

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-46

Name: Sheridan Lake

County: Pennington

Legal description: Sec. 11-14 T1S R5E; and Sec. 7 T1S R4E

Location from nearest town: 5 miles east and 2 miles north of Hill City, SD

Dates of present survey: May 23-25, June 2, and July 18-19, 2013

Date last surveyed: May 25-26 and July 19-20, 2012

Most recent lake management plan: F21-R-38

Date: 2006

Management classification: Warmwater permanent

Contour mapped: June 2012

Primary Species: (game and forage)

Secondary and other species:

1. Rainbow Trout
2. Yellow Perch
3. Black Crappie
4. Largemouth Bass
5. Brown Trout
6. _____
7. _____
8. _____
9. _____

1. Northern Pike
2. Golden Shiner
3. Green Sunfish
4. White Sucker
5. European Rudd
6. Black Bullhead
7. Rock Bass
8. Channel Catfish
9. Smallmouth Bass

PHYSICAL CHARACTERISTICS

Surface Area: 383 acres

Watershed: 95,311 acres

Maximum depth: 96 feet

Mean depth: 30 feet

Lake elevation at survey: 4,654 ft. in July (near full)

Ownership of lake and adjacent lakeshore property

Sheridan Lake was constructed by the Civilian Conservation Corps for recreational purposes in 1939. Sheridan Lake and its dam are maintained and operated by the United States Forest Service (USFS). The operation and maintenance of campgrounds, picnic areas, parking lots, and boat launch facilities are managed under a special use permit by non-government entities. These entities also cooperate with the USFS during major maintenance and improvement in the off season. The marina and concession operations are leased to private enterprise under other long-term use permits (Personal communication with Amy Ballard, USFS, 1995).

Land use

The ownership of the Sheridan Lake watershed is 85.8% USFS (81,818 ac) and 14.2% private (13,493 ac) (Personal communication Jon Macy, USFS, 1994). The bulk of USFS land is managed for timber production, but is also grazed through a permit process. Most of this land is covered by pine or spruce forest interspersed with meadows. Logging, thinning, and other timber management practices are ongoing. All of these activities contribute to the sediment load into Sheridan Lake carried by Spring and Horse Creeks. Private land is often less forested and more often used as horse pasture, cattle grazing land, home sites, or campgrounds. The

watershed also contains the town of Hill City and several other small developments. Small reservoirs including Mitchell, Major, Newton Fork and several unnamed farm ponds are located within the watershed. Most of the watershed consists of hills with moderate to steep inclines. Roads and trails are prevalent throughout the watershed.

Fishing Access

Sheridan Lake has boat launches on the north and south ends of the lake. Shore fishing is accessible via roads at both locations with floating fishing docks in both locations. Several floating docks are also located at a parking lot off of SD Hwy 385 on the west end of the lake. This area was renovated in the fall of 2012 to include a concrete stairway, ADA accessible ramp to the fishing piers and ice fishing access. Improvements were also made to the south boat ramp at the same time.

Observations of Water Quality and Aquatic Vegetation

Abundant emergent vegetation, primarily cattails, is present in the shallow ends of bays, along shallow shoreline areas, and near the inlets of Spring and Horse Creeks. Submergent vegetation is abundant throughout the lake at depths of six to eight feet. Algae blooms sometimes occur during the summer months and filamentous algae is found at times along the shoreline. Sheridan Lake is also infested with curly leaf pond weed which fills some bays.

Siltation occurs at all inlets, especially the Spring Creek and Horse Creek inlets, and is caused by agricultural use (grazing), timber/logging operations, highway runoff, and natural erosion.

Observations on condition of structures, (i.e. spillway, level regulators, boat ramps, etc.)

A faulty valve in the dam prevented controllable water releases from Sheridan Lake into Spring Creek during 2003. This valve was repaired in late 2004 and attempts have been made recently to open the valve, but it is not a part of lake or stream management at this time.

CHEMICAL DATA

Water column parameter data was collected using a YSI Sonde in 2013 prior to setting gill nets on July 18. One location was sampled near the first gill net site. A thermocline was present between four and eight meters (13-26 ft) (Table 1). This is not necessarily an accurate reflection of the rest of the lake. Sheridan Lake does oxygen and temperature stratify and dissolved oxygen levels likely limit the habitat of fish species to the upper reaches (<18 ft) of the lake during the summer.

Table 1. Water quality parameters collected with a YSI Sonde by depth at Sheridan Lake, South Dakota on July 18 2013. Sample location: UTM 13T 622427, 4870349.

