North Rush Lake

Site Description

Location

Water designation number (WDN)	22-0063-00
Legal description	T122N-R54W-Sec.18,19,29,30; T122N-R55W-Sec.13,23,24,25
County (ies)	Day
Location from nearest town	3.0 miles west of Waubay, SD

Survey Dates and Sampling Information

Survey dates	June 4-6, 2013 (FN,GN)
Frame net sets (n)	16
Gill net sets (n)	6

Morphometry

Watershed area (acres)	186,967
Surface area (acres)	≈2,800
Maximum depth (ft)	≈12
Mean depth (ft)	unknown

Ownership and Public Access

North Rush Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by SDGFP. Public boat access is difficult on North Rush Lake as no formal boat ramp exists (Figure 1). Shorefishing opportunities exist from state-owned lands and along Highway 12 (parking is limited) which divides North and South Rush Lakes. Lands adjacent to North Rush Lake are under mixed ownership including the State of South Dakota and private individuals.

Watershed and Land Use

The 11,969 acre Rush Lake sub-watershed 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 Ordinary High Water Mark has been established by the South Dakota Water Management Board on the Rush Lakes. On May 21, 2013 the elevation of the Rush Lakes was 1803.3 fmsl, approximately 0.9 ft higher than the fall 2012 elevation of 1802.4 fmsl. By October 8, 2013 the water level had declined to an elevation of 1802.7 fmsl.

Fish Management Information

Primary species	Northern Pike, Walleye, Yellow Perch
Other species	Black Bullhead, Black Crappie, Common Carp, Rock Bass, Smallmouth Bass, White Bass, White Sucker
Lake-specific regulations	Game Fish Spearing Allowed (June 15-March 15)
Management classification	warm-water marginal
Fish Consumption Advisories	none

