



Minnesota Department of Natural Resources
Fisheries Management



STANDARD LAKE SURVEY REPORT

DRAFT VERSION - PRELIMINARY DATA (AS OF 11/20/2013)

Lake Name: Sand

Survey Type: Special Assessment

DOW Number: 31-0826-00

Survey ID Date: 09/24/2013

SPECIAL ASSESSMENT
Gill Netting
Water Quality Measurement

Lake Identification

Alternate Lake Name: N/A
Primary Lake Class ID: 22

DNR Sounding Map Number: B0165
Alternate Lake Class ID: N/A

Lake Location

Primary County: Itasca

Nearest Town: Squaw Lake

Legal Descriptions

Lake Center: Township - 148N Range - 26W Section - 20
PLS Section Lake Center: 14802620

All Legal Descriptions:

Itasca County: Township - 148N Range - 26W (Eleven various sections)

Area Office

Area Name: Grand Rapids
Region Name: Northeast

ORG Code: F216
Region Number: 2

Lake Access

(Information based on Special Assessment dated 09/08/2011)

Station ID	Ownership	Public Use	Type	Location / Comments
AC - 1	DNR	Open to Public use	Concrete	Southeast shore in the narrows.

Lake Characteristics

Lake Area (planimetered acres): 4328.00	GIS Shoreline Length (miles): 13.69
GIS Lake Area (acres): 3391.85	Maximum Fetch (miles): 5.50
DOW Lake Area (acres): 3785.00	Fetch Orientation (degrees): 22
Littoral Area (acres): 1897.00	USGS Quad Map Number: H13d
Area in MN (acres): 3391.85	USGS Quad 24K GIS Index: 1526
Maximum Depth (feet): 70.0	
Mean Depth (feet): N/A	

Watershed Characteristics

Major Watershed

Name: Big Fork River
Watershed Number: 77
Watershed size (acres): 1,315,131

Minor Watershed

Name: From Little Sand L
Watershed Number: 39
Watershed size (acres): 21,028

Surveys And Investigations

Initial Survey: 07/16/1957.

Re-Survey: 07/09/1984, 07/07/1975.

Population Assessment: 07/10/2006, 07/16/2001, 07/15/1996, 07/13/1992, 07/11/1988, 07/14/1980.

Special Assessment: 10/16/2013, 09/24/2013, 10/16/2012, 09/25/2012, 09/08/2011, 07/25/2011, 06/13/2011, 09/16/2010, 06/01/2010, 10/12/2009, 09/17/2008, 09/25/2007, 09/20/2006, 09/14/2005, 09/07/2004, 09/16/2003, 09/08/2003, 09/04/2002, 09/10/2001, 09/13/2000, 09/20/1999, 09/08/1997, 10/16/1996, 09/26/1995.

Water Level History - Readings

Station ID	Date	Level	Reading (feet)	Reading Type
BM - 1	07/28/2011	N/A	N/A	Above or below Benchmark
	07/13/2006	Low	5.90	Above or below Benchmark
BM - 2	07/13/2006	N/A	0.00	Not Found
GA - 1	07/28/2011	N/A	N/A	Direct Gauge Reading
	07/14/2006	Low	1.79	Direct Gauge Reading

Water Level History - Station Summary

Station ID	Minimum Level		Maximum Level		Range (feet)	Average Level (feet)	Reading Type (and number of readings)
	Feet	Date	Feet	Date			
BM - 1	5.90	07/13/2006	5.90	07/13/2006	0.00	5.90	Above or below Benchmark (1)
BM - 2	0.00	07/13/2006	0.00	07/13/2006	0.00	0.00	Not Found (1)
GA - 1	1.79	07/14/2006	1.79	07/14/2006	0.00	1.79	Direct Gauge Reading (1)

Fish Diseases And Parasites

Species Examined	Number of Fish Examined			Examination Results	
	Internally	Externally	In Lab	Condition Observed	Number of Fish
northern pike	-	45	-	None observed	22
				Neascus (Black Spot)	23
walleye	-	37	-	None observed	30
				Neascus (Black Spot)	7

