

Rush Lakes (North/South) Site Description

Location

Water designation number (WDN)	22-0063-00; 22-0064-00
Legal description	T122N-R54W-Sec. 18,19,29,30; T122N-R55W-Sec. 13,23,24,25 T122N-R54W-Sec. 5,6,31,32,33; T122N-R55W-Sec. 36
County (ies)	Day
Location from nearest town	3 miles west of Waubay, SD

Survey Dates and Sampling Information

	North Rush	South Rush
Survey dates	June 15-17, 2010 (FN,GN)	June 16-18, 2010 (FN,GN)
Frame net sets (n)	18	18
Gill net sets (n)	6	6

Morphometry

	North Rush	South Rush
Watershed area (acres)	186,967	186,967
Surface area (acres)	≈2,800	≈1,700
Maximum depth (ft)	≈12	≈10
Mean depth (ft)	unknown	unknown

Ownership and Public Access

Rush Lakes are meandered lakes owned by the State of South Dakota and managed by the SDGFP. Public boat access is difficult on North and South Rush Lakes as no formal boat ramp exists; however, shorefishing opportunities exist at the Bluedog Spillway, from state-owned lands (Herold-Stanley WAA), and along Highway 12 (parking is limited) which divides North and South Rush Lakes (Figure 1). Lands adjacent to North and South Rush Lakes 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 5, 2010 the elevation of the Rush Lakes was 1804.2 fmsl and the highest recorded since 1983. The May 5, 2010 elevation indicated a substantial increase (2.7 ft) from the fall 2009 elevation of 1801.5 fmsl. By October 6, 2010 the water level had declined to an elevation of 1803.0 fmsl.

Aquatic Nuisance Species Monitoring

Plant Survey

Emergent vegetation is common along the shoreline of North and South Rush Lakes; while submersed vegetation was found in shallow protected areas of both lakes. Aquatic plant species identified during the 2010 survey include bulrush, cattail, common duckweed, sago pondweed, and smartweed. No aquatic nuisance plant species were encountered.

Macro-Invertebrate/Mussel Survey

No aquatic nuisance macro-invertebrate or mussel species were sampled in 2010.

Fish Community Survey

Common carp was the only aquatic nuisance fish species captured during 2010.

Fish Management Information

North Rush

Primary species	northern pike, walleye, yellow perch
Other species	black bullhead, black crappie, common carp, white bass, white sucker
Lake-specific regulations	NE Panfish Management Area: 10 daily; 50 possession
Management classification	warm-water marginal
Fish Consumption Advisories	none

South Rush

Primary species	northern pike, walleye, yellow perch
Other species	black bullhead, black crappie, common carp, orangespotted sunfish, rock bass, white bass, white sucker
Lake-specific regulations	NE Panfish Management Area: 10 daily; 50 possession Game Fish Spearing Allowed (June 15-February 28)
Management classification	warm-water marginal
Fish Consumption Advisories	none