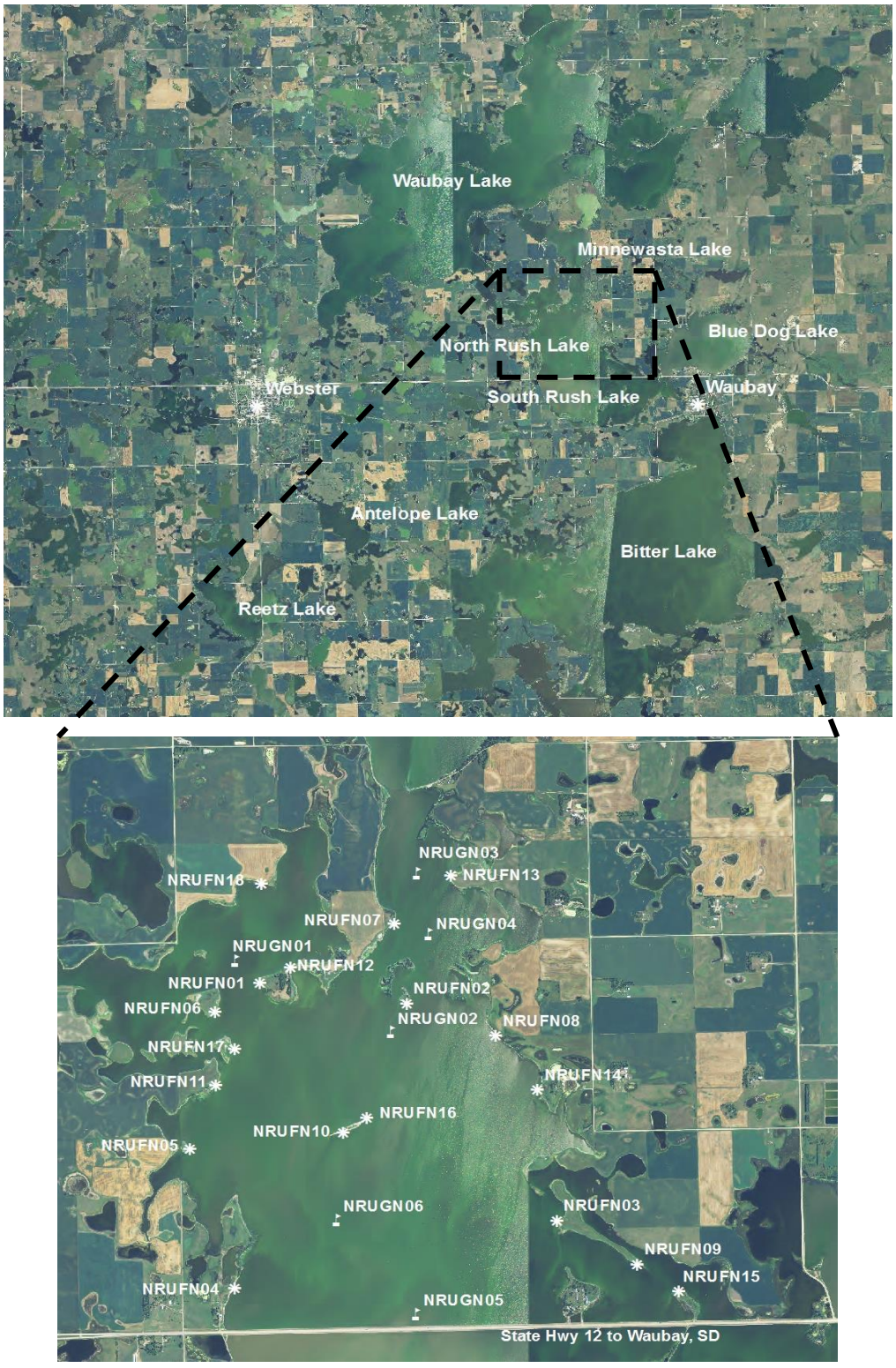

Figure 1. Map depicting geographic location of several Day County, South Dakota Lakes including North Rush Lake (top). Also noted, are standardized net locations for North Rush Lake. NRUFN= frame nets; NRUGN= gill nets

Management Objectives

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

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

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

Results and Discussion

Prior to the 1990s, North Rush Lake was shallow, experienced frequent winterkill events, and offered limited sport fishing opportunities. High water conditions since the mid to late 1990s have increased the water depth and surface area of North Rush Lake, diminished the threat of winterkill, and created habitat capable of sustaining a sport fishery. Currently, North Rush Lake is managed as a Northern Pike, Walleye and Yellow Perch fishery.

Note: During the 2013 fish community survey, gill net catches were reduced due to a heavy build-up of algae and likely were not representative of the at-large population for several fish species commonly assessed using gill net data (i.e., Northern Pike, Walleye, and Yellow Perch). Therefore, the results and discussion will be limited to a brief discussion of the 2013 frame net catch. Summarized data for the 2010 and 2013 fish community surveys is provided in the following tables and figures.

Frame Net Catch

Black Bullhead: Black Bullheads were the most abundant species in the frame net catch (Table 1). The mean frame net CPUE of stock-length Black Bullhead was 25.1 (Table 1). The 2013 mean frame net CPUE represented an increase from the 2010 CPUE of 1.0 (Table 2) and indicated high relative abundance.

Frame net captured Black Bullheads ranged in TL from 14 to 40 cm (5.5 to 15.7) in). Visual inspection of the length frequency indicate that the majority were ≥ quality-length (23 cm; 9 in), with a mode of 30 cm (11.8 in). Therefore, size structure indices were high, with PSD and PSD-P values of 98 and 47 (Table 1). No age and growth information was collected. Mean Wr values of Black Bullheads captured in the 2013 frame net catch ranged from 92 to 99 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length fish being 96 (Table 1). No length-related trends in condition were apparent.

Walleye: Walleye were the second most abundant fish species in the frame net catch. Frame nets captured 144 Walleye that ranged in TL from 25 to 67 cm (9.8 to 26.4 in) and resulted in a mean frame net CPUE for stock-length walleye of 9.0 (Table 1). No age or growth information was collected. However, sampled Walleye had acceptable condition with mean Wr values that were $\geq$ 80 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Walleye was 82 and no length-related trends in condition were apparent.