Dissolved Oxygen And Temperature Profile Of Lake Water

Station ID	Sampling Date	Bottom Depth (Feet)	Sample Depth (Feet)	Water Temperature (°F)	Dissolved Oxygen (ppm)
WQ - 1	09/26/2013	54.0	Surface	61.7	9.8
			6.0	61.7	9.5
			12.0	61.7	9.5
			18.0	61.7	9.5
			24.0	61.7	9.4
			30.0	61.7	9.4
			36.0	61.7	9.3
			40.0	61.9	8.9
			42.0	61.9	8.9
			43.0	54.5	2.2
			45.0	51.4	0.8
			50.0	50.0	0.4

Field Measurements Of Water Quality

Station ID	Sampling Date	Sample Depth (Feet)	Secchi Depth (Feet)	Field pH	Alkalinity (ppm)	Water Color	Color Cause
WQ - 1	09/26/2013	Surface	7.0	N/A	N/A	N/A	N/A

Net Catch Summary by Numbers for GN

Standard gill net sets

Number of Sets: 15
 First Set Date: 09/24/2013
 Last Lift Date: 09/27/2013
 Target Species: N/A

Abbr	Species	Total Fish	Number Per Set	Quartiles for Lake Class 22*		
				25%	50%	75%
BLC	Black Crappie	96	6.40	0.22	0.42	1.14
BLG	Bluegill	23	1.53	N/A	N/A	N/A
BOF	Bowfin (Dogfish)	18	1.20	0.08	0.13	0.24
BRB	Brown Bullhead	3	0.20	0.25	0.50	1.62
GLR	Golden Redhorse	1	0.07	N/A	N/A	N/A
LMB	Largemouth Bass	2	0.13	0.25	0.62	1.20
NOP	Northern Pike	96	6.40	3.00	5.00	7.89
PMK	Pumpkinseed	2	0.13	N/A	N/A	N/A
RKB	Rock Bass	26	1.73	1.00	2.93	6.63
SHR	Shorthead Redhorse	16	1.07	0.08	0.14	0.46
SMB	Smallmouth Bass	11	0.73	0.20	0.44	0.87
TLC	Tullibee (Cisco)	2	0.13	0.50	1.56	5.20
WAE	Walleye	73	4.87	4.01	6.61	9.63
WTS	White Sucker	24	1.60	1.02	2.00	3.49
YEB	Yellow Bullhead	1	0.07	0.65	2.59	6.43
YEP	Yellow Perch	177	11.80	7.06	17.14	33.87
Total Fish/Set:			38.07	* Quartiles for Number Per Set		

Net Catch Summary by Weight for GN

Standard gill net sets

Abbr	Species	Total Weight (Pounds)	Pounds Per Set	Mean Weight	Quartiles for Lake Class 22*		
					25%	50%	75%
BLC	Black Crappie	26.04	1.74	0.27	0.24	0.38	0.55
BLG	Bluegill	11.28	0.75	0.49	N/A	N/A	N/A
BOF	Bowfin (Dogfish)	74.53	4.97	4.14	3.01	4.13	5.18
BRB	Brown Bullhead	4.41	0.29	1.47	0.67	0.90	1.19
GLR	Golden Redhorse	3.80	0.25	3.80	N/A	N/A	N/A
LMB	Largemouth Bass	0.17	0.01	0.08	0.55	0.77	1.05
NOP	Northern Pike	143.17	9.54	1.49	1.68	2.25	2.80
PMK	Pumpkinseed	0.90	0.06	0.45	N/A	N/A	N/A
RKB	Rock Bass	14.20	0.95	0.55	0.30	0.41	0.52
SHR	Shorthead Redhorse	34.47	2.30	2.15	1.46	1.98	2.69
SMB	Smallmouth Bass	34.41	2.29	3.13	0.94	1.35	1.81
TLC	Tullibee (Cisco)	3.85	0.26	1.92	0.37	0.69	1.04
WAE	Walleye	81.20	5.41	1.11	1.12	1.43	1.90
WTS	White Sucker	51.76	3.45	2.16	1.52	1.89	2.28
YEB	Yellow Bullhead	0.68	0.05	0.68	0.62	0.75	0.95
YEP	Yellow Perch	44.39	2.96	0.25	0.12	0.15	0.21
Total Pounds Fish/Set:			35.28	* Quartiles for Mean Weight			