Depth (m)	Temperature (°C)	Conductivity (µS)	D.O. mg/L	pH
0.5	24.20	0.316	10.90	8.84
1.0	24.21	0.314	10.92	8.86
2.0	24.18	0.314	10.93	8.87
3.0	24.05	0.313	11.15	8.87
4.0	23.77	0.313	10.77	8.84
5.0	22.90	0.318	8.14	8.46
5.5	21.67	0.321	5.73	8.08
6.0	20.02	0.322	3.62	7.72
6.5	18.05	0.323	0.89	7.49
7.0	16.02	0.323	0.68	7.46
8.0	13.00	0.323	0.79	7.44
9.0	11.74	0.323	0.57	7.43
10.0	10.41	0.324	0.70	7.44
11.0	9.21	0.324	0.64	7.44

MANAGEMENT OBJECTIVES

Objective 1. Maintain a mean gill net CPUE of stock-length Yellow Perch equal to or greater than 20, a PSD of 30-60.

Objective 2. Maintain a secondary fishery of Rainbow Trout through stocking catchable size fish.

Objective 3. Maintain a Largemouth Bass population with a minimum nighttime electrofishing CPUE for stock-length and longer fish equal to or greater than 40, PSD range between 40 and 70, and a PSD-P equal to or greater than 10.

Objective 4. Maintain a Smallmouth Bass population with a minimum nighttime electrofishing CPUE for stock-length fish of 20, PSD range between 40 and 70, and a PSD-P equal to or greater than 10.

BIOLOGICAL DATA

Sampling Effort

A modified fyke (trap) net survey consisting of eight net nights was completed on May 23-25, 2013 (Table 2, Figure 1). Trap nets consisted of a 1.3 X 1.5 m frame, 19.1 mm (0.75 in) mesh and a 1.2 X 23 m (3.9 X 75.5 ft) lead. Trap nets have been set in similar locations during previous surveys with six to eight nets set. Since 2011 trap net surveys have been conducted in May instead of July, as in previous years. Nets remained in the water overnight for a total of eight trap net nights.

Prior to setting gill nets on July 18, 2013 water column parameter data was collected using a YSI meter. Gill nets were then set at approximately 15-20 ft depth, as this was determined to be the depth where oxygen dropped below a habitable level. Gill nets were monofilament experimental type and measured 45.7 m (150 ft) long and 1.8 m (6 ft) deep with six 7.6 m (25 ft)

panels of bar mesh sizes: 12.7 mm (0.5 in), 19.1 mm (0.75 in), 25.4 mm (1.0 in), 31.8 mm (1.25 in), 38.1 mm (1.5 in), and 50.8 mm (2.0 in). Nets remained in the water overnight for a total of two gill net nights.

Night electrofishing was conducted at Sheridan Lake on June 2, 2013 to sample Largemouth Bass and Smallmouth Bass. Six 10-minute sites were completed. In the past, night electrofishing was completed in September, but with the addition of Smallmouth Bass to the reservoir sampling was moved to late spring in 2011 on recommendations from studies done at South Dakota State University.

Table 2. Net locations for 2013 fisheries survey of Sheridan Lake.

Set Date	Net #	UTM Lat	UTM Long
7/18	Gill 1	4870356	622353
7/18	Gill 2	4869626	623239
6/4	Trap 1	4869662	623330
6/4	Trap 2	4869257	623458
6/4	Trap 3	4869603	622765
6/4	Trap 4	4869722	622580
6/5	Trap 5	4869674	622017
6/5	Trap 6	4869471	621708
6/5	Trap 7	4870662	622060
6/5	Trap 8	4870921	622653

Results and Discussion

Nine fish species were caught in trap nets totaling 136 fish (Table 3). Rock Bass, Black Bullhead, and Yellow Perch were the most numerous species sampled in trap nets. Nine species were caught in gill nets with Yellow Perch making up the majority (76.5%) of the catch (Table 4). This year's gill net survey produced a greater diversity of species, likely due to a different placement of the second net. Yellow Perch usually make up over 90% of the gill net catch.

