (i.e., lake is full), excess walleye are available, and other higher priority stockings have been completed.

4) Monitor water levels and winter/summer kill events. In cases of substantial winter/summer kill the need to re-establish a fishery in White Lake should be evaluated. If water levels are sufficient; Black Crappie, 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 (PSD-P) fish, and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets from White Lake, 2012. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; YEP= Yellow Perch

	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Frame nets								
BLB	114.4	43.8	22	2	1	0	99	1
BLC	166.9	35.2	40	2	17	1	115	1
WAE	0.3	0.3	0	---	0	---	88	2
WHS	3.9	1.7	100	0	98	4	86	1
YEP	2.4	0.7	69	15	0	---	98	1
Gill nets								
BLB	89.7	47.7	4	2	0	---	104	1
COC	0.3	0.6	0	---	0	---	93	---
NOP	0.7	1.3	100	0	50	50	97	19
WAE	5.3	6.7	75	20	6	11	89	2
WHS	3.7	2.7	100	0	64	28	96	3
YEP	17.7	10.1	70	11	2	3	107	1

Table 2. Historic mean catch rate (CPUE; gill nets = catch/net night, electrofishing = catch/hour) of stock-length fish for various fish species captured in frame nets and experimental gill nets from White Lake, 2003-2012. BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; YEP= Yellow Perch

	CPUE						
Species	2003	2004	2005	2006[1]	2007[1]	2008	2012
Frame nets							
BLB	25.4	---	---	11.1	---	14.5	114.4
BLC	132.1	---	---	49.8	---	47.3	166.9
COC	0.0	---	---	0.3	---	0.0	0.0
NOP	0.3	---	---	0.1	---	0.2	0.0
WAE	0.0	---	---	0.3	---	2.5	0.3
WHS	1.1	---	---	8.1	---	3.3	3.9
YEP	4.3	---	---	18.9	---	0.6	2.4
Gill nets							
BLB	11.0	20.7	11.7	4.3	8.7	25.0	89.7
BLC	18.0	33.3	15.7	9.3	4.7	3.7	0.0
COC	0.0	2.0	3.0	4.0	4.3	0.3	0.3
NOP	1.7	2.0	2.7	0.7	0.3	1.7	0.7
WAE	5.0	8.0	7.7	4.3	1.3	10.0	5.3
WHS	3.7	1.3	0.7	2.7	3.0	3.3	3.7
YEP	81.0	76.7	26.0	47.0	7.7	18.0	17.7

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

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 mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from White Lake, 2003-2012. BLB= Black Bullhead; BLC= Black Crappie; WAE= Walleye; YEP= Yellow Perch

Species	2003	2004	2005	2006	2007	2008	2012	Objective
Frame nets								
BLB								
CPUE	25	---	---	11	---	15	114	< 100
PSD	64	---	---	83	---	91	22	---
PSD-P	0	---	---	2	---	6	1	---
Wr	95	---	---	91	---	96	99	---
BLC								
CPUE	132	---	---	50	---	47	167	≥ 10
PSD	93	---	---	81	---	99	40	30-60
PSD-P	58	---	---	12	---	18	17	5-10
Wr	100	---	---	103	---	94	115	---
Gill nets								
WAE								
CPUE	5	8	8	4	1	10	5	≥ 10
PSD	7	100	96	46	50	3	75	30-60
PSD-P	7	13	9	23	25	0	6	5-10
Wr	92	96	92	90	84	88	89	---
YEP								
CPUE	81	77	26	47	8	18	18	≥ 30
PSD	10	57	40	33	43	72	70	30-60
PSD-P	0	2	0	0	4	2	2	5-10
Wr	99	80	91	108	94	102	107	---

[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 Black Crappie sampled in frame nets from White Lake 2006-2012.

	Year Class													
Survey Year	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
2012			1657			40	20	172	38	79				
2008[1]	---	---	---	---				194	264	56	27	2		17
2006	---	---	---	---	---	---			61	468	12	7	4	20

[1] Older Black Crappie were sampled, but are not reported in this table

Table 5. Weighted mean TL at capture (mm) for Black Crappie age-2 through age-10 sampled in frame nets (expanded sample size) from White Lake, 2006-2012. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

	Age								
Year	2	3	4	5	6	7	8	9	10
2012	194(1657)	---	---	290(40)	287(20)	311(172)	298(38)	310(79)	---
2008	---	214(194)	234(264)	261(56)	273(27)	284(2)	---	254(17)	304(6)
2006	166(61)	218(468)	274(12)	258(7)	286(4)	292(20)	308(1)	---	---

[1] Older Black Crappie were sampled, but are not reported in this table

Table 6. 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 White Lake, 2006-2012.