Length Frequency Distribution For GN

Standard gill net sets

(Field work conducted between 09/24/2013 and 09/27/2013)

	<u>BLC</u>	<u>BLG</u>	<u>BOF</u>	<u>BRB</u>	<u>GLR</u>	<u>LMB</u>	<u>NOP</u>	<u>YNOP</u>	<u>PMK</u>	<u>RKB</u>	<u>SHR</u>	<u>SMB</u>	<u>TLC</u>	<u>WAE</u>	<u>WTS</u>
< 3.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00 - 3.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.50 - 3.99	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4.00 - 4.49	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.50 - 4.99	11	4	-	-	-	-	-	-	-	-	-	-	-	-	-
5.00 - 5.49	21	-	-	-	-	2	-	-	-	-	-	-	-	-	-
5.50 - 5.99	17	1	-	-	-	-	-	-	-	1	-	-	-	-	-
6.00 - 6.49	7	-	-	-	-	-	-	-	-	1	-	-	-	-	-
6.50 - 6.99	2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
7.00 - 7.49	-	3	-	-	-	-	-	-	1	3	-	-	-	-	1
7.50 - 7.99	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
8.00 - 8.49	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-
8.50 - 8.99	2	4	-	-	-	-	-	-	-	2	-	-	-	1	-
9.00 - 9.49	6	6	-	-	-	-	-	1	-	2	-	-	-	4	-
9.50 - 9.99	12	1	-	-	-	-	-	-	-	6	-	-	-	2	-
10.00 - 10.49	14	1	-	-	-	-	-	-	-	5	-	-	-	2	1
10.50 - 10.99	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11.00 - 11.49	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
11.50 - 11.99	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-
12.00 - 12.99	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-
13.00 - 13.99	-	-	-	3	-	-	-	-	-	-	-	-	-	8	-
14.00 - 14.99	-	-	-	-	-	-	1	-	-	-	2	1	-	7	-
15.00 - 15.99	-	-	-	-	-	-	4	-	-	-	1	1	2	6	1
16.00 - 16.99	-	-	-	-	-	-	10	-	-	-	-	2	-	14	7
17.00 - 17.99	-	-	-	-	-	-	20	-	-	-	7	5	-	4	8
18.00 - 18.99	-	-	-	-	-	-	20	-	-	-	6	1	-	1	6
19.00 - 19.99	-	-	1	-	-	-	17	-	-	-	-	1	-	2	-
20.00 - 20.99	-	-	6	-	1	-	8	-	-	-	-	-	-	2	-
21.00 - 21.99	-	-	4	-	-	-	5	-	-	-	-	-	-	-	-
22.00 - 22.99	-	-	2	-	-	-	3	-	-	-	-	-	-	2	-
23.00 - 23.99	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
24.00 - 24.99	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
25.00 - 25.99	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
26.00 - 26.99	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
27.00 - 27.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28.00 - 28.99	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
29.00 - 29.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00 - 30.99	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
31.00 - 31.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32.00 - 32.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00 - 33.99	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
34.00 - 34.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35.00 - 35.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
= > 36.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	<u>BLC</u>	<u>BLG</u>	<u>BOF</u>	<u>BRB</u>	<u>GLR</u>	<u>LMB</u>	<u>NOP</u>	<u>YNOP</u>	<u>PMK</u>	<u>RKB</u>	<u>SHR</u>	<u>SMB</u>	<u>TLC</u>	<u>WAE</u>	<u>WTS</u>
Total	96	23	18	3	1	2	95	1	2	26	16	11	2	73	24
Min. Length	4.33	3.90	19.88	13.58	20.51	5.20	14.17	9.29	7.09	5.51	14.33	14.25	15.75	8.94	7.13
Max. Length	11.06	10.04	26.22	13.86	20.51	5.43	33.78	9.29	8.15	10.47	18.74	19.57	15.94	22.56	18.98
Mean Length	7.07	7.69	22.12	13.69	20.51	5.31	19.28	9.29	7.62	8.55	17.34	17.08	15.85	14.43	16.56
# Measured	96	23	18	3	1	2	95	1	2	26	16	11	2	73	24
No Lengths for	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Unless all fish were measured in the catch, totals shown for some length-frequency distributions may differ from the total number of fish in the catch, due to rounding of fractions used in the estimation of length frequency from a subsample of measured fish

