North Drywood Lake

Site Description

Location

Water designation number (WDN)	55-0009-00
Legal description	T125N-R52W-Sec. 15,16,17,21,22
County (ies)	Roberts
Location from nearest town	5.0 miles west and 3.0 miles south of Sisseton, SD

Survey Dates and Sampling Information

Survey dates	May 28-39, 2013 (FN, GN)
Frame net sets (n)	17
Gill net sets (n)	6

Morphometry

Watershed area (acres)	9,463
Surface area (acres)	≈1,100
Maximum depth (ft)	≈14
Mean depth (ft)	unknown

Ownership and Public Access

North Drywood Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. Public access is limited to a single primitive boat ramp (i.e., constructed using over-sized rock and gravel) located on the north shore or flooded road rights-of-way. Lands adjacent to North Drywood Lake are under mixed ownership including the Bureau of Indian Affairs, State of South Dakota and private individuals.

Watershed and Land Use

The 9,463 acre Drywood Lakes sub-watershed (HUC-12) is located within the larger Lower Little Minnesota River (HUC-10) watershed. Land use within the watershed is primarily agricultural including a mix of pasture or grassland, cropland, and scattered shelterbelts.

Water Level Observations

On May 16, 2013 the elevation of the North Drywood Lake was 1950.2 fmsl. The spring 2013 elevation indicated an 0.8 ft increase from the fall 2012 elevation of 1949.4 fmsl. No fall 2013 observation was recorded.

Fish Management Information

Primary species	Northern Pike, Walleye, Yellow Perch
Other species	Black Bullhead
Lake-specific regulations	none
Management classification	warm-water marginal
Fish consumption advisories	none