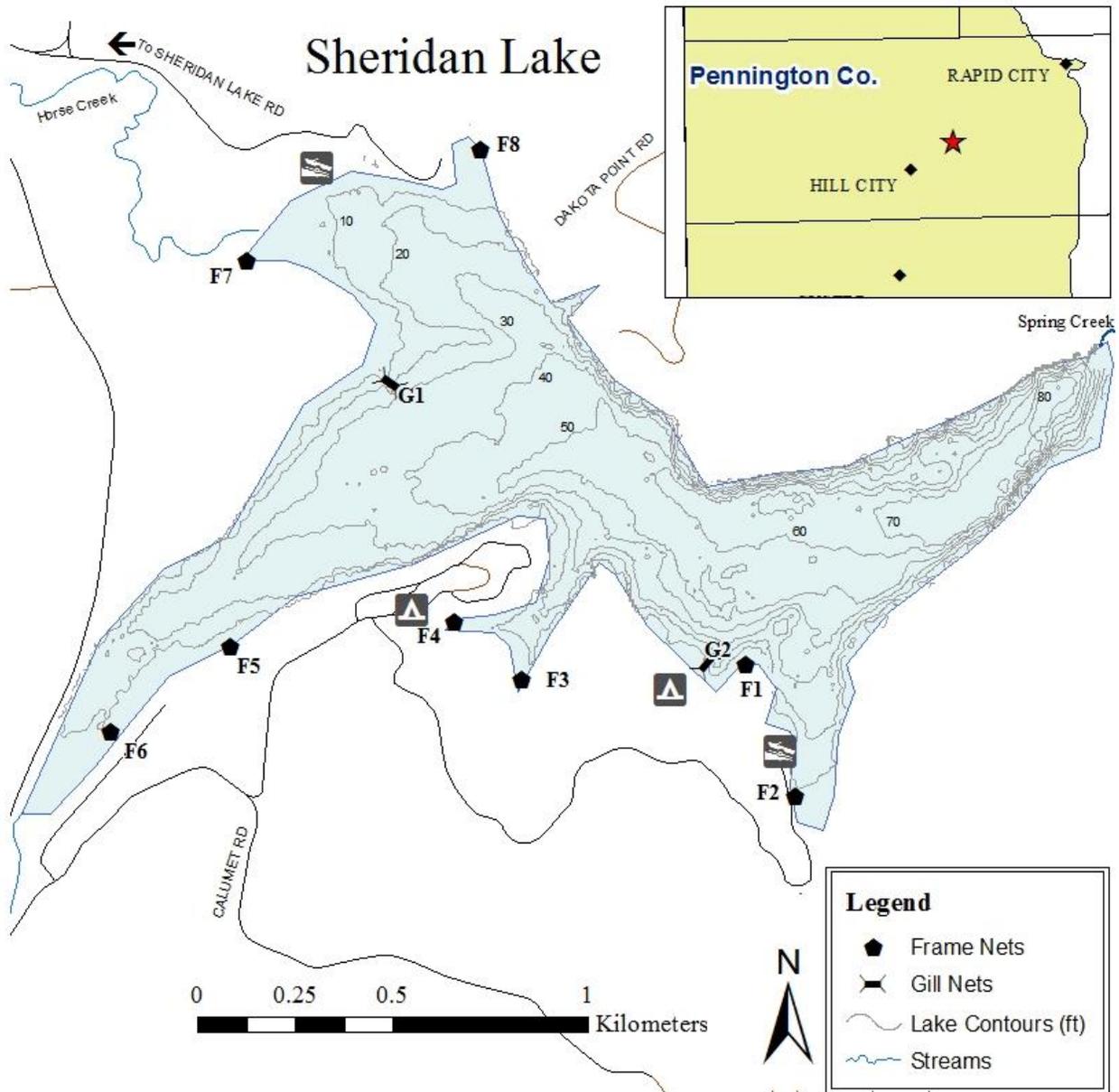


Figure 1. Lake map and 2013 sampling sites for Sheridan Lake, SD.

Table 3. Total catch for eight trap nets in Sheridan Lake on May 24-25, 2013. Parameters are reported with confidence intervals.

Species	N	CPUE (80%)	CPUE-S (80%)	PSD (90%)	PSD-P (90%)	<i>Wr</i> ≥S (90%)
Black Bullhead	23	2.8 (2.9)	2.8 (2.9)	91 (10)	35 (18)	117.3 (19.6)
Black Crappie	10	1.3 (0.9)	0.7 (0.7)	50 (45)	17 (33)	112.5 (10.5)
Green Sunfish	4	0.5 (0.5)	0.5 (0.5)	50 (50)	25 (59)	95.2 (24.0)
Largemouth Bass	2	0.2 (0.2)	0	0	0	102.3*
Northern Pike	1	0.1 (0.2)	0.1 (0.2)	0	0	95.6
Rainbow Trout	1	0.1 (0.2)	0.1 (0.2)	0	0	119.6
Rock Bass	65	8.1 (4.2)	7.9 (4.1)	46 (10)	0	100.0 (1.7)
European Rudd	8	1.0 (0.9)	1.0 (0.9)	100	100	-
Yellow Perch	22	2.8 (2.6)	2.5 (2.5)	60 (19)	10 (12)	101.9 (2.3)

**Wr* for substock length fish

Table 4. Total catch for two 150 ft experimental gill nets set in Sheridan Lake, South Dakota on July 19, 2013. Parameters are reported with confidence intervals.