Length Frequency Distribution For GN (Continued)

Standard gill net sets

(Field work conducted between 09/24/2013 and 09/27/2013)

	<u>YEB</u>	<u>YEP</u>
< 3.00	-	-
3.00 - 3.49	-	-
3.50 - 3.99	-	-
4.00 - 4.49	-	-
4.50 - 4.99	-	-
5.00 - 5.49	-	1
5.50 - 5.99	-	18
6.00 - 6.49	-	15
6.50 - 6.99	-	13
7.00 - 7.49	-	23
7.50 - 7.99	-	16
8.00 - 8.49	-	22
8.50 - 8.99	-	20
9.00 - 9.49	-	16
9.50 - 9.99	-	12
10.00 - 10.49	1	14
10.50 - 10.99	-	5
11.00 - 11.49	-	2
11.50 - 11.99	-	-
12.00 - 12.99	-	-
13.00 - 13.99	-	-
14.00 - 14.99	-	-
15.00 - 15.99	-	-
16.00 - 16.99	-	-
17.00 - 17.99	-	-
18.00 - 18.99	-	-
19.00 - 19.99	-	-
20.00 - 20.99	-	-
21.00 - 21.99	-	-
22.00 - 22.99	-	-
23.00 - 23.99	-	-
24.00 - 24.99	-	-
25.00 - 25.99	-	-
26.00 - 26.99	-	-
27.00 - 27.99	-	-
28.00 - 28.99	-	-
29.00 - 29.99	-	-
30.00 - 30.99	-	-
31.00 - 31.99	-	-
32.00 - 32.99	-	-
33.00 - 33.99	-	-
34.00 - 34.99	-	-
35.00 - 35.99	-	-
= > 36.00	-	-

	<u>YEB</u>	<u>YEP</u>
Total	1	177
Min. Length	10.47	5.31
Max. Length	10.47	11.02
Mean Length	10.47	8.02
# Measured	1	177
No Lengths for	0	0

Note: Unless all fish were measured in the catch, totals shown for some length-frequency distributions may differ from the total number of fish in the catch, due to rounding of fractions used in the estimation of length frequency from a subsample of measured fish

Length At Capture With Last Incremental Length

(Body-Scale constant, all lengths, and all length increments in inches)

Species: Black Crappie
Body-Scale Constant: 0.79
Total Sample Size: 28

Length at Capture in 2013 for Each Age Class, with Incremental Lengths for 2013

Year Class	Age	Sample Size	Length At Capture			Standard Error	Length Increments	
			Average Length	Maximum Length	Minimum Length		Increment	Standard Error
2012	1	9	5.24	6.10	4.65	0.168	2.35	0.095
2011	2	0	-	-	-	-	-	-
2010	3	13	9.54	10.16	8.86	0.124	1.96	0.081
2009	4	6	10.01	10.35	9.57	0.137	1.22	0.141