	Year Class										
Survey Year	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
2012			3	6	5	1		1			
2008	---	---	---	---		2	7	23			
2007[1]	---	---	---	---	---			1	1		1
2006[1]	---	---	---	---	---	---		2	5	2	5
# stocked											
fry	200				250						
sm. fingerling			24				19				
lg. fingerling								10			

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

Table 7. Weighted mean TL at capture (mm) for Walleye sampled in experimental gill nets (expanded sample size) from White Lake, 2005-2012. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

	Age							
Year	1	2	3	4	5	6	7	8
2012	---	333(3)	411(6)	460(5)	454(1)	---	520(1)	---
2008	209(2)	286(7)	343(23)	---	---	---	---	---
2007	---	322(1)	330(1)	---	498(1)	---	---	---
2006	226(2)	300(5)	371(2)	509(5)	---	---	---	---
2005	---	255(1)	---	460(21)	---	---	---	664(1)

Table 8. Stocking history including size and number for fishes stocked into White Lake, 2002-2012. WAE= Walleye;

Year	Species	Size	Number
2005	WAE	large fingerling	10,230
2006	WAE	small fingerling	19,000
2008	WAE	fry	250,000
2010	WAE	small fingerling	23,540
2012	WAE	fry	200,000

Table 9. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from White Lake, 2012.

	Year Class				
Survey Year	2012	2011	2010	2009	2008
2012		2	24	26	3

Table 10. Weighted mean TL (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from White Lake, 2012.

	Age			
Year	1	2	3	4
2012				
Male	---	189 (4)	214 (5)	226 (1)
Female	104 (2)	197 (20)	226 (22)	261 (1)
Combined	104 (2)	195 (24)	223 (26)	238 (3)