Species	N	CPUE (80%)	CPUE-S (80%)	PSD (90%)	PSD-P (90%)	<i>Wr</i> ≥S (90%)
Black Crappie	8	4.0 (0)	1.0 (3.0)	25 (31)	0	103.5 (3.4)
Golden Shiner	1	0.5 (1.5)	-	-	-	-
Largemouth Bass	1	0.5 (1.5)	0.5 (1.5)	100 (0)	100	99.0
Northern Pike	6	3.0 (0)	3.0 (0)	100 (0)	17 (33)	106.2 (8.0)
Rainbow Trout	12	6.0 (15.4)	6.0 (15.4)	17 (20)	0	140.8 (0.6)
Rock Bass	13	6.5 (16.9)	6.0 (15.4)	8 (13)	0	86.6 (1.9)
Smallmouth Bass	4	2.0 (0)	1.5 (1.5)	100 (0)	33 (67)	93.4 (66.9)
White Sucker	5	2.5 (1.5)	2.5 (1.5)	100 (0)	100	91.7 (2.8)
Yellow Perch	163	81.0 (156.9)	80.5 (155.4)	64 (6)	18 (5)	100.5 (0.6)

Largemouth Bass

During one hour of night boat electrofishing 101 Largemouth Bass were captured (Table 5). This is similar to 2012 and over twice as many fish than in 2008-2011. However, surveys prior to 2011 were completed in September and must be considered when comparing years.

Sheridan Lake is managed under a 15 inch (381 mm) minimum angling regulation for Largemouth Bass. The size structure of Largemouth Bass has been good and was a PSD of 56 and PSD-P of 5 in 2013. This is within the management goal of a PSD value of 40 to 60 and almost within the goal of a PSD-P value of 10. Length-frequency histogram shows a sample of fish ranging from 70 mm to just over 410 mm (Figure 2).

Fish condition (*Wr*) continues to be very good, ranging from 99 to 106 over the past ten years.

Aging of Largemouth Bass from the 2012 survey indicated most were three to six years old (Table 6). Growth in 2013 was estimated as slightly faster than the past two surveys. Bass still range one to three inches per year slower than the SD mean and less than an inch per year slower than the Region 1 (western SD) mean (Figure 3) (Willis et. al 2001). Bass are reaching stock length (200 mm or 8 in) at about three years of age; whereas statewide they reach this at two to three years.

Table 5. Results of Largemouth Bass captured during night electrofishing surveys of Sheridan Lake, 2003 - 2013.

Month/Year	N	Effort (sec)	CPUE (80%)	CPUE-S (80%)	PSD (90%)	PSD-P (90%)	Wr \geq S (90%)
9/2003	82	3,600	82 (45)	69 (36)	20 (8)	7 (5)	102 (0.1)
9/2004	57	3,600	57 (20)	38 (19)	37 (14)	3 (4)	102 (1.4)
9/2005	57	3,488	58 (23)	33 (20)	39 (14)	0	99 (1.3)
9/2007	111	3,450	115 (25)	102 (23)	26 (8)	1 (2)	104 (0.6)
9/2008	54	3,600	54 (22)	46 (19)	61 (12)	9 (7)	105 (1.7)
9/2009	50	3,550	50 (17)	37 (13)	43 (14)	0	104 (1.1)
9/2010	62	3,600	62 (39)	42 (30)	31 (12)	7 (7)	101 (1.8)
5/2011	52	3,676	52 (19)	50 (19)	34 (11)	10 (7)	98 (1.4)
6/2012	113	2,400	170 (50)	152 (59)	42 (9)	6 (4)	107 (1.0)
6/2013	101	3,600	101 (20)	75 (15)	56 (10)	5 (4)	106 (0.2)

Table 6. Length (mm) at age (yr) for Largemouth Bass surveyed in Sheridan Lake by night electrofishing in 2013, with population means for 2010-2013 and the statewide and region 1 (western S.D.) means.