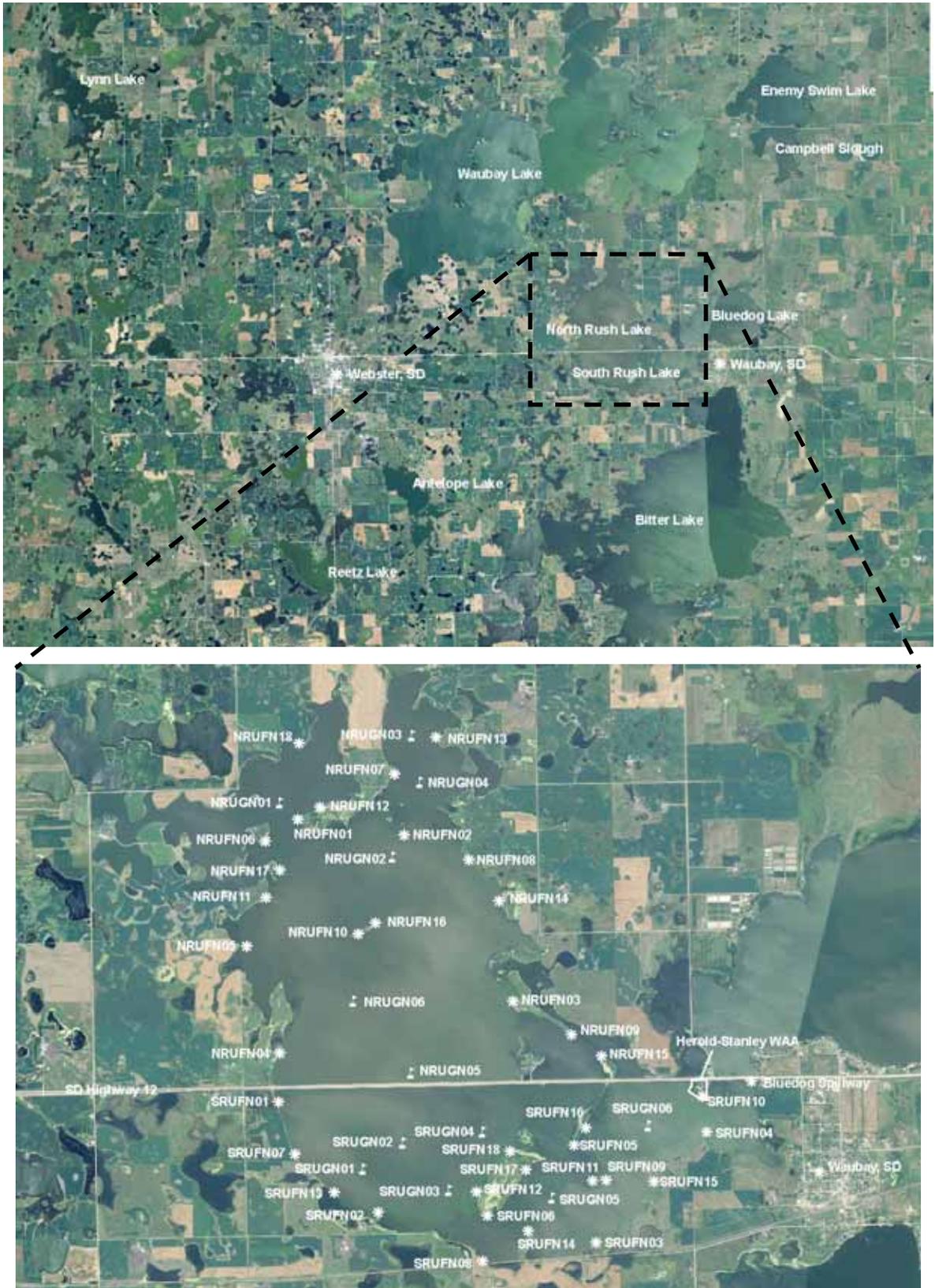


Figure 1. Map depicting geographic location of several Day County, South Dakota Lakes including North and South Rush (top). Also noted, is the Bluedog Spillway, Herold-Stanley WAA, and standardized net locations for North and South Rush Lakes. NRUFN= frame nets (North Rush); NRUGN= gill nets (North Rush); SRUFN= frame nets (South Rush); SRUGN= gill nets (South Rush)

Management Objectives

North and South Rush Lakes

- 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 1990's, North and South Rush Lakes were shallow, experienced frequent winterkill events, and offered limited sport-fishing opportunities. High water conditions since the mid to late 1990's have increased the water depth and surface area of North and South Rush Lakes, diminished the threat of winterkill, and created habitat capable of sustaining a sport fishery. Currently, North and South Rush Lakes are managed as northern pike, walleye and yellow perch fisheries.

North Rush Lake Primary Species

Northern Pike: The 2010 gill net mean CPUE of stock-length northern pike was 0.8 (Table 1) and below the minimum objective (≥ 3 stock-length northern pike/net). Northern pike relative abundance is considered low in North Rush Lake.

Northern pike collected by gill nets in 2010 ranged in total length from 35 to 71 cm (13.8 to 28.0 in), had a PSD of 60 and PSD-P of 40 (Table 1; Figure 2). The PSD of 60 was within the objective range of 30-60 while the PSD-P of 40 was well above the objective range of 5-10 (Table 3).

No northern pike growth information was collected during 2010. Condition of northern pike in 2010 was good with mean W_r values ranging from 88 to 101 for all length categories. The mean W_r for stock-length northern pike was 91 (Table 1). Mean W_r values were likely at a seasonal low as Neumann and Willis (1995) reported that W_r values were lowest during spring following the spawn and throughout the summer in Lake Thompson, South Dakota.