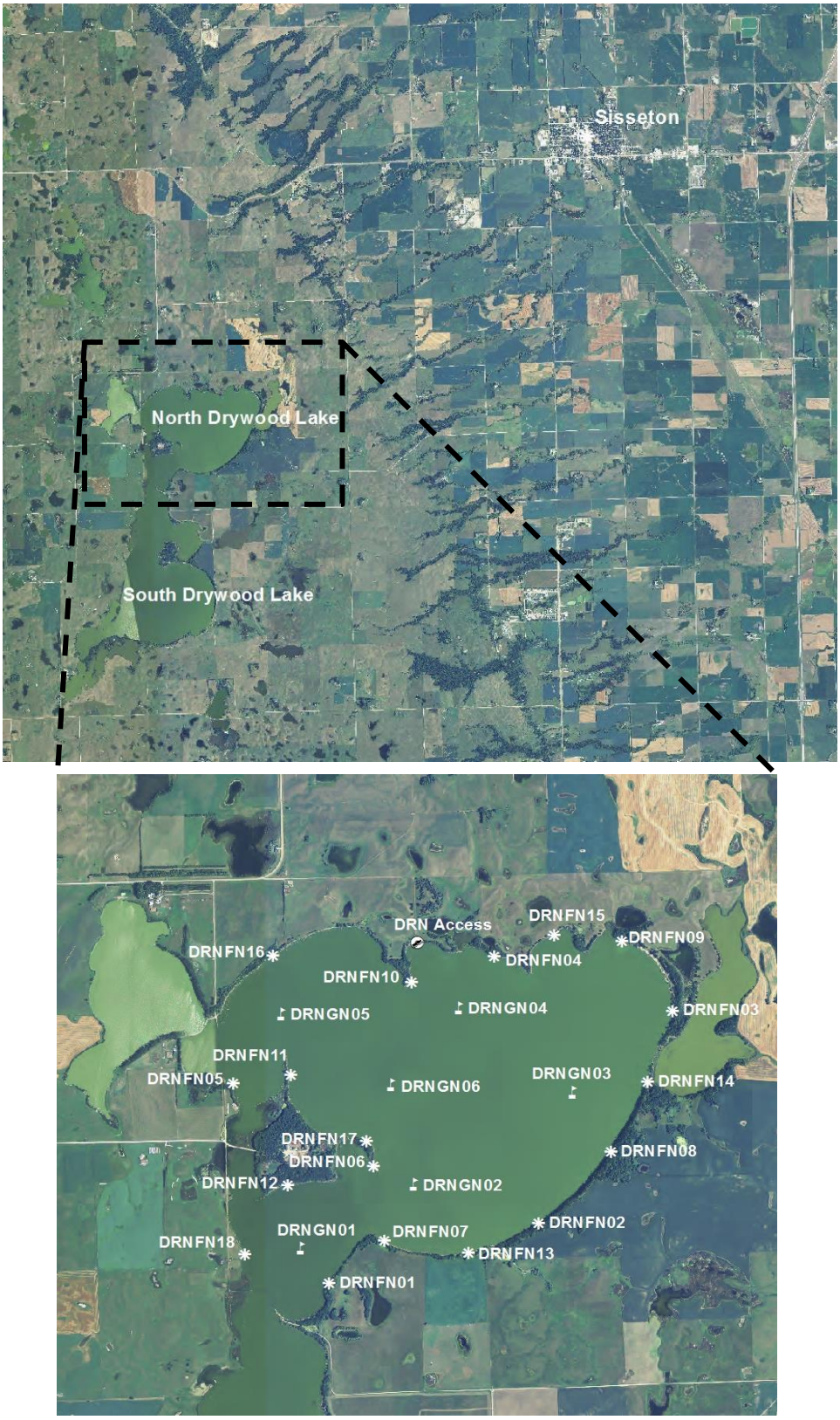

Figure 1. Map depicting geographic locations of North and South Drywood Lakes from Sisseton, South Dakota (top). Also noted is the public access site and standardized net locations for North Drywood Lake (bottom). DRNFN= frame net; DRNGN= gill net

Management Objectives

1) Maintain a mean gill net CPUE of stock-length northern pike ≥ 3, 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 PSD-P of 5-10.

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

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

Results and Discussion

North Drywood Lake is a relatively-shallow natural lake located in western Roberts County, South Dakota. Although past fisheries information is limited on the Drywood Lakes, past reports dating back to the 1950's indicate periods of abundant northern pike, walleye, and yellow perch populations; however, relatively-frequent winterkill events have been reported.

High water conditions since the mid to late 1990s have increased the water depth and surface area of North Drywood Lake, diminished the threat of winterkill and created habitat capable of sustaining a sport fishery. North Drywood Lake is managed as a northern pike, walleye, and yellow perch fishery. Currently, the road which separates North and South Drywood Lakes is submerged and fish movement between the lakes is possible; however, water depth over the submerged road is shallow and likely limits fish movement between the lakes.

Primary Species

Northern Pike: The mean gill net CPUE of stock-length Northern Pike was 11.7 (Table 1) and above the minimum objective of (≥ 3 stock-length Northern Pike/net night; Table 3). The 2013 gill net CPUE represents a substantial increase from the 2010 CPUE of 4.2 (Table 2) and indicates high relative abundance. High relative abundance can be attributed to increased recruitment related to substantial rises in spring water levels that took place from 2007-2011(SDDENR 2014). Northern Pike depend heavily on flooded vegetation for spawning and recruitment, and tend to have improved recruitment during springs that have rising water levels.

Gill net captured Northern Pike ranged in TL from 41 to 85 cm (16.1 to 33.5 in), had a PSD of 79 and PSD-P of 9 (Table 1; Table 3; Figure 2). The PSD was above the management objective of 30-60; while the PSD-P was within the management objective of 5-10; Table 3).

No Northern Pike age or growth information was collected. Northern Pike in the gill net catch had mean Wr values that ranged from 77 to 82 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length pike was 82 (Table 1) and no length-related trends in condition were apparent. Mean Wr values were likely at a seasonal low as Neumann and Willis (1995) reported that Wr values were lowest during spring following the spawn and throughout the summer in Lake Thompson, South Dakota.