Year	Age →		1	2	3	4	5	6	7	8
	Age	N								
2011	2	8	98	159						
2010	3	20	60	145	198					
2009	4	5	94	163	234	283				
2008	5	21	61	119	185	256	292			
2007	6	21	61	128	185	233	279	307		
2006	7	5	54	127	198	261	306	340	364	
2005	8	7	55	135	214	255	292	316	338	350
2013 mean			69	139	202	257	292	321	351	350
2012 mean			67	119	167	221	267	302	326	347
Statewide mean			96 (3)	182 (6)	250 (7)	305 (8)	342 (8)			
Region 1 mean			78 (4)	154 (10)	214 (11)	272 (13)	318 (13)			

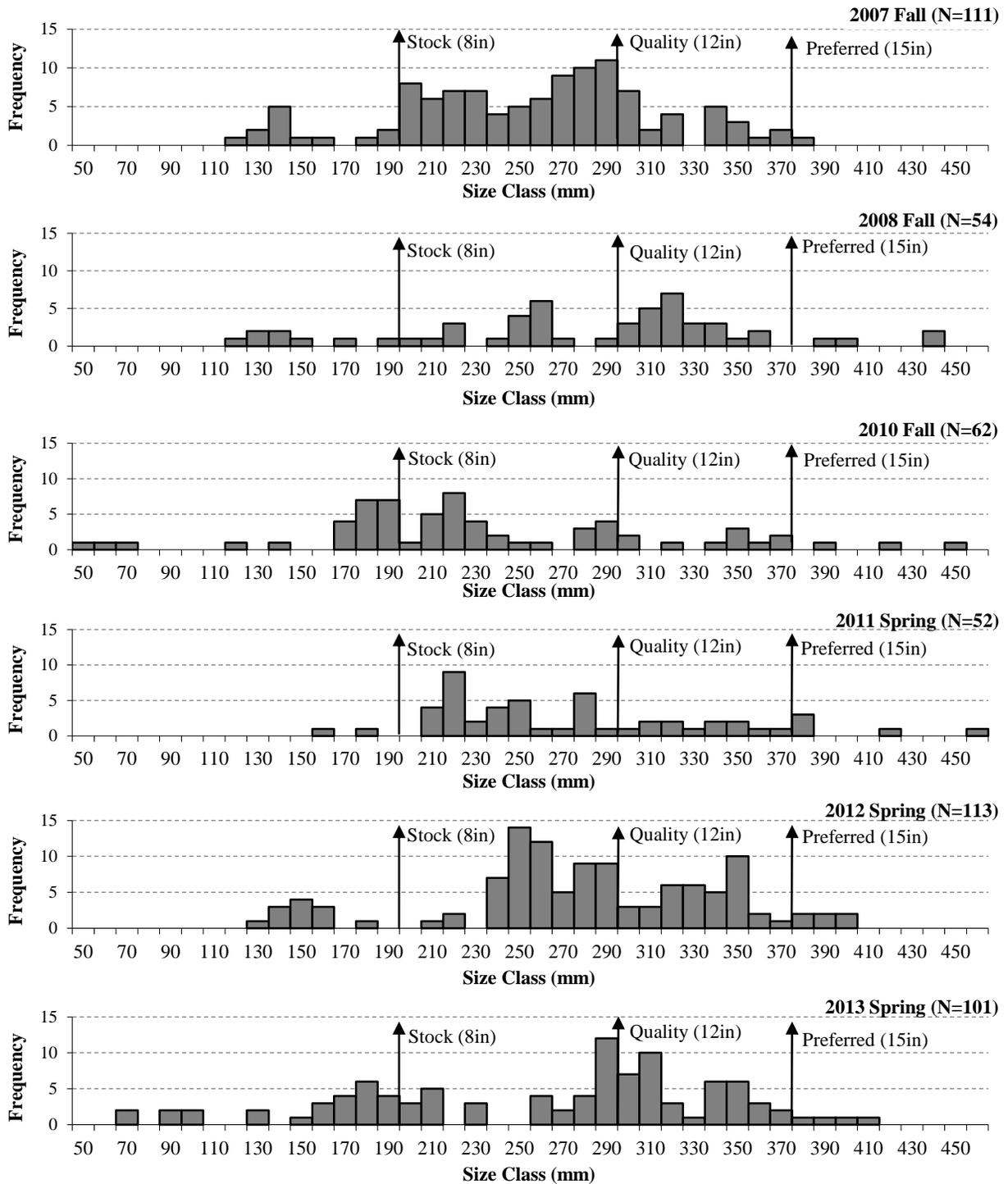


Figure 2. Length frequency histograms for Largemouth Bass collected by night electrofishing from Sheridan Lake, Pennington County, South Dakota, 2007-2008, 2010-2013.