Walleye: The 2010 gill net mean CPUE of stock-length walleye was 14.0 (Table 1) and above the minimum objective (≥ 10 stock-length walleye/net; Table 3). Based on the 2010 walleye gill net catch, relative abundance appears to be high.

Walleye captured in gill nets during 2010 ranged in total length from 22 to 58 cm (8.7 to 22.8 in) had a PSD of 43 and PSD-P of 11 (Figure 3). The 2010 PSD was within the objective range of 30-60 and PSD-P was slightly above the objective range of 5-10 indicating a relatively balanced population.

Otoliths were collected from a sub-sample of gill net captured walleye in 2010. Recruitment appears to be consistent with six consecutive year-classes (2004-2009; Table 2) present in the sample. The 2010 fry stocking in North Rush Lake was marked with OTC to determine the contribution of stocking to the population. Electrofishing and frame nets were used to recapture age-0 walleye. Eleven age-0 walleye were recaptured with only one having OTC marks. It is impossible to determine the source of walleye year-classes in North Rush Lake because it is connected to Minnewasta, South Rush and Waubay Lake, all of which have existing walleye populations and are regularly stocked.

Walleye in North Rush Lake currently exhibit fast growth with the weighted mean total length at capture of age-2 and age-3 walleye in the 2010 gill net catch being 346 and 432 mm (13.6 and 17.0 in), respectively (Table 3). Walleye were in good condition with mean W_r values ranging from 101 to 107 for all length categories sampled. The mean W_r of stock-length walleye captured in gill nets during 2010 was 104 (Table 1), and no length-related trends in W_r values were apparent.

Yellow Perch: The gill net mean CPUE of stock-length yellow perch in 2010 was 7.7 (Table 1) and below the minimum objective (≥ 25 stock-length yellow perch/net). Relative abundance of yellow perch in North Rush Lake is low.

Yellow perch sampled in gill nets during 2010 ranged in total length from 13 to 29 cm (5.1 to 11.4 in), had a PSD of 87 and a PSD-P of 41 (Figure 4). In 2010 both PSD and PSD-P were above the objective ranges of 30-60 and 5-10 indicating a population skewed towards quality-length and larger individuals (Table 3; Figure 4).

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2010. Recruitment appears to be consistent with three consecutive year-classes (2007-2009) present in the sample; however, the magnitude of most year classes appears to be low resulting in low relative abundance.

Growth appears to be good with mean total length at capture of age-2 and age-3 male yellow perch being 185 and 226 mm (7.3 and 8.9 in.) and age-2 and age-3 female yellow perch being 210 and 262 mm (8.3 and 10.3 in.; Table 6). Condition is good with mean W_r values for gill net captured yellow perch ranging from 103 to 105 for all length categories sampled with the mean W_r of stock-length yellow perch being 104 (Table 1). No length-related trends in W_r were observed.

Other Species

Other: Black bullhead, black crappie, common carp, white bass and white sucker were captured in low numbers and likely contribute little to the sport fishery (Table 1).

Management Recommendations (North Rush Lake)

- 1) Conduct fish community surveys utilizing gill nets and frame nets on an every third year basis (next survey scheduled in summer 2013) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Stock walleye on a biennial basis (≈ 500 fry/acre) to supplement the walleye population.
- 3) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.
- 4) Monitor winter and summer kill events. In cases of complete winter/summerkill stock with northern pike and yellow perch to re-establish a fish community.
- 5) Establish a public access site that would include boat ramp and dock.

South Rush Lake
Primary Species

Northern Pike: The 2010 gill net mean CPUE of stock-length northern pike was 1.2 (Table 1) and below the minimum objective (≥ 3 stock-length northern pike/net). Northern pike relative abundance is considered moderate in South Rush Lake.

Northern pike collected by gill nets in 2010 ranged in total length from 35 to 69 cm (13.8 to 27.2 in), had a PSD of 86 and PSD-P of 0 (Table 1; Figure 2). The PSD of 86 was above the objective range of 30-60 while the PSD-P of 0 was below the objective range of 5-10 (Table 3).

No northern pike growth information was collected during 2010. Condition of northern pike in 2010 was good with mean W_r values ranging from 85 to 89 for all length categories. The mean W_r for stock-length northern pike was 86 (Table 1). Mean W_r values were likely at a seasonal low as Neumann and Willis (1995) reported that W_r values were lowest during spring following the spawn and throughout the summer in Lake Thompson, South Dakota.