Walleye: The mean gill net CPUE of stock-length Walleye was 6.0 (Table 1) and below the minimum objective ($\geq$ 10 stock-length Walleye/net night; Table 3). The 2013 gill net CPUE represents a slight decrease from the 2010 CPUE of 7.7 (Table 2) and indicates moderate relative abundance.

Walleye captured in the 2013 gill net catch ranged in TL from 12 to 69 cm (4.7 to 27.2 in; Figure 3). A high proportion of walleye in the gill net catch exceeded quality- (38 cm; 15 in) and preferred-length (51 cm; 20 in) resulting in a PSD of 83 and a PSD-P of 44 (Table 1; Figure 3). Both the PSD and PSD-P were above management objective ranges of 30-60 and 5-10, respectively (Table 3). However, size structure indices should be interpreted with caution as sample size was low (i.e., 36 stock-length Walleye).

Otoliths were collected from a sub-sample of gill net captured Walleye. Age structure information suggested the presence of nine year classes (2002-2004, 2006, and 2008-2012; Table 4). Year classes produced from 2008-2010 were the most represented and collectively comprised 81% of Walleye in the gill net catch (Table 4). The 2009 year class is the result of natural reproduction; while the 2008 and 2010 year classes coincided with fry stocking (Table 4; Table 6). The contribution of stocked or naturally-produced Walleye to year classes produced during stocked years is unknown, as stocked individuals are typically unmarked making it difficult to differentiate stocked from naturally-produced Walleye. Although approximately 600,000 Walleye fry were stocked into North Drywood Lake in 2012 (Table 6), only a single individual from this cohort was represented in the 2013 gill net catch potentially indicating limited recruitment. However, the North Drywood Lake survey was conducted in late-May; as a result, Walleye from the 2012 cohort may have been too small to be effectively sampled.

Although sample sizes were low, Walleye growth in North Drywood Lake appears to have slowed in recent years (Table 5). In 2013, gill net captured Walleye had the lowest weighted mean TL at capture values since 2006 (Table 5). Weighted mean TL at capture values were 240, 317, and 496 mm (9.4, 12.5, and 19.5 in) at ages 2, 3, and 4; respectively (Table 5). Since 2006, the weighted mean TL at capture of age-2 Walleye has ranged from 240 to 400 mm (9.4 to 15.7 in); while weighted mean TL at capture of age-3 fish has ranged from 317 to 473 mm (12.5 to 18.6 in; Table 5). Decreased growth of Walleye is likely related to reduced Yellow Perch recruitment and subsequent abundance in recent years (Table 2; Figure 4). Stock-length Walleye in the gill net catch had mean Wr values that ranged from 79 to 87 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length Walleye being 85 (Table 1). No length-related trends in condition were apparent.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 2.7 (Table 1) and below the minimum objective (≥ 30 stock-length Yellow Perch/net night; Table 3). The 2013 gill net CPUE was the lowest recorded since 2004 (Table 2).

Sixteen Yellow perch that ranged in TL from 15 to 22 cm (5.9 to 8.7 in) were captured in the 2013 gill net catch. Based on otolith age estimates, three year classes (2008-2010) comprised the entire sample, with the 2009 cohort being the most represented (Table 7). Few inferences can be made concerning Yellow Perch size structure, growth, and condition due to low sample size.

Other Species

Black Bullhead: The mean frame net CPUE was 210.6 (Table 1) and above the management objective (≤ 100 stock-length bullhead/net night; Table 3). The 2013 frame net CPUE represented a substantial increase from the 2010 CPUE of 59.2 (Table 2). Currently, relative abundance is high.

Frame net captured Black Bullhead ranged in TL from 14 to 32 cm (5.5 to 12.6 in; Figure 5). A high proportion, primarily the result of what appears to be a single strong year class, exceeded quality-length (23 cm; 9 in) and resulted in a PSD of 92 (Table 1; Figure 5). No growth information was collected in 2013. Mean Wr values for Black Bullhead captured in the frame net catch ranged from 92 to 101 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Black Bullhead was 98 (Table 1) and no length-related trends in condition were apparent.