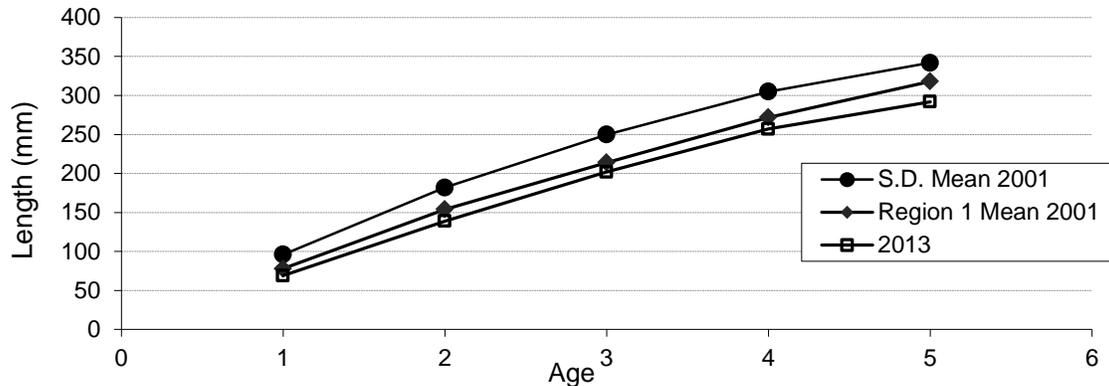


Figure 3. Length-at-age for Largemouth Bass captured in Sheridan Lake by night electrofishing in 2013 plotted with the South Dakota mean and Region 1 (western South Dakota) mean.

Yellow Perch

Gill net catch per unit effort of Yellow Perch has improved for 2011-2013 with a CPUE of 81 in 2013 (Table 7). The likely reason for this is that gill nets may have been set deeper than the optimal oxygen levels in years prior to 2011.

From 2011-2013, proportion of Yellow Perch over quality length has been lower with a PSD value of 64 in 2013 (Table 7). Proportions of preferred length fish (PSD-P) have remained fairly similar with a slight increase in 2013. These values are slightly above the management goal of a PSD of 30-60. Condition (W_r) for Yellow Perch captured in gill nets has been excellent and remained relatively constant with values over 100.

The length frequency has remained fairly similar through the years (Figure 4). Yellow Perch in Sheridan Lake may not grow much over 240 mm possibly due to high fishing pressure and anglers cropping off the larger Yellow Perch. A winter creel census was completed in 2010-2011 and estimated that anglers harvested around 7,700 perch in Jan-March, with a high proportion of harvested fish over 220 mm (Simpson 2011).

Otoliths were taken from Yellow Perch captured in gill nets (Table 8). A majority of fish were aged at two to seven years old. Some Sheridan Lake Yellow Perch do exhibit faster growth reaching quality length (200 mm or 8 in) around age-3, but on average it takes four years for them to grow to this length. This is similar to the South Dakota scale aged mean but faster than the Region 1 (Western South Dakota) mean (Willis et. al, 2001). It appears that some older Yellow Perch exist in Sheridan Lake. In 2010-2013 four fish, (247 mm, 230 mm, 292 mm, and 270 mm), were aged at 12, 14, 11, and 11 years old, respectively.