Walleye: The 2010 gill net mean CPUE of stock-length walleye was 4.2 (Table 1) and below the minimum objective (≥ 10 stock-length walleye/net; Table 3). Based on the 2010 walleye gill net catch, relative abundance appears to be moderate.

Walleye captured in gill nets during 2010 ranged in total length from 19 to 58 cm (7.5 to 22.8 in) had a PSD of 56 and PSD-P of 16 (Figure 3). The 2010 PSD was within the objective range of 30-60 and PSD-P was above the objective range of 5-10 indicating a slightly higher proportion of preferred-length walleyes in the population.

Otoliths were collected from a sub-sample of gill net captured walleye in 2010. Recruitment appears to be consistent with five consecutive year-classes (2005-2009; Table 2) present in the sample. The 2010 fry stocking in South Rush Lake was marked with OTC to determine the contribution of stocking to the population. Electrofishing and frame nets were used to recapture age-0 walleye. Eleven age-0 walleye were recaptured with none having OTC marks. It is impossible to determine the source of walleye year-classes in South Rush Lake because it is connected to Blue Dog, North Rush and Bitter Lake, all of which have existing walleye populations and are regularly stocked.

Walleye in South Rush Lake currently exhibit fast growth with the weighted mean total length at capture of age-2 and age-3 walleye in the 2010 gill net catch being 349 and 429 mm (13.7 and 16.9 in), respectively (Table 3). Walleye were in good condition with mean W_r values ranging from 93 to 96 for all length categories sampled. The mean W_r of stock-length walleye captured in gill nets during 2010 was 96 (Table 1), and no length-related trends in W_r values were apparent.

Yellow Perch: The gill net mean CPUE of stock-length yellow perch in 2010 was 12.2 (Table 1) and below the minimum objective (≥ 25 stock-length yellow perch/net). Relative abundance of yellow perch in South Rush Lake is moderate.

Yellow perch sampled in gill nets during 2010 ranged in total length from 9 to 27 cm (3.5 to 10.6 in), had a PSD of 73 and a PSD-P of 32 (Figure 4). In 2010 both PSD and PSD-P were above the objective ranges of 30-60 and 5-10 indicating a population skewed towards quality-length individuals (Table 3; Figure 4).

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2010. Recruitment appears to be consistent with three consecutive year-classes (2007-2009) present in the sample; however, the magnitude of most year classes appears to be low resulting in moderate relative abundance.

Growth appears to be good with mean total length at capture of age-2 and age-3 male yellow perch being 185 and 223 mm (7.3 and 8.8 in.) and age-2 and age-3 female yellow perch being 216 and 256 mm (8.5 and 10.1 in.; Table 6). Condition is good with mean W_r values for gill net captured yellow perch ranging from 108 to 113 for all length categories sampled with the mean W_r of stock-length yellow perch being 111 (Table 1). No length-related trends in W_r were observed.

Other Species

Black Crappie: The gill net mean CPUE of stock-length black crappie in 2010 was 1.6 (Table 1). Relative abundance of black crappie in South Rush Lake is low. Black crappie sampled in gill nets during 2010 ranged in total length from 8 to 36 cm (3.1 to 14.2 in), had a PSD of 71 and a PSD-P of 68 (Figure 5). Although relative abundance is low, high PSD and PSD-P values indicate a population skewed towards quality-length black crappies which may provide limited angling potential. Condition is good with a mean W_r for stock-length black crappie of 103 (Table 1).

Other: Black bullhead, common carp, orangespotted sunfish, rock bass, white bass and white sucker were all captured in low numbers and likely contribute little to the sport fishery (Table 1).

Management Recommendations (South Rush Lake)

- 1) Conduct fish community surveys utilizing gill nets and frame nets on an every third year basis (next survey scheduled in summer 2013) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Stock walleye on a biennial basis (\approx 500 fry/acre) to supplement the walleye population.
- 3) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.
- 4) Monitor winter and summer kill events. In cases of complete winter/summerkill stock with northern pike and yellow perch to re-establish a fish community.
- 5) Establish a public access point that would include boat ramp and dock.