Other: No other fish species were captured during the 2013 survey (Table 1).

Management Recommendations

1) Conduct fish community surveys utilizing gill nets and frame nets on an every third year basis (next survey scheduled during the summer of 2016) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Stock walleye (≈500 fry/acre) on a biennial basis to establish additional year classes, provided water levels are sufficient.

3) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.

4) Improve public access to North Drywood Lake via enhancements to the current access site (e.g., dock installation).

5) Monitor winter and summer kill events. In cases of substantial winter/summer kill the need to re-establish a fishery in North Drywood Lake should be evaluated. If water levels are sufficient; 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 North Drywood Lake, 2013. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= Black Bullhead; NOP=Northern Pike; WAE= Walleye; 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	210.6	76.2	92	1	8	1	98	1
NOP	0.4	0.2	100	0	33	42	80	6
WAE	1.8	0.4	45	18	16	14	83	1
Gill Nets								
BLB	39.0	14.3	89	3	9	3	94	1
NOP	11.7	3.1	79	8	9	6	82	1
WAE	6.0	2.3	83	11	44	14	85	1
YEP	2.7	0.9	31	21	0	---	86	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 North Drywood Lake, 2004-2013. BLB= Black Bullhead; NOP=Northern Pike; WAE= Walleye; YEP= Yellow Perch

	CPUE						
Species	2004	2005	2006[1]	2007[1]	2008	2010	2013
Frame nets							
BLB	---	---	---	---	---	59.2	210.6
NOP	---	---	---	---	---	0.5	0.4
WAE	---	---	---	---	---	0.3	1.8
YEP	---	---	---	---	---	5.3	0.0
Gill Nets							
BLB	203.3	14.0	0.3	66.7	5.3	6.5	39.0
NOP	1.3	1.0	0.3	0.7	5.7	4.2	11.7
WAE	0.7	1.0	2.0	3.3	6.7	7.7	6.0
YEP	35.0	5.3	14.7	42.0	14.0	14.5	2.7

[1] 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 frame nets and experimental gill nets from North Drywood Lake, 2004-2013. BLB= Black Bullhead; NOP= Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2004	2005	2006[1]	2007[1]	2008	2010	2013	Objective
Frame nets								
BLB								
CPUE	---	---	---	---	---	59	211	≤ 100
PSD	---	---	---	---	---	20	92	---
PSD-P	---	---	---	---	---	3	8	---
Wr	---	---	---	---	---	95	98	---
Gill nets								
NOP								
CPUE	1	1	<1	1	6	4	12	≥ 3
PSD	0	100	100	100	35	60	79	30-60
PSD-P	0	0	100	100	35	16	9	5-10
Wr	115	95	86	93	97	99	94	---
WAE								
CPUE	1	1	2	3	7	8	6	≥ 10
PSD	100	67	100	100	10	50	83	30-60
PSD-P	0	33	33	50	5	20	44	5-10
Wr	120	98	113	107	94	97	85	---
YEP								
CPUE	35	5	15	42	14	15	3	≥ 30
PSD	67	6	5	15	33	17	31	30-60
PSD-P	53	6	0	1	2	0	0	5-10
Wr	88	94	93	96	86	98	86	---

[1] 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 1000) from North Drywood Lake, 2006-2013.