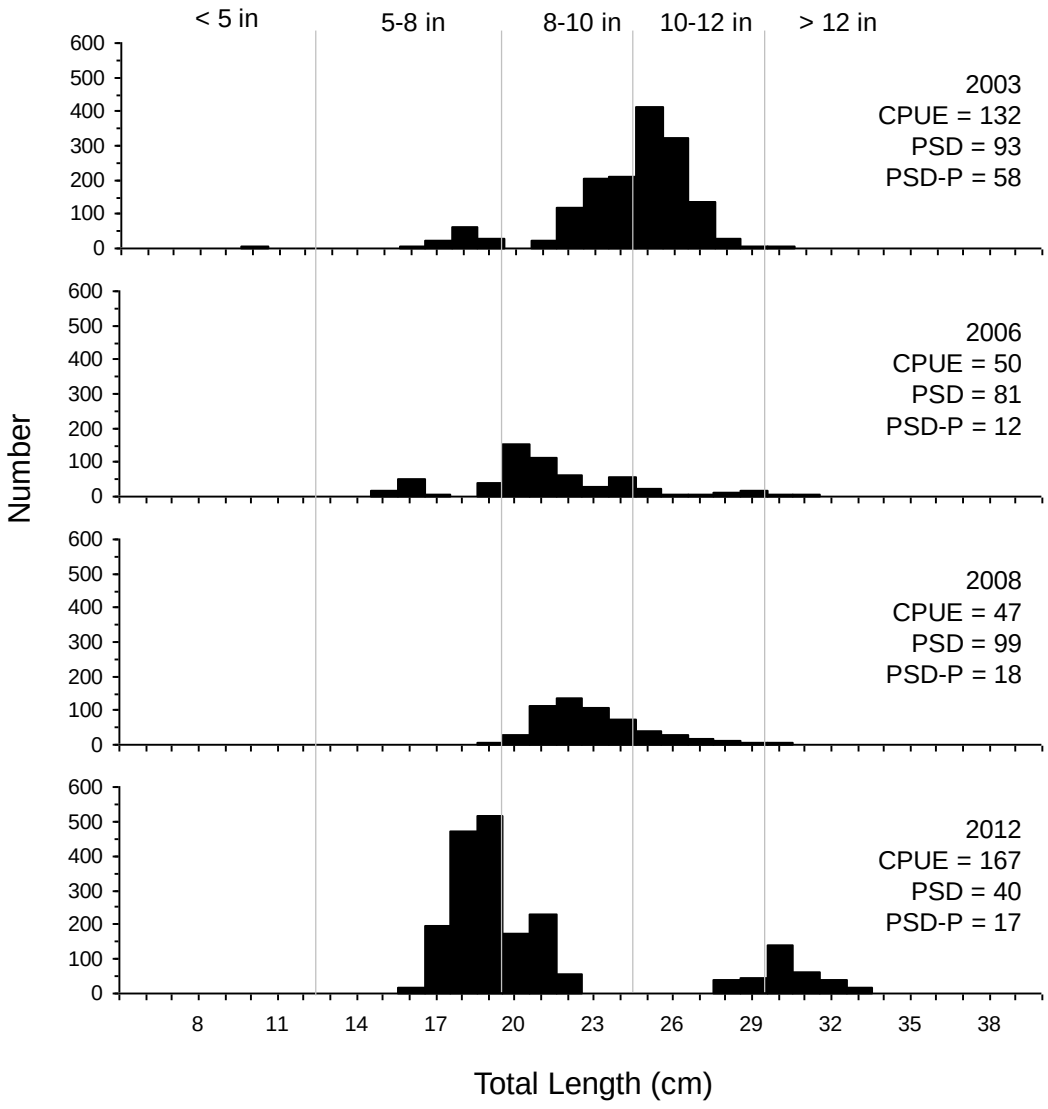

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Crappie captured using frame nets in White Lake, 2003-2012.