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 and South Rush Lakes, 2010. 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; OSF= orangespotted sunfish; ROB= rock 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>North Rush Lake</i>								
<i>Frame nets</i>								
BLB	2.1	0.6	71	13	24	11	103	1
BLC	0.1	0.1	50	50	50	50	123	---
COC	1.2	0.6	100	0	91	9	91	4
NOP	0.5	0.2	78	22	11	21	89	2
WAE	4.2	1.2	68	9	37	10	99	1
WHB	1.7	0.6	100	0	100	0	108	<1
WHS	0.6	0.3	100	0	100	0	101	3
<i>Gill nets</i>								
BLC	0.2	0.2	0	---	0	---	128	---
COC	0.2	0.2	100	---	100	---	132	---
NOP	0.8	0.5	60	40	40	52	91	6
WAE	14.0	2.6	43	9	11	5	104	<1
WHS	1.7	1.0	100	0	70	28	109	3
YEP	7.7	1.1	87	8	41	13	104	1
<i>South Rush Lake</i>								
<i>Frame nets</i>								
BLB	1.0	0.4	44	21	33	20	105	1
BLC	1.6	0.9	71	15	68	15	103	1
COC	1.3	0.7	100	0	83	13	92	4
NOP	0.3	0.2	83	17	0	---	81	17
OSF	0.3	0.3	---	---	---	---	---	---
ROB	0.2	0.2	25	59	0	---	106	9
WAE	2.6	0.7	62	12	13	8	94	2
WHB	1.7	1.2	100	0	93	7	108	1
WHS	0.6	0.2	100	0	90	10	105	5
YEP	0.1	0.1	50	50	0	---	112	---
<i>Gill nets</i>								
COC	0.3	0.3	100	0	100	0	108	11
NOP	1.2	0.4	86	14	0	---	86	5
OSF	0.3	0.5	---	---	---	---	---	---
WAE	4.2	2.1	56	17	16	13	96	1
WHB	0.2	0.2	0	---	0	---	98	---
WHS	1.3	0.3	100	0	63	34	107	3
YEP	12.2	1.6	73	8	32	9	111	<1

Table 2. 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 North and South Rush Lakes, 2010.

Survey Year	Year Class						
	2010	2009	2008	2007	2006	2005	2004
<i>North Rush Lake</i>							
2010		4	48	16	5	10	4
Number stocked							
fry	1,100						
small fingerling							
large fingerling							
<i>South Rush Lake</i>							
2010		3	10	10	1	4	
Number stocked							
fry	1,100						
small fingerling							
large fingerling							

Table 3. Weighted mean length at capture (mm) for walleye captured in experimental gill nets (expanded sample size) from North and South Rush Lakes, 2010.

Year	Age					
	1	2	3	4	5	6
<i>North Rush Lake</i>						
2010	236(4)	346(48)	432(16)	458(5)	498(10)	536(4)
<i>South Rush Lake</i>						
2010	219(3)	349(10)	429(10)	472(1)	549(4)	---

Table 4. Stocking history including size and number for fishes stocked into North and South rush Lakes, 2004-2010.

Year	Species	Size	Number
<i>North Rush Lake</i>			
2010	NOP	fry	523,500
	WAE	fry	1,100,000
<i>South Rush Lake</i>			
2010	WAE	fry	1,100,000

Table 5. Year class distribution based on expanded age/length summary for yellow perch sampled in gill nets from North and South Rush Lakes, 2010.

Survey Year	Year Class			
	2010	2009	2008	2007
<i>North Rush Lake</i>				
2010		2	19	25
<i>South Rush Lake</i>				
2010		18	35	28

Table 6. Weighted mean total length (mm) at capture by gender for yellow perch captured in experimental gill nets (expanded sample size) from North and South Rush Lakes, 2010.

Year	Age		
	1	2	3
North Rush Lake			
2010			
Male	136 (1)	185 (2)	226 (1)
Female	147 (1)	210 (17)	262 (24)
Combined	142 (2)	208 (19)	261 (25)
South Rush Lake			
2010			
Male	127 (6)	185 (10)	223 (1)
Female	127 (12)	216 (25)	256 (27)
Combined	127 (18)	207 (35)	255 (28)