	Year Class												
Survey Year	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2013[1]		1	2	5	16	8		1		1	1	1	
2010	---	---	---	---	6	24	6	16			1	1	
2008	---	---	---	---	---		23	17	1		1		
2007[2]	---	---	---	---	---	---		13	1		8		1
2006[2]	---	---	---	---	---	---	---				4		2
# stocked													
fry		600		1200		1200		1200					
sm. fingerling											125		
lg. fingerling													

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

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

Table 5. Weighted mean length at capture (mm) for Walleye captured in experimental gill nets (expanded sample size) from North Drywood Lake, 2006-2013. 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	9	10
2013[1]	129(1)	240(2)	317(5)	496(16)	531(8)	---	640(1)	---	640(1)	622(1)
2010	208(6)	347(24)	415(6)	510(16)	---	---	616(1)	600(1)	---	---
2008	222(23)	363(17)	473(1)	---	559(1)	---	---	---	---	---
2007	212(13)	400(1)	---	516(8)	---	565(1)	---	---	---	---
2006	---	---	461(4)	---	550(2)	---	---	---	---	---

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

Table 6. Stocking history including size and number for fishes stocked into North Drywood Lake, 2001-2013. NOP= Northern Pike; WAE= Walleye

Year	Species	Size	Number
2003	NOP	fingerling	16,020
	WAE	fingerling	124,600
2006	WAE	fry	1,200,000
2008	WAE	fry	1,200,000
2010	WAE	fry	1,200,000
2012	WAE	fry	600,000

Table 7. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from North Drywood Lake, 2010-2013.

	Year Class								
Survey Year	2013	2012	2011	2010	2009	2008	2007	2006	2005
2013				2	12	2			
2010	---	---	---		18	283	33	11	2

Table 8. Weighted mean total length (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from North Drywood Lake, 2010-2013. 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
2013					
Male	---	---	---	---	---
Female	---	---	168(2)	194(12)	198(2)
Combined	---	---	168(2)	194(12)	198(2)
2010					
Male	88(4)	105(133)	161(5)	---	180(1)
Female	88(8)	121(160)	190(24)	182(11)	---
Combined	89(18)	113(283)	178(33)	182(11)	180(2)