Species: Northern Pike
Body-Scale Constant: 2.09
Total Sample Size: 55

Length at Capture in 2013 for Each Age Class, with Incremental Lengths for 2013

Year Class	Age	Sample Size	Length At Capture			Standard Error	Length Increments	
			Average Length	Maximum Length	Minimum Length		Increment	Standard Error
2013	0	1	9.29	9.29	9.29	N/A	9.29	N/A
2012	1	7	16.21	17.32	14.17	0.422	5.83	0.247
2011	2	20	17.94	19.37	16.42	0.215	3.30	0.154
2010	3	17	19.48	21.26	17.72	0.274	1.63	0.127
2009	4	7	21.93	24.88	19.76	0.662	1.51	0.277
2008	5	3	23.62	28.27	20.51	2.367	1.22	0.400

Species: Walleye
Body-Scale Constant: 1.10
Total Sample Size: 50

Length at Capture in 2013 for Each Age Class, with Incremental Lengths for 2013

Year Class	Age	Sample Size	Length At Capture			Standard Error	Length Increments	
			Average Length	Maximum Length	Minimum Length		Increment	Standard Error
2012	1	6	9.50	10.16	8.94	0.173	2.97	0.160
2011	2	20	12.64	14.37	10.24	0.227	3.06	0.111
2010	3	12	15.18	16.34	13.94	0.238	2.07	0.149
2009	4	6	16.40	16.93	15.94	0.159	1.46	0.073
2008	5	3	18.29	19.61	16.14	1.085	1.16	0.054
2007	6	1	17.09	17.09	17.09	N/A	1.26	N/A
2006	7	2	18.13	18.74	17.52	0.610	0.74	0.093

Back-Calculated Lengths for Each Age Class and Average Annual Increments of Back-Calculated Lengths

Species: Black Crappie

Gear Type: Combined Gear Types (GN)

Class	Age	N	1	2	3	4
2012	1	9	2.89	-	-	-
			2.89	-	-	-
2010	3	13	2.32	4.49	7.58	-
			2.32	2.17	3.09	-
2009	4	6	2.49	4.52	6.91	8.79
			2.49	2.03	2.39	1.88
Mean Length			2.54	4.50	7.37	8.79
Mean Increment			2.54	2.13	2.87	1.88
Total N			28	19	19	6

Species: Northern Pike

Gear Type: Combined Gear Types (GN)

Class	Age	N	1	2	3	4	5
2012	1	7	10.38	-	-	-	-
			10.38	-	-	-	-
2011	2	20	8.70	14.64	-	-	-
			8.70	5.94	-	-	-
2010	3	17	8.50	14.53	17.86	-	-
			8.50	6.03	3.33	-	-
2009	4	7	7.29	13.71	17.61	20.42	-
			7.29	6.42	3.90	2.81	-
2008	5	3	7.25	13.21	16.92	19.81	22.41
			7.25	5.96	3.71	2.89	2.59
Mean Length			8.59	14.37	17.69	20.24	22.41
Mean Increment			8.59	6.05	3.52	2.84	2.59
Total N			54	47	27	10	3

Species: Walleye

Gear Type: Combined Gear Types (GN)

Class	Age	N	1	2	3	4	5	6	7
2012	1	6	6.53	-	-	-	-	-	-
			6.53	-	-	-	-	-	-
2011	2	20	5.22	9.58	-	-	-	-	-
			5.22	4.36	-	-	-	-	-
2010	3	12	5.77	9.97	13.12	-	-	-	-
			5.77	4.20	3.15	-	-	-	-
2009	4	6	4.89	8.74	12.28	14.95	-	-	-
			4.89	3.85	3.54	2.67	-	-	-
2008	5	3	5.41	9.55	12.72	15.22	17.13	-	-
			5.41	4.13	3.18	2.49	1.91	-	-
2007	6	1	4.42	7.36	9.56	12.32	14.00	15.82	-
			4.42	2.94	2.20	2.76	1.68	1.82	-
2006	7	2	4.68	7.40	10.28	12.51	15.07	16.67	17.39
			4.68	2.73	2.88	2.24	2.56	1.61	0.72
Mean Length			5.44	9.42	12.47	14.39	15.92	16.39	17.39
Mean Increment			5.44	4.12	3.19	2.56	2.09	1.68	0.72
Total N			50	44	24	12	6	3	2