Other Species

Other: Black Crappie, Common Carp, Northern Pike, Rock Bass, Smallmouth Bass, White Bass, White Sucker, and Yellow Perch were other fish species captured in low numbers in the 2013 frame net catch (Table 1).

Management Recommendations

1) Conduct fish community surveys utilizing gill nets and frame nets on an every third year basis (next survey scheduled in summer 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) Establish a public access site that would include boat ramp and dock.

5) Monitor winter and summer kill events. In cases of substantial winter/summer kill the need to re-establish a fishery in North Rush 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 and experimental gill nets from North Rush Lake, 2013. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP= Northern Pike; OSF= Orangespotted Sunfish; ROB= Rock Bass; WAE= Walleye; WHB= White Bass; 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	25.1	13.1	98	1	47	4	96	2
BLC	1.2	0.7	89	13	53	20	115	3
COC	0.1	0.1	100	---	100	---	---	---
NOP	1.0	0.3	75	20	19	18	73	4
ROB	0.1	0.1	100	---	0	---	101	---
SMB	0.1	0.1	50	50	0	---	104	43
WAE	9.0	4.1	53	7	8	4	82	<1
WHB	1.3	0.6	100	0	100	0	96	1
WHS	0.2	0.2	100	0	100	0	92	8
YEP	0.1	0.1	100	---	100	---	87	---
Gill nets[1]								
BLB	1.5	1.2	100	0	78	27	107	5
NOP	1.7	0.8	80	24	10	18	73	3
WAE	3.5	1.9	62	19	19	15	82	1
WHB	0.2	0.2	100	---	100	---	95	---
WHS	0.3	0.5	100	0	50	50	98	15
YEP	2.0	1.1	67	26	58	27	100	3

[1] Gill net catches were reduced due to heavy algal build-up and are likely not representative of the at-large population.

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured experimental gill nets from North Rush Lake, 2010-2013. BLB= Black Bullhead; BLC= Black Crappie; COC= Common Carp; NOP= Northern Pike; OSF= Orangespotted Sunfish; ROB= Rock Bass; SMB= Smallmouth Bass; WAE= Walleye; WHB= White Bass; WHS= White Sucker; YEP= Yellow Perch

	CPUE			
Species	2010	2011	2012	2013[1]
Frame nets				
BLB	2.1	---	---	25.1
BLC	0.1	---	---	1.2
COC	1.2	---	---	0.1
NOP	0.5	---	---	1.0
ROB	0.0	---	---	0.1
SMB	0.0	---	---	0.1
WAE	4.2	---	---	9.0
WHB	1.7	---	---	1.3
WHS	0.2	---	---	0.2
YEP	0.0	---	---	0.1
Gill nets				
BLB	0.0	---	---	1.5
BLC	0.2	---	---	0.0
COC	0.2	---	---	0.0
NOP	0.8	---	---	1.7
WAE	14.0	---	---	3.5
WHB	0.0	---	---	0.2
WHS	1.7	---	---	0.3
YEP	7.7	---	---	2.0

[1] Gill net catches were reduced due to heavy algal build-up and are likely not representative of the at-large population.

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 North Rush Lake, 2010-2013. NOP= Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2010	2011	2012	2013[1]	Objective
Gill nets					
NOP					
CPUE	1	---	---	2	≥ 3
PSD	60	---	---	80	30-60
PSD-P	40	---	---	10	5-10
Wr	91	---	---	73	---
WAE					
CPUE	14	---	---	4	≥ 10
PSD	43	---	---	62	30-60
PSD-P	11	---	---	19	5-10
Wr	104	---	---	82	---
YEP					
CPUE	8	---	---	2	≥ 30
PSD	87	---	---	67	30-60
PSD-P	41	---	---	58	5-10
Wr	104	---	---	100	---

[1] Gill net catches were reduced due to heavy algal build-up and are likely not representative of the at-large population.

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 North Rush Lake, 2010-2013.

	Year Class									
Survey Year	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
2013[1]			2	14	1		2		2	
2010	---	---	---		4	48	16	5	10	4
# stocked										
fry		1,400	300	1,100						
small fingerling										
large fingerling										

[1] Gill net catches were reduced due to heavy algal build-up and are likely not representative of the at-large population.