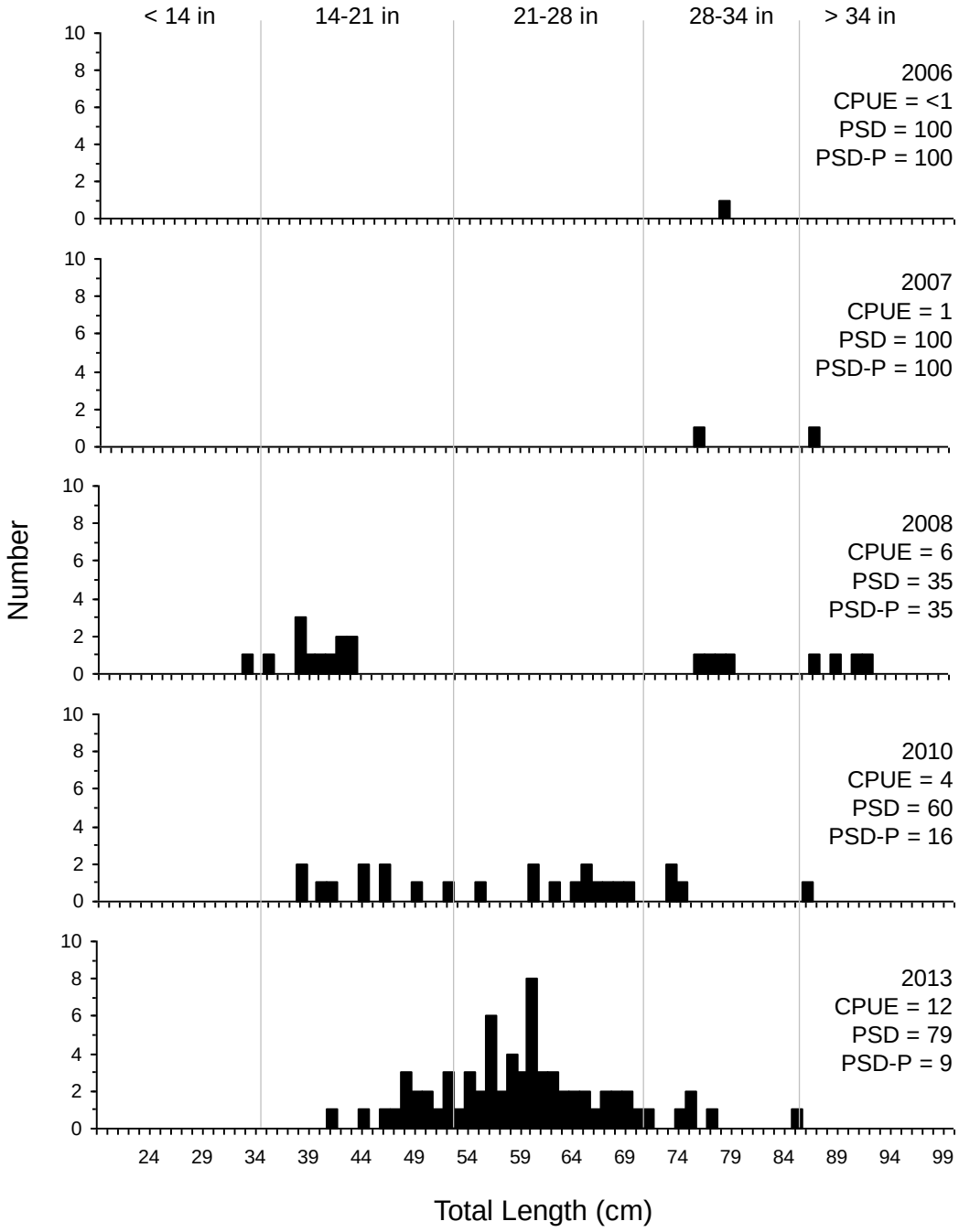

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using experimental gill nets in North Drywood Lake, 2006-2013.