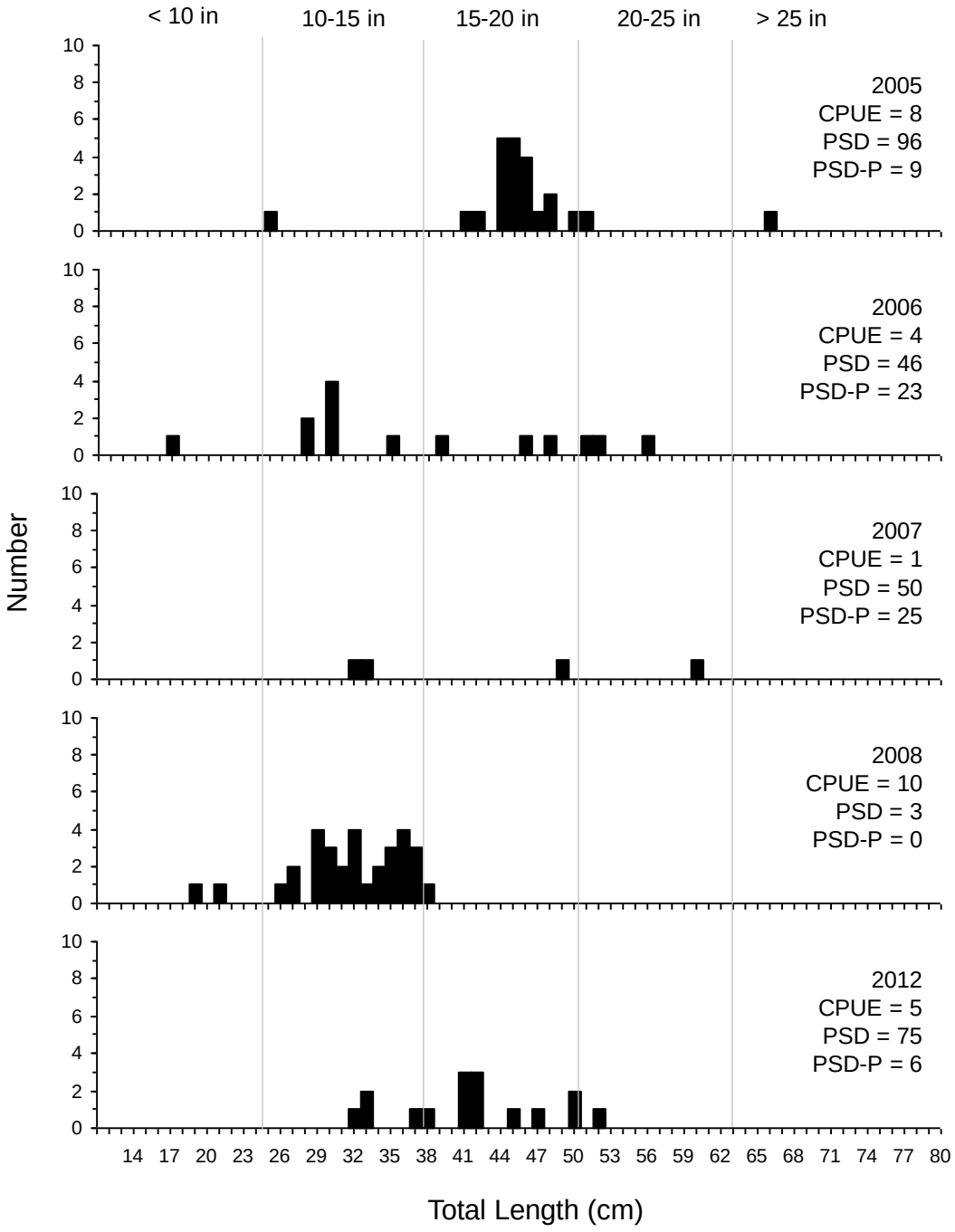

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in White Lake, 2005-2012.

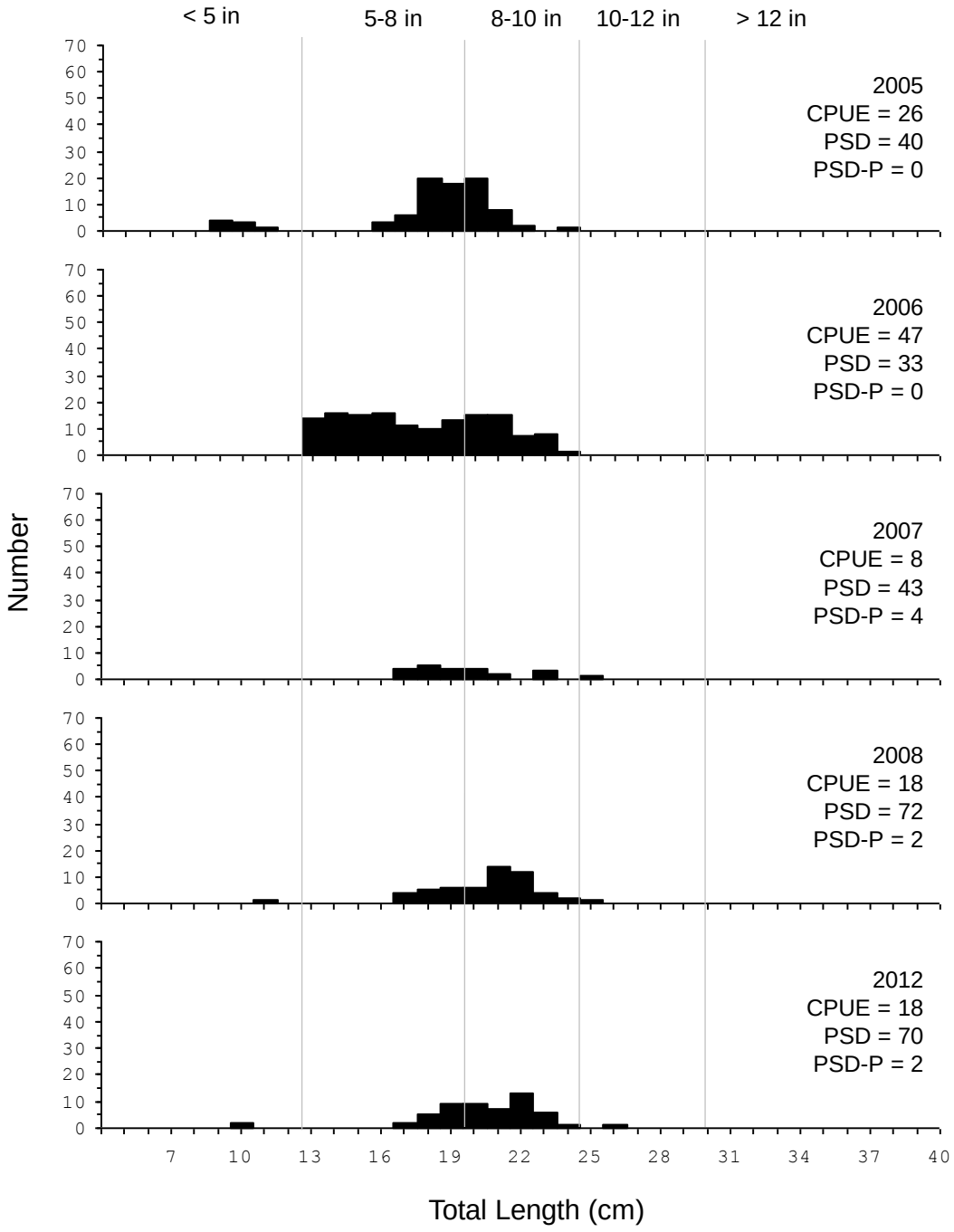

Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in White Lake, 2005-2012.