Table 5. Weighted mean total length (mm) at capture for Walleye captured in experimental gill nets (expanded sample size) from North Rush 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	6	7	8
2013	---	291(2)	382(14)	484(1)	---	560(2)	---	647(2)
2010	236(4)	346(48)	432(16)	458(5)	498(10)	536(4)	---	---

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

Year	Species	Size	Number
2010	NOP	fry	523,500
	WAE	fry	1,100,000
2011	WAE	fry	300,000
2012	WAE	fry	1,400,000

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

	Year Class						
Survey Year	2013	2012	2011	2010	2009	2008	2007
2013[1]			5	3	3		1
2010	---	---	---		2	19	25

[1] Gill net catches were reduced due to heavy algal build-up and are likely not representative of the at-large population.

Table 8. Weighted mean total length (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from North Rush 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	6
2013						
Male	---	160 (1)	---	---	---	---
Female	---	189 (4)	268 (3)	299 (3)	---	347 (1)
Combined	---	183 (5)	268 (3)	299 (3)	---	347 (1)
2010						
Male	136 (1)	185 (2)	226 (1)	---	---	---
Female	147 (1)	210 (17)	262 (24)	---	---	---
Combined	142 (2)	208 (19)	261 (25)	---	---	---

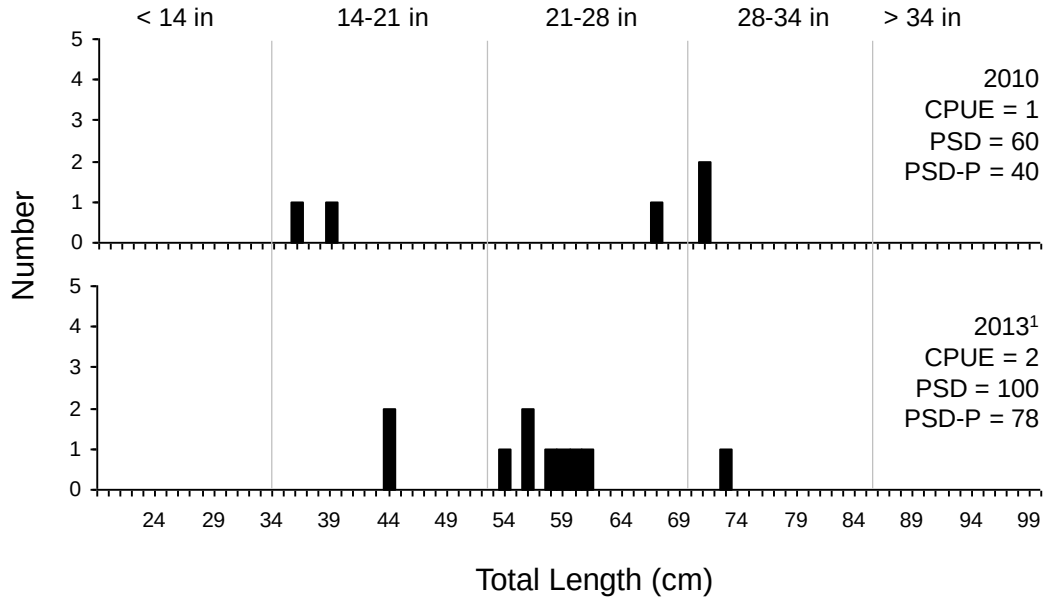

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using experimental gill nets in North Rush Lake, 2010-2013.

[1] Gill net catches were reduced due to heavy algal build-up.