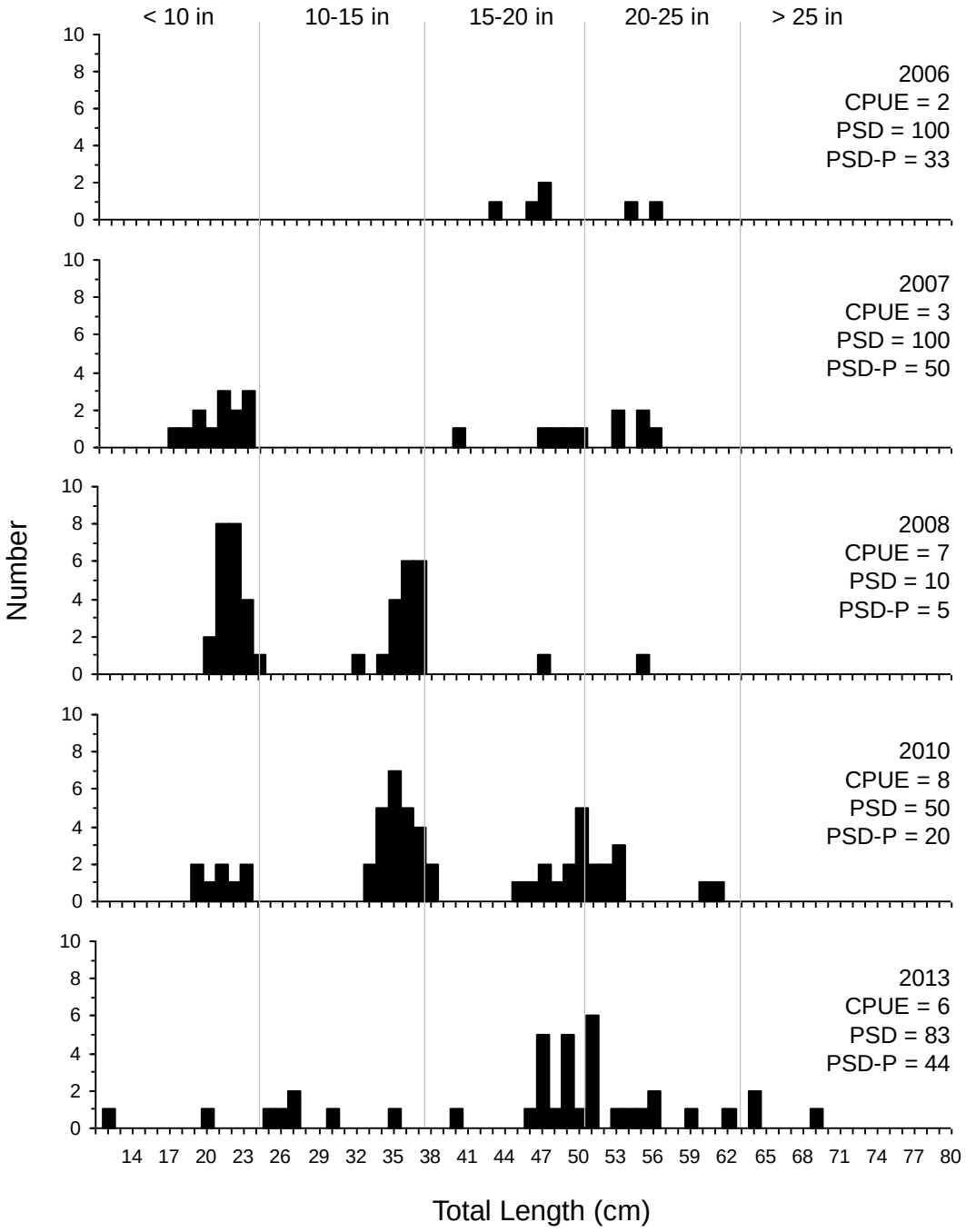

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in North Drywood Lake, 2006-2013.