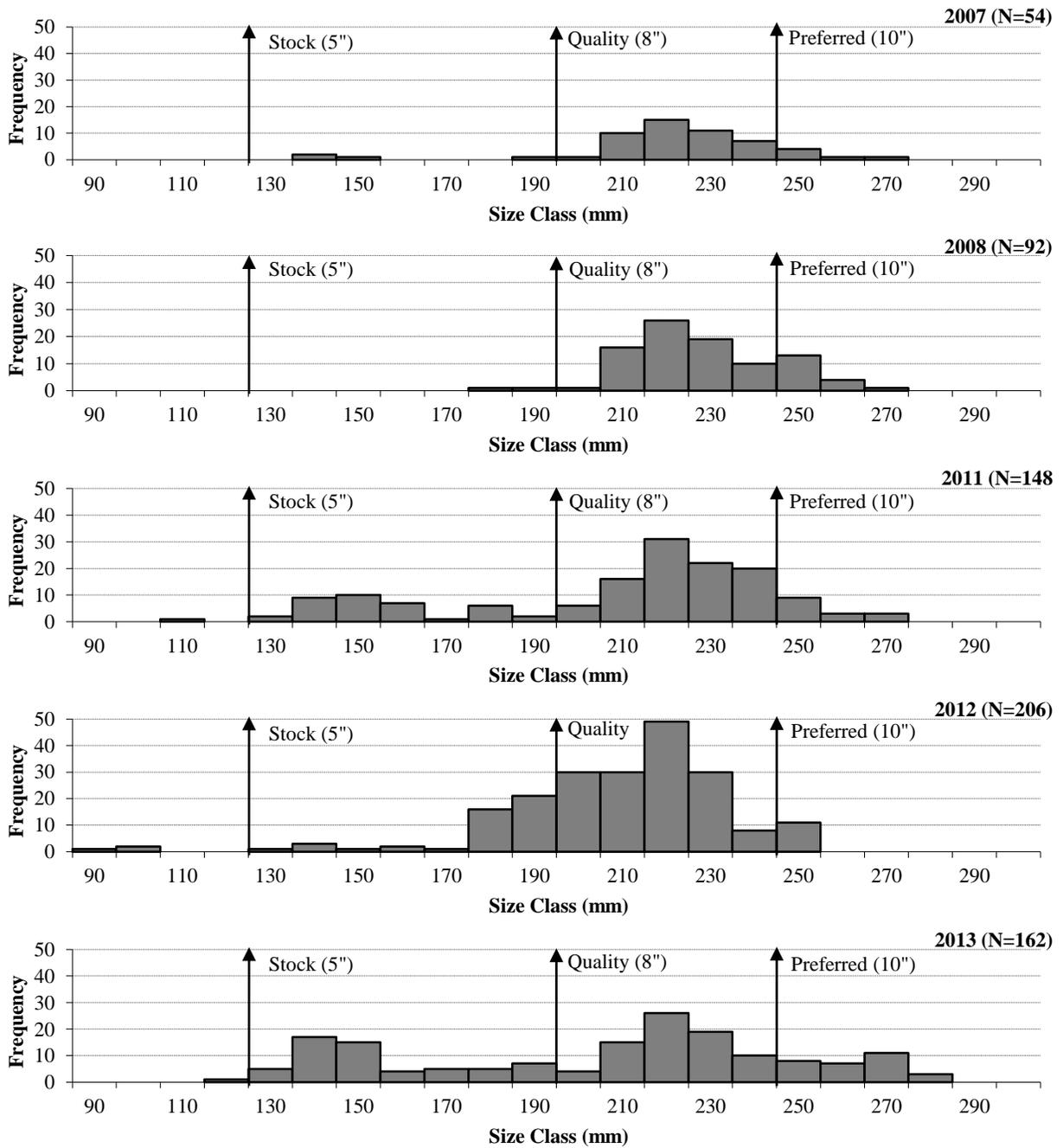


Figure 4. Length frequency histogram for Yellow Perch captured during gill net surveys of Sheridan Lake, Pennington County, South Dakota, 2007-2013.

Table 7. Catch data, stock indices, and condition for Yellow Perch captured with gill nets in Sheridan Lake, South Dakota, 2003 - 2013. Confidence intervals are reported in parentheses.

Year	N	Effort	CPUE (80%)	CPUE-S (80%)	PSD (90%)	PSD-P (90%)	Wr-S (90%)
2003	147	2	73.5 (69.2)	73.5 (69.2)	75 (6)	5 (3)	101.8 (0.5)
2004	231	2	115.5 (113.9)	115.5 (113.9)	81 (4)	7 (3)	98.1 (0.4)
2005	89	2	44.5 (84.6)	44.5 (84.6)	83 (6)	8 (5)	97.4 (0.7)
2006	193	2	96.5 (238.5)	71.0 (160.1)	78 (6)	1 (2)	99.4 (0.5)
2007	54	2	27.0 (15.4)	27.0 (15.4)	93 (6)	11 (7)	96.5 (0.8)
2008	92	2	46.0 (12.3)	46.0 (12.3)	98 (3)	20 (7)	100.4 (0.1)
2009	21	2	10.5 (13.8)	10.5 (13.8)	100	24 (17)	100.3 (2.3)
2010	14	4	3.5 (3.1)	3.5 (3.1)	93 (13)	14 (17)	103.5 (2.5)
2011	148	2	74.0 (0)	74.0 (2.0)	74 (8)	10 (4)	101.8 (1.2)
2012	219	2	110.0 (60.0)	108.0 (55.0)	79 (4)	11 (3)	106.2 (0.4)
2013	162	2	81.0 (156.9)	80.5 (155.4)	64 (6)	18 (5)	100.4 (0.7)

Table 8. Sheridan Lake Yellow Perch minimum, maximum, and weighted mean lengths (mm) by age (from otoliths) for fish caught in experimental gill nets during the 2013 fishery survey, and Region 1 and Statewide mean lengths by age (from scales) (Willis et al. 2001).

Age	Minimum	Weighted Mean	Maximum	N	Region 1 Mean	S. Dakota Mean
2	141	153	174	11	117	145
3	180	195	215	9	158	190
4	205	218	222	4	186	220
5	203	232	274	12	208	242
6	218	246	284	9	-	-
7	235	255	281	8	-	-
11	270	270	270	1	-	-

Black Crappie

Black Crappie is a species targeted by anglers at Sheridan Lake (Simpson 2011). Like other species, survey catch rates have been down the last two years with a trap net CPUE of 1.3 in 2013 (Table 3). A number of smaller fish were surveyed this year and PSD dropped to 50 this year from 100 in 2012. However, proportion of preferred length fish (PSD-P) went up to 17 in 2013 from zero the last three years. Condition was good with a *Wr* of 112.