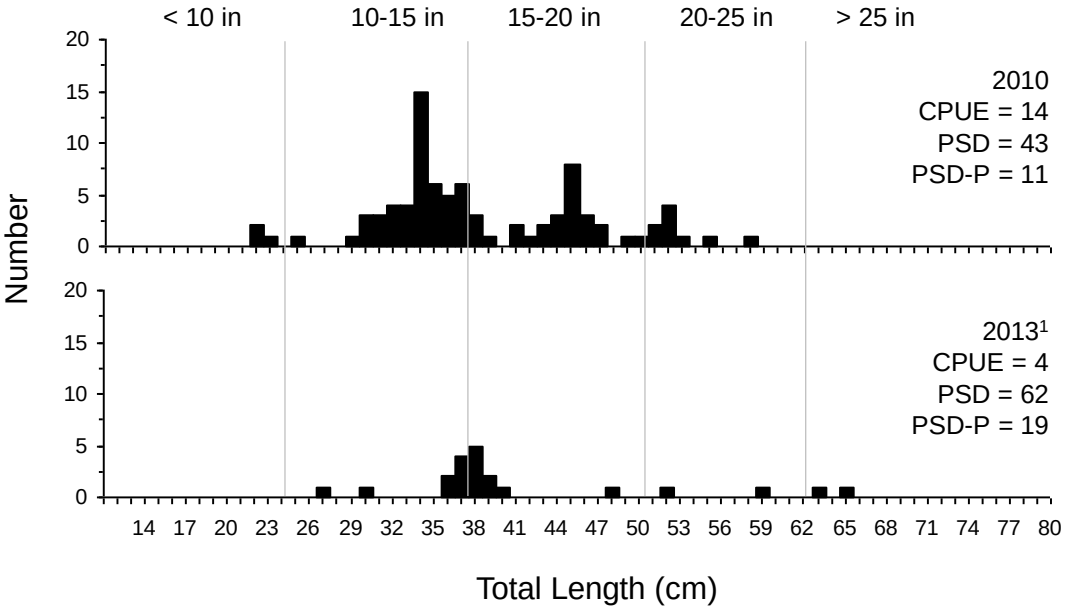

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in North Rush Lake, 2010-2013.

[1] Gill net catches were reduced due to heavy algal build-up.

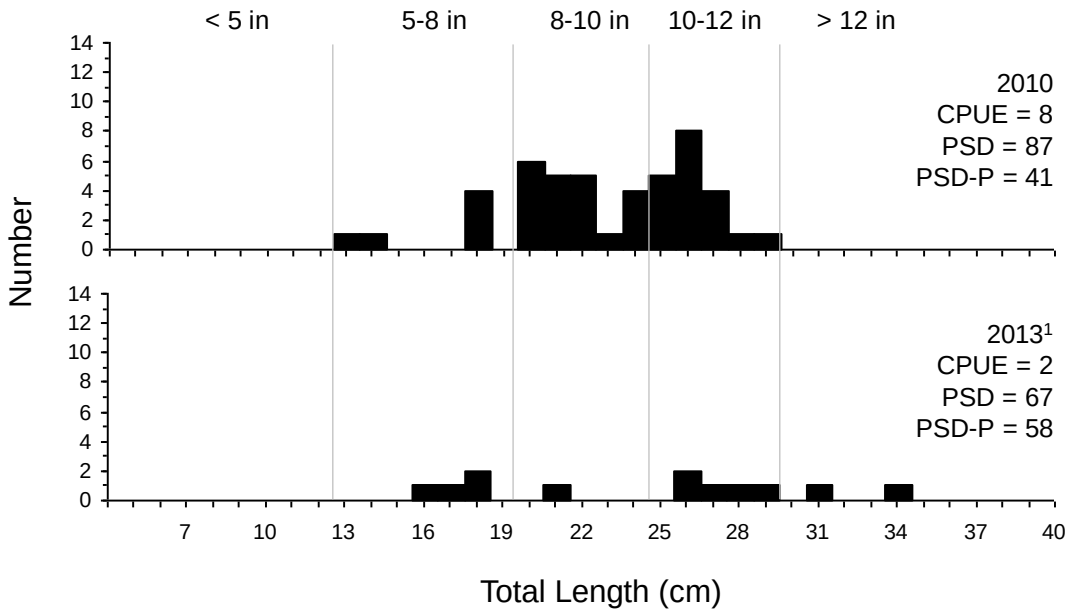

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in North Rush Lake, 2010-2013.

[1] Gill net catches were reduced due to heavy algal build-up.