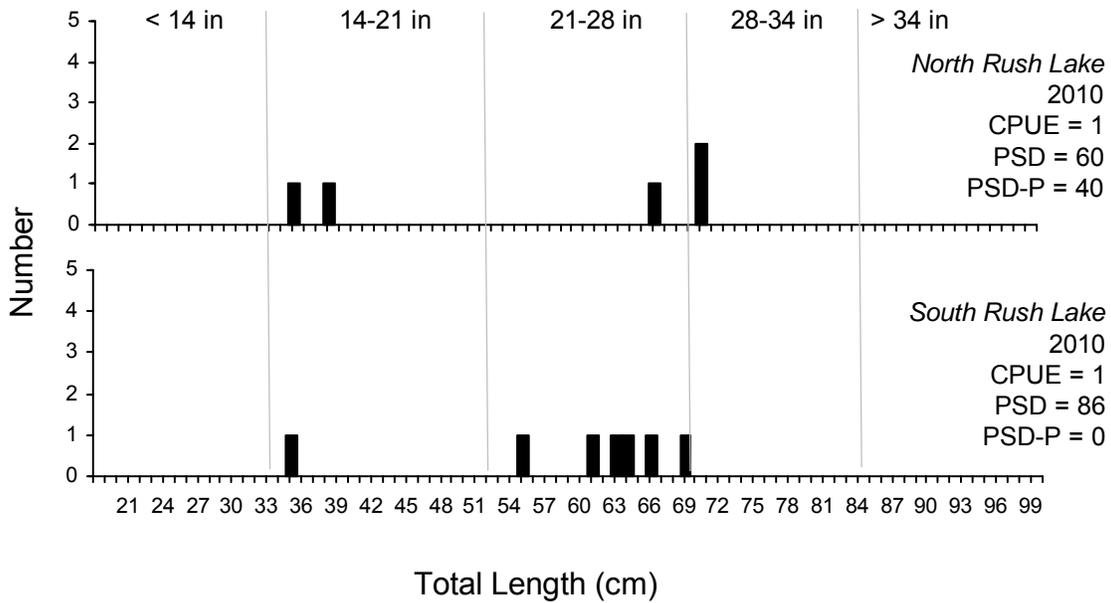


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured by gill nets in North (top) and South (bottom) Rush Lakes, 2010.

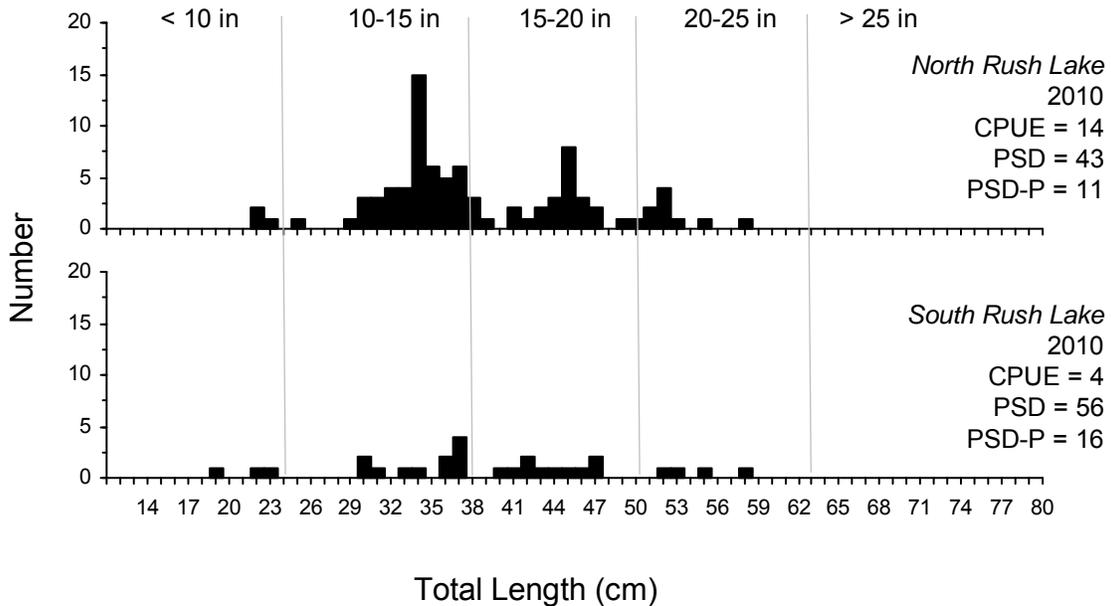


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured by gill nets in North (top) and South (bottom) Rush Lakes, 2010.