Age Class Frequency Distribution

Species and Gear (1)	Number of Fish (2)			Number of Fish in Year Class ('yy) and Age Class															
	Aged	Keyed	Unaged	'13 0	'12 1	'11 2	'10 3	'09 4	'08 5	'07 6	'06 7	'05 8	'04 9	'03 10	'02 11	'01 12	'00 13	'99 14	<'99 15+
Black Crappie																			
GN	28	62	6	0	56	0	21	13	0	0	0	0	0	0	0	0	0	0	0
Northern Pike																			
GN	58	38	0	1	12	38	27	10	5	0	3	0	0	0	0	0	0	0	0
Walleye																			
GN	55	18	0	0	8	27	15	9	5	1	4	3	0	1	0	0	0	0	0

(1) Key to sampling gear abbreviations:

GN = Standard gill net sets

(2) Notes:

Number of Fish Aged: Fish that were aged from bony parts.

Number of Fish Keyed: Fish assigned an age with an age-length key or by expansion of mesh or station age distributions.

Number of Fish Unaged: Fish that were not aged and were not assigned an age.

Field Notes - General Field

Test netting was conducted during a stretch of windy weather. High fishing pressure was observed with most anglers targeting walleye and black crappie.

Field Crew: Dave Weitzel and Warren Foster

Analysis and write up: Dave Weitzel

Discussion

A special assessment was conducted on Sand Lake in September of 2013. This assessment consisted of 15 gill net sets. It should be noted that catch per unit comparisons to past summer netting may not be representative of population changes, as gill net catch rates typically display seasonal variation.

The purpose of the assessment was to collect data to determine a baseline walleye spawning stock density as part of an OTC marking study to evaluate stocked fry success. Secondary purposes of the assessment were to determine the baseline status of walleye in terms of age and size structures to provide data for a proposed walleye protected slot limit. Another secondary purpose was to determine the status of the northern pike population as part of an ongoing regulation evaluation. This was the first fall gill net assessment on Sand Lake.

Results

Walleye

Walleye were captured at a rate of 4.9 per gill net, resulting in a sample size of 73 fish. Sand Lake has a history of producing a walleye population dominated by small, young fish. Length indices in 2013 were similar to past assessments, as the proportional stock density (PSD) of walleye exceeding the quality length of 15 inches was 47. Relative stock density (RSD-17) of walleye exceeding 17 inches was 17 and RSD-20 was 6. Walleye length ranged from 8.9 to 22.6 and averaged 14.4 inches.

Walleye populations are often characterized by dominant year classes and irregular recruitment (Kelso and Bagenal, 1977; Kocovsky and Carline, 2001). Age and growth analysis from Sand Lake indicated nine year classes with inconsistent recruitment, as 57% of the sampled walleye belonged to the 2011 (37%) and 2010 (20%) year classes. Growth was similar to past assessments and near the statewide average, as walleye typically exceeded 15 inches by age 5. Walleye averaged 3.2 years of age.

Age of maturity is often variable in fish populations, and can be impacted by compensatory responses resulting from exploitation. Heavy exploitation often results in a shift in size at first maturation, with fish reaching maturity at a smaller size and age (Spangler et al, 1977; Muth and Wolfert, 1986; Gangl, 2001). Female walleye in Sand Lake were fully mature by 15 inches and males were mature by 14 inches. The size of maturity in Sand Lake was smaller than expected when compared to some other populations and suggests an exploited fishery.