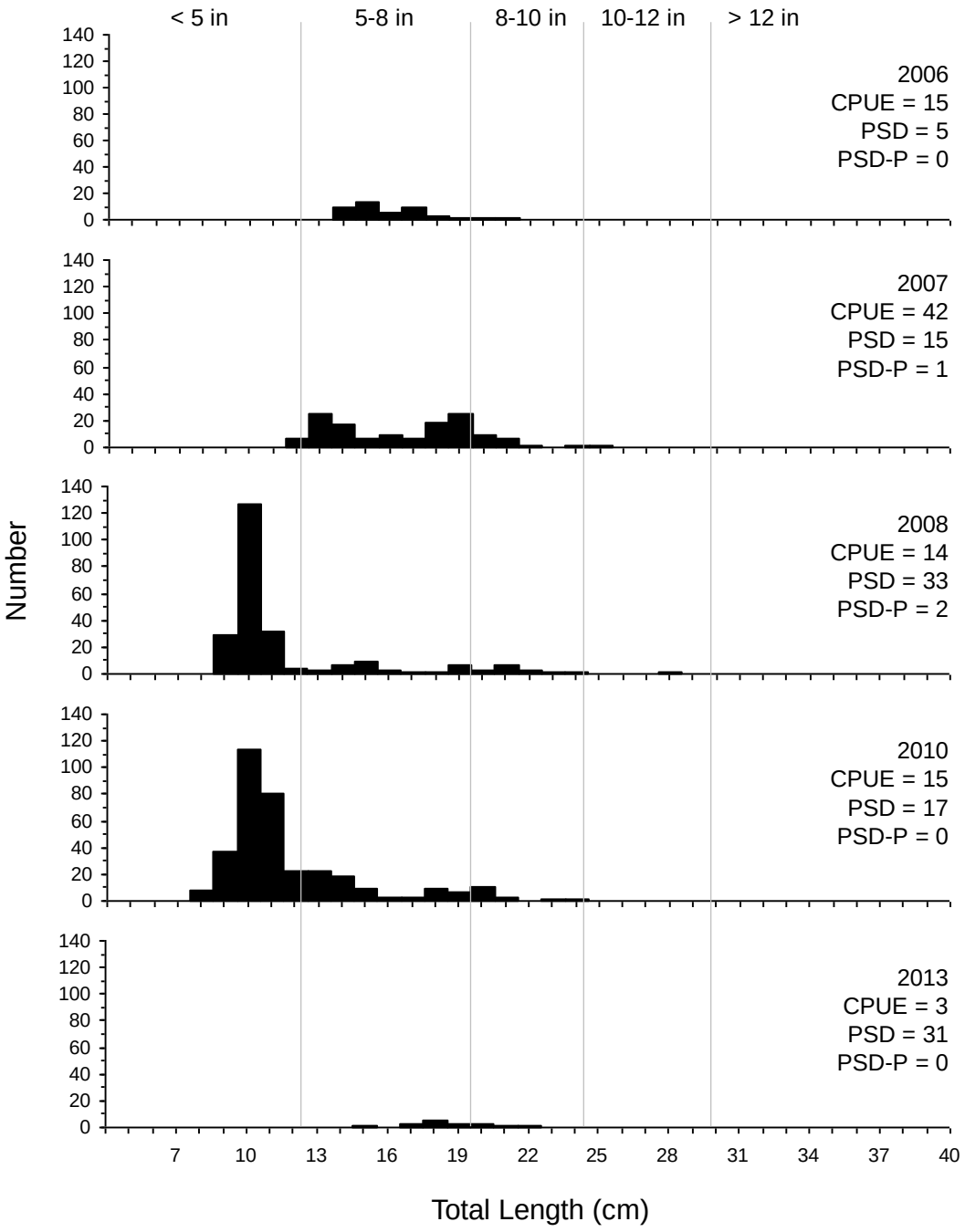

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in North Drywood Lake, 2006-2013.

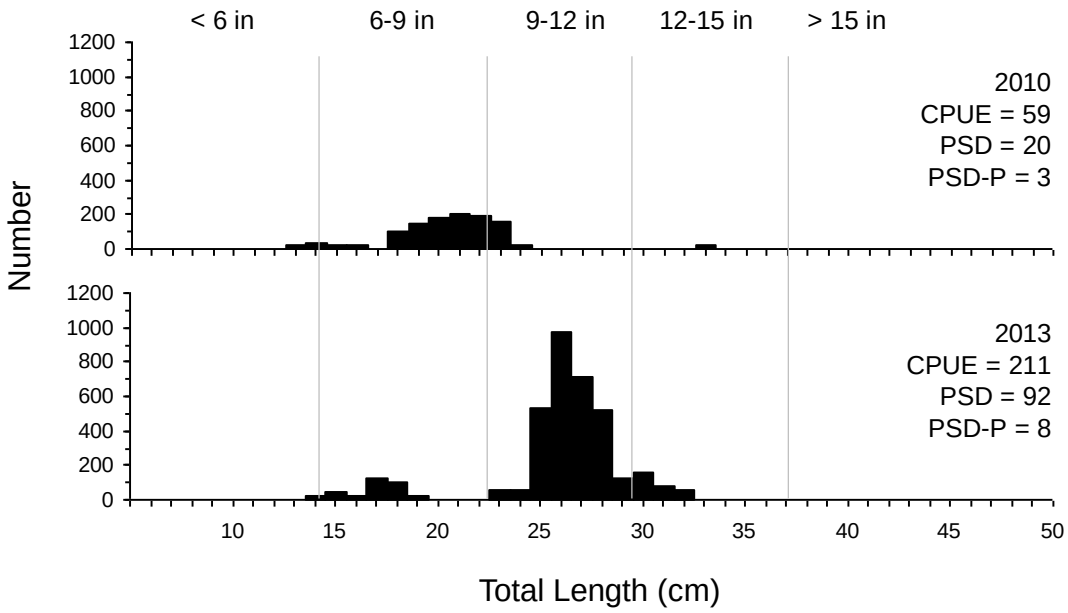

Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in North Drywood Lake, 2010-2013.