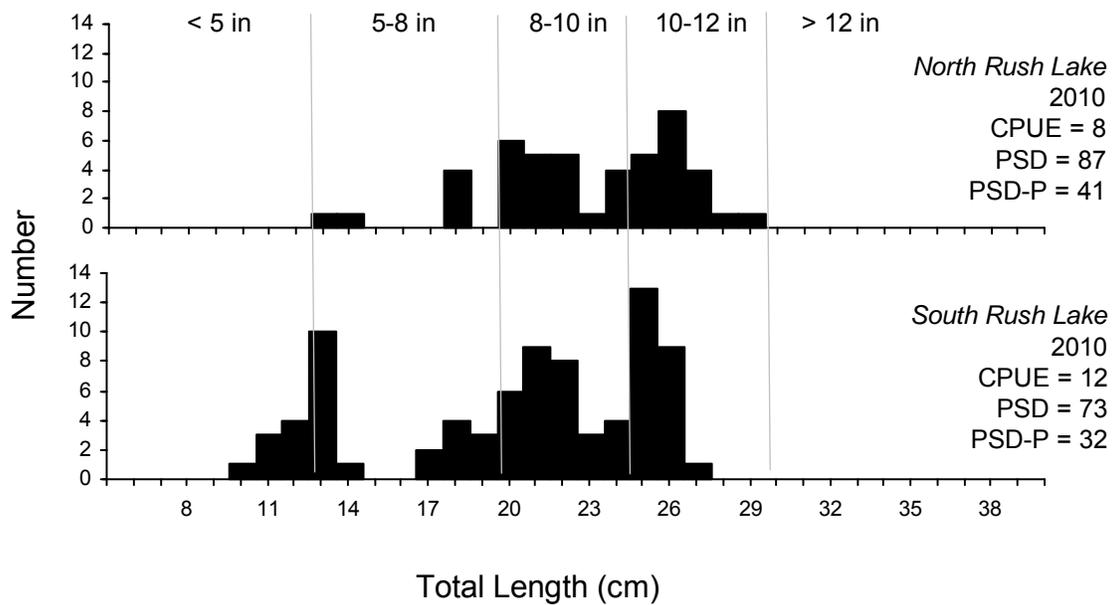


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured by gill nets in North (top) and South (bottom) Rush Lakes, 2010.

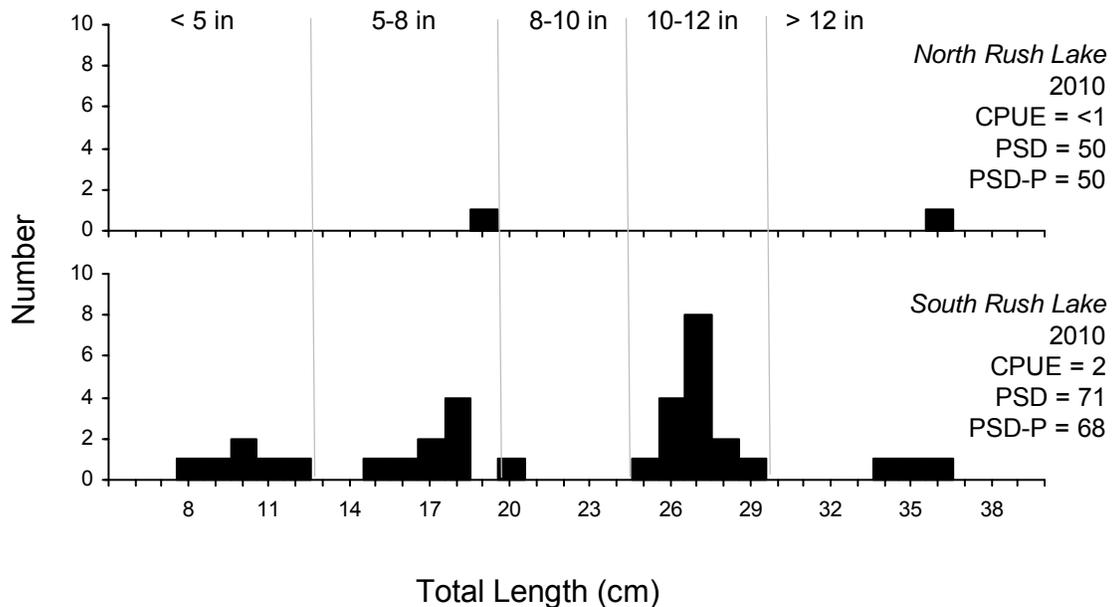


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured by frame nets in North (top) and South (bottom) Rush Lakes, 2010.