Q_{abg} modeling (Anderson 1998) was run for all walleye and separately for mature females to estimate female spawning stock density. Q_{abg} modeling estimated a total walleye population of 29,120 walleye with a 95% confidence range of 17,575 to 41,680. Density was estimated at 6.7 walleye per acre (4.3 pounds per acre) with a 95% confidence range of 4.1 walleye (2.9 pounds) per acre to 9.6 walleye (6.1 pounds) per acre. Female spawning stock density was estimated at 0.9 pounds per acre with a 95% confidence range of 0.4 to 1.5 pounds per acre. Density, in terms of numbers of mature females, was very low, as two acres only produced one mature female walleye (density = 0.5 walleye per acre, 95% CI = 0.2-0.9 per acre). This represents a relatively low female spawning stock density compared to some other Minnesota lakes (MN DNR, unpublished).

The Sand Lake walleye population continues to be dominated by small, young walleye. Maturity schedule and low female spawning stock density suggests high angler exploitation. Natural reproduction has been documented in past assessments, indicating the potential for a self-sufficient population. Low numbers of spawning adults may limit natural reproduction and subsequent recruitment, however. As such, Sand Lake has been managed using supplemental walleye stocking.

Discussion (Continued)**Northern pike**

Northern pike populations typically exhibit density dependent growth. Average size and growth rates are typically poor when northern pike occur at high densities (Pierce 2012). Northern pike in Sand Lake have occurred in high numbers and size structure has predictably been poor in past assessments. A special regulation was implemented in 2007 to improve the northern pike size structure. This regulation requires the immediate release of all pike from 22 to 36 inches, but allows nine legal-length fish to be in possession. The goals of this regulation are to improve northern pike size structure by improving gill net catch of pike > 22 inches to 2/net, increase the mean length to 20 inches with 25% of sampled pike exceeding 21 inches and 5% exceeding 28 inches.

Pike were captured at a rate of 6.4 per gill net in 2013. Size structure remained relatively poor, as PSD (21 inches) was 16 and RSD-P (28 inches) was 5. Northern pike length ranged from 9.3 to 33.8 inches and averaged 19.2 inches. Although the goals of the regulation were not met in 2013, it should be noted that PSD and RSD-P were the highest observed for the dataset.

Total mortality of northern pike often exceeds 50% and natural mortality rates are often high. Exploitation is typically size selective resulting in additive mortality for older, larger fish (Allen et al. 1998; Pierce 2012). Given relatively high exploitation and mortality, northern pike populations often show a preponderance of 2 to 5 year old fish, as few pike survive beyond age-7 (Griffiths et al, 2004; Becker 1982). Age and growth analysis from Sand Lake in 2013 identified 7 year classes with a preponderance of pike from age-1 to 5 and few pike exceeding age-7. Pike averaged 2.7 years of age. Growth was similar to past assessments and near the statewide average as pike exceeded 21 inches by age-5.

Becker (1982) reported that males reached maturity in 1-2 years (16-18 inches) while females matured in 2-3 years (20-22 inches). Pike from Sand Lake matured by age 1 (males) or 2 (females) and all pike exceeding 16 inches were mature, suggesting an early maturity schedule indicative of a high density, exploited fishery.

A lack of older, larger pike still limits the potential popularity of the pike fishery in Sand Lake. Improvements in the pike size structure may be difficult to attain given poor to average growth, consistent recruitment, early maturation, and apparently high adult mortality. ?

Black crappie

Black crappie is an important management species in Sand Lake. Crappies were captured at a rate of 6.4 per gill net in 2013. Size structure was moderate, as crappie ranged from 4.3 to 11.1 inches. Black crappie populations often exhibit irregular recruitment resulting in dominate year classes, shifting age and size structures, and inconsistent angler success (Parsons et al. 2004). Recruitment appeared inconsistent in 2013, as only three year classes were present. Age-1 crappie were most common in the gill net (62%), followed by age-3 (23%). The oldest crappie sampled was age-4. The lack of crappie exceeding age-5 may indicate poor recruitment in the past, high mortality, and/or high angler exploitation. Growth rates from Sand Lake have generally exceeded the statewide average and remained good in 2013, as crappie generally exceeded 8 inches by age-4. Given the current size and age structure, good angling opportunities presently exist in Sand Lake.