Rainbow Trout

One Rainbow Trout was captured in trap nets and twelve in gill nets during the 2013 survey. Sheridan Lake was stocked with 10,000 catchable Rainbow Trout in May, over two months prior to the survey. A number of anglers report having high catch rates of Rainbow Trout over 14 in, indicating either a fast growth rate or carryover from prior years' stockings. The one caught in June trap nets was around 354 mm (14 in) and those in gill nets ranged 300-463 mm (11-18 in).

Rock Bass

Rock Bass was the most abundant species captured in trap nets during the survey with 65 individuals collected, half as many as caught in 2012. The greatest number caught was in 2004

with 207 surveyed. They are an illegally introduced species within the Black Hills Trout Management Area and are considered a nuisance species. Other reservoirs have experienced angler complaints about Rock Bass catch hindering their ability to catch other fish species.

European Rudd

European Rudd, another introduced species, was captured in lower abundance in 2012 and 2013 after a high catch in 2011 of 58 fish. This doesn't likely indicate a lower population, but could be due to survey timing. European Rudd may pose a threat to the Sheridan Lake system because of their omnivorous habits, which may result in predation on other fishes and competition for resources (Howells et al. 1991).

Smallmouth Bass

In 2011 and 2012 Smallmouth Bass adults were stocked into Sheridan Lake with 200 and 285, respectively. Also, 7,800 and 5,600 fingerlings were stocked in August 2010 and 2011, respectively. Four individuals were sampled in gill nets all over quality length. Anglers have begun to report fair catch rates of this species. Future electrofishing surveys targeted in Smallmouth Bass habitat will help monitor this species.

Northern Pike

Northern Pike, also an illegally introduced species to Black Hills lakes, are a sought after fish for some anglers at Sheridan Lake, especially during the winter. One was caught in spring trap nets and six were caught in summer gill nets and ranged in length from 602 mm to 711 mm (23-30 in) (Tables 2 and 3).

Black Bullhead

Black Bullhead, another illegally introduced species, were the second most abundant species captured during the trap net survey. Their population seems to be doing well with a PSD value of 91 and a *Wr* of 117 (Table 3).

Other Species

Golden Shiner, Green Sunfish, and White Sucker were also trapped during the survey in low numbers (Tables 1 and 2).

RECOMMENDATIONS

1. Continue stocking Rainbow Trout at current stocking rate.
2. Conduct annual lake survey in 2014.
 - a. Trap netting to be conducted in early summer as better suited for panfish catches.
 - b. YSI water chemistry profiles should be taken prior to net placement when gill netting.
 - c. Conduct night electrofishing during the spring for Largemouth Bass and Smallmouth Bass, moving one survey site to along the dam to better sample Smallmouth Bass.

LITERATURE CITED

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APPENDIX

Appendix A. Stocking record for Sheridan Lake, South Dakota, 2005-2013.

Year	Species (Strain)	Size	Stockings	Number
2007	Brown Trout (Soda Lake)	Catchable	1	726
	Rainbow Trout (Erwin)	Catchable 11"	2	4,100
	Rainbow Trout (Shasta)	Catchable	2	7,490
2008	Rainbow Trout (Shasta)	Catchable 11"	1	3,582
	Rainbow Trout (Utah)	Catchable	1	5,000
2009	Brown Trout (Utah)	Catchable 11"	1	1,000
	Rainbow Trout (Erwin)	Catchable	1	10,000
	Rainbow Trout (McConaughy)	Catchable	3	10,637
	Rainbow Trout (McConaughy)	Fingerling	1	6,000
2010	Brown Trout (Soda Lake)	Catchable 11"	1	900
	Rainbow Trout (Erwin X Arlee)	Catchable	1	9,000
	Rainbow Trout (McConaughy)	Catchable	2	9,630
	Smallmouth Bass	Fingerling	1	7,800
2011	Rainbow Trout (Erwin X Arlee)	Catchable	1	7,920
	Rainbow Trout (McConaughy)	Catchable	2	9,630
	Rainbow Trout (Shasta)	Fingerling	1	7,933
	Smallmouth Bass	Adults	1	200
	Smallmouth Bass	Fingerling	1	5,600
2012	Rainbow Trout (Erwin X Arlee)	Catchable	1	9,000
	Rainbow Trout (McConaughy)	Catchable	2	10,000
	Smallmouth Bass	Adults	1	285
2013	Rainbow Trout (Erwin X Arlee)	Catchable	1	9,000
	Rainbow Trout (McConaughy)	Catchable	2	10,000