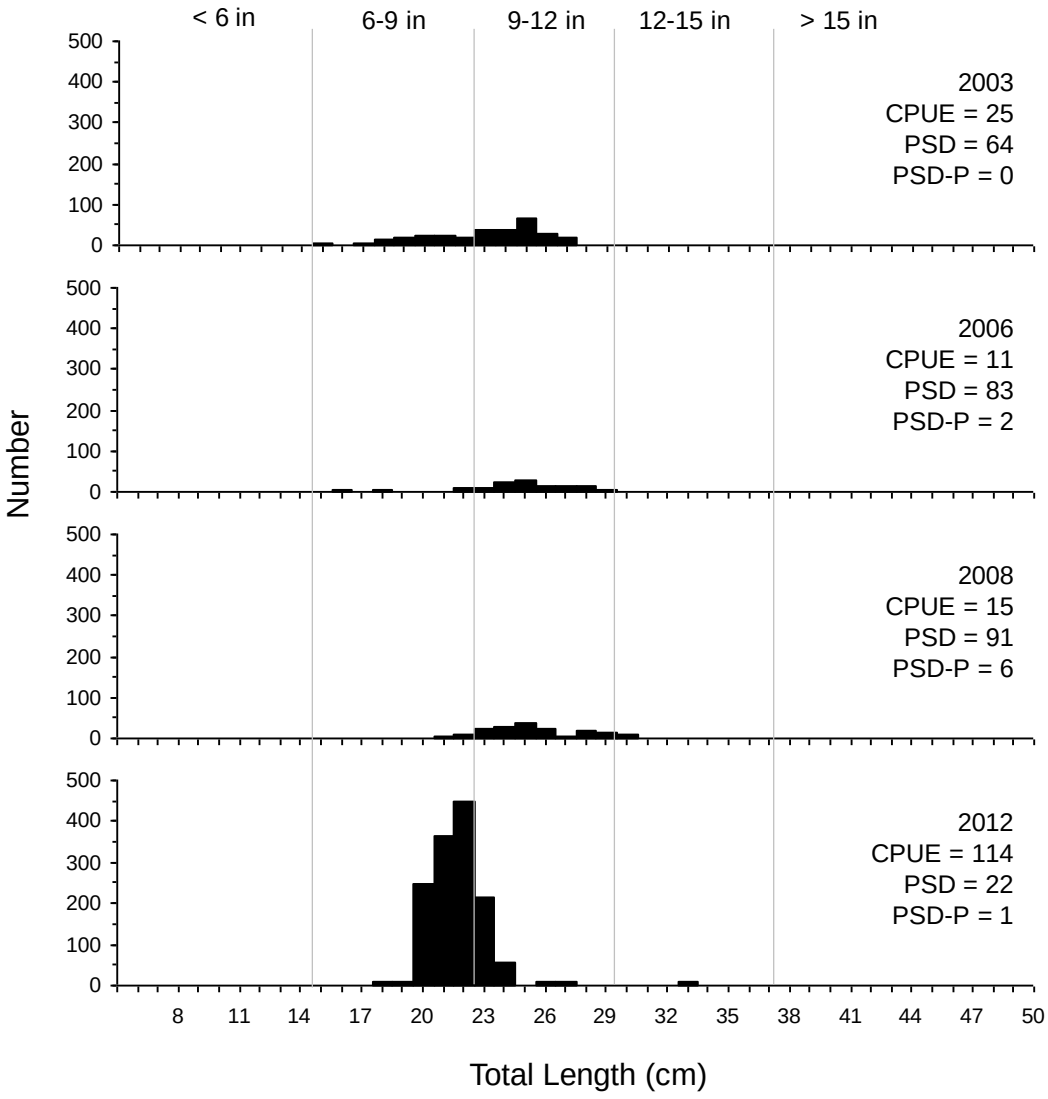

Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in White Lake, 2003-2012.