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Discussion (Continued)

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Status Of The Fishery

The Sand Lake walleye population has a history of being dominated by young, small walleye. Age and size structure remained poor in 2013. Maturity schedule and low female spawning stock density suggests high angler exploitation. Natural reproduction has been documented in past assessments, indicating the potential for a self-sufficient population. Low numbers of spawning adults may limit natural reproduction and subsequent recruitment, however. As such, Sand Lake has been managed using supplemental walleye stocking.

Sand Lake has a history of producing a high density northern pike population dominated by young, small pike. A special regulation was implemented in 2007 to improve the northern pike size structure. This regulation requires the immediate release of all pike from 22 to 36 inches, but allows nine legal-length fish to be in possession. Size structure remained poor in 2013, although length indices were the highest observed for the dataset, suggesting marginal improvements. A lack of older, larger pike still limits the potential popularity of the pike fishery in Sand Lake. Improvements in the pike size structure may be difficult to attain given poor to average growth, consistent recruitment, early maturation, and apparently high adult mortality.

Black crappie is an important management species in Sand Lake. Black crappie populations often exhibit irregular recruitment resulting in dominate year classes, shifting age and size structures, and inconsistent angler success. Recruitment in Sand Lake appeared inconsistent in 2013, as only three year classes were present. Age-1 crappie were most common in the gill net (62%), followed by age-3 (23%). The oldest crappie sampled was age-4. The lack of crappie exceeding age-5 may indicate poor recruitment in the past, high mortality, and/or high angler exploitation. Growth rates from Sand Lake have generally exceeded the statewide average and remained good in 2013, as crappie generally exceeded 8 inches by age-4. Given the current size and age structure, good angling opportunities presently exist in Sand Lake.

Approval Dates And Notices

Date Approved By Grand Rapids Area Fisheries Supervisor: _____

Date Approved By Northeast Region Fisheries Manager: _____

This Draft version of the Standard Lake Survey Report contains preliminary data (as of 11/20/2013), and is therefore subject to change at any time.



Minnesota Department of Natural Resources

By accepting the data in this report, the user agrees the data will be used for personal benefit and not for profit. Any other uses or publication of the data needs the consent of the Department. The Minnesota Department of Natural Resources assumes no responsibility for actual or consequential damage incurred as a result of any user's reliance on the data.

Standard Lake Survey Report revision: 04/05/2011-RJE. Data Date: 11/20/2013 at 12:18 pm .

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REPORT OVERVIEW - FOR OFFICE USE ONLY

(This page is not part of the Standard Lake Survey Report and should be discarded)

Lake Name: Sand

Survey Type: Special Assessment

DOW Number: 31-0826-00

Survey ID Date: 09/24/2013

Gill Netting, Water Quality Measurement

Survey Status: Field Work Complete

The following 16 (of 31) report components are not included in this report:

1. Current Water Level
2. Benchmark And Gauge Descriptions / Locations
3. Water Level History*
4. Lake Inlets
5. Additional Inlet Information
6. Lake Outlets
7. Additional Outlet Information
8. Water Control Structure (Dam)
9. Surrounding Watershed Characteristics, Shoreline Characteristics, and Riparian Landscape Observations
10. Resorts And Campgrounds
11. Fish Spawning Conditions
12. Erosion And Pollution
13. Aquatic Vegetation And Shoalwater Substrates
14. Laboratory Analysis Of Water Chemistry
15. Other Species (added to revision 03/24/2009)
16. Water Quality (Winter Observations) (added to revision 01/21/2010)

* Water Level History report: This data has not yet been migrated into the Fisheries LSM database. On 01/08/2009, two additional Water Level History report components (Readings and Station Summary) were added.

Note: The data source for Length and Age Class Frequency Distribution tables is updated twice daily - once at noon and once overnight. Any changes to the data made after noon on 11/20/2013 may not be reflected in the Distribution tables until 11/21/2013.