

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Spirit Lake, Kingsbury County
2102-F-21-R-47
2014



Figure 1. Spirit Lake, Kingsbury County

Legal Description: T112-R57-Sec. 13, 24-25 and T112- R56- Sec. 18-19, 30

Location from nearest town: 7 miles east of Bancroft, SD

Surface Area: 1,259 acres

Meandered (Y/N): Yes

OHWM elevation: None set

Outlet elevation: None set

Max. depth at outlet elevation: 10.5 feet

Observed water level: 2 ft. low

Contour map available: Yes

Watershed area: No data available

Shoreline length: 6.3 miles

Date set: NA

Date set: NA

Mean depth at outlet elevation: 9.2 feet

Lake volume: 11,628 acre feet

Date mapped: 1998

Introduction

General

Historical documents indicate two possible origins for the lake name. First is that it may have been named by an early settler, H.J. Burvee, for Spirit Lake, Iowa. The second is that Mrs. Burvee, while watching a sunset from the Indian burial mound at the south end of the lake, thought that perhaps the lake belonged to the Indian spirits buried there and so gave it the name.

Ownership of Lake and Adjacent Lakeshore Properties

Spirit Lake is a large natural lake located in northwestern Kingsbury County. It is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. Except for a county road right-of-way on the south side of the lake, the entire shoreline is privately owned.

Fishing Access

There are no boat ramps or lake access areas on Spirit Lake. Boats can be launched off the county road right-of-way on the southwest corner side of the lake, but parking is limited (Figure 1). Shore fishing is also possible from this right-of-way. Most fishing activity occurs during the winter.

Water Quality and Aquatic Vegetation

The water in Spirit Lake was somewhat turbid with a Secchi depth of 84 cm (33 in) (Table 1). This is likely the reason no aquatic vegetation was observed.

Table 1. Water temperature, Secchi depth and observations/comments on water quality and aquatic vegetation in Spirit Lake, Kingsbury County, 2005-2014.

<i>Year</i>	<i>Water Temp °C (°F)</i>	<i>Secchi Depth cm (in)</i>	<i>Observations/Comments (algae, aquatic vegetation, water quality, etc.)</i>
2014	23 (73)	84 (33)	No aquatic vegetation observed
2013	-- (--)	135 (53)	Sago pondweed and bulrush
2012	20 (69)	100 (39)	No observations recorded

Fish Community

Spirit Lake contains relatively few fish species (Table 2) and the bullheads, carp and white suckers can become very abundant.

Table 2. Fish species commonly found in Spirit Lake, Kingsbury County.

<i>Game Species</i>	<i>Other Species</i>
Walleye	Common Carp
Yellow Perch	White Sucker
Northern Pike	
Black Bullhead	

Fish Management

Although shallow and subject to frequent fish kills (Table 3), the lake occasionally provides good fishing opportunity for walleye, yellow perch, and northern pike. Whenever the lake is deep enough, frequent stockings are needed to maintain the fishery (Table 4).

Table 3. Fish kill history for Spirit Lake, Kingsbury County.

Year	Severity	Species Killed	Notes
2012	Light	WAE	August summerkill of mostly 8" WAE
2010	Severe	All	Severe winterkill, may have been total.
2001	Severe	All	Severe winterkill, only 80 BLB and 5 WHS netted.
1997	Severe	All	Severe winterkill, only a few YEP, rough fish alive

Table 4. Stocking history for Spirit Lake, Kingsbury County, 2005-2014.

Year	Number	Species	Size
2010	1,100,000	Walleye	Fry
	53,000	Yellow Perch	Juvenile
2011	1,100,000	Walleye	Fry
2014	550,000	Walleye	Fry

Methods

Spirit Lake was sampled on July 24-25, 2014 with three overnight gill net sets. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting.

Results and Discussion

Net Catch Results

Spirit Lake was not sampled from 2003-2011 due to low water levels and the subsequent absence of a manageable fishery (Table 7). Stocking resumed in 2010 (Table 4) and populations of walleye and yellow perch were reestablished (Tables 5 and 6). The other species survived the low water period.

Table 5. Total catch from three overnight gill nets set in Spirit Lake, Kingsbury County, July 24-25, 2014.

<i>Species</i>	<i>Number</i>	<i>%</i>	<i>CPUE¹</i>	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
Yellow Perch	52	38.5	17.3	+12.1	38.3	4	4	115
Black Bullhead	42	31.1	14.0	+12.9	5.5	5	2	--
Walleye	26	19.3	8.7	+4.8	14.0	96	0	92
White Sucker	9	6.7	3.0	+2.7	4.9	--	--	--
Common Carp	4	3.0	1.3	+0.9	1.6	--	--	--
Northern Pike	2	1.5	0.7	+0.9	1.9	--	--	--

* 3 years (2012, 2013, 2014)

Table 6. CPUE by length category for selected species sampled with gill nets in Spirit Lake, Kingsbury County, July 24-25, 2014.

<i>Species</i>	<i>Substock</i>	<i>Stock</i>	<i>S-Q</i>	<i>Q-P</i>	<i>P+</i>	<i>All sizes</i>	<i>80% C.I.</i>
Yellow Perch	--	17.3	16.7	0.3	0.3	17.3	+12.1
Black Bullhead	0.3	13.7	13.0	0.3	0.3	14.0	+12.9
Walleye	--	8.7	0.3	8.3	--	8.7	+4.8
White Sucker	--	3.0	0.3	0.3	2.3	3.0	+2.7
Common Carp	--	1.3	--	--	1.3	1.3	+0.9
Northern Pike	--	0.7	--	0.7	--	0.7	+0.9

Length categories can be found in Appendix A.

Table 7. Gill-net CPUE for selected fish species sampled in Spirit Lake, Kingsbury County, 2005-2014.

<i>Species</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
Bigmouth Buffalo								--	--	--
Black Bullhead								1.3	1.3	14.0
Common Carp								0.7	2.7	1.3
Northern Pike								4.0	1.0	0.7
Walleye								20.7	12.7	8.7
White Sucker								3.0	8.7	3.0
Yellow Perch								12.7	85.0	17.3

¹ See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Walleye

Management Objective

- maintain a walleye population with a total gill-net CPUE of at least 15 whenever the lake is deep enough to minimize the risk of fish kills

Management Strategy

- stock walleye fry at the rate of 500/acre (629,500) as needed to achieve the management objective

Walleye gill-net CPUE has been declining since 2012 and is now below the management objective (Table 8). The population currently consists of fish ranging in length from 36-49 cm (14.2-19.3 in) (Figures 2 and 3) that were likely produced by the 2010 fry stocking (Table 9). Walleyes have grown quickly with some fish approaching 50 cm (20 in) by their fifth season of growth (Figure 3).

Table 8. CPUE, PSD, RSD-P, and mean Wr for all walleye sampled with gill nets in Spirit Lake, Kingsbury County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE								20.7	12.7	8.7
PSD								9	29	96
RSD-P								0	0	0
Mean Wr								83	77	92

Table 9. Walleyes stocked into Spirit Lake, Kingsbury County, 2005-2014.

Year	Number	Size
2010	1,100,000	Fry
2011	1,100,000	Fry
2014	550,000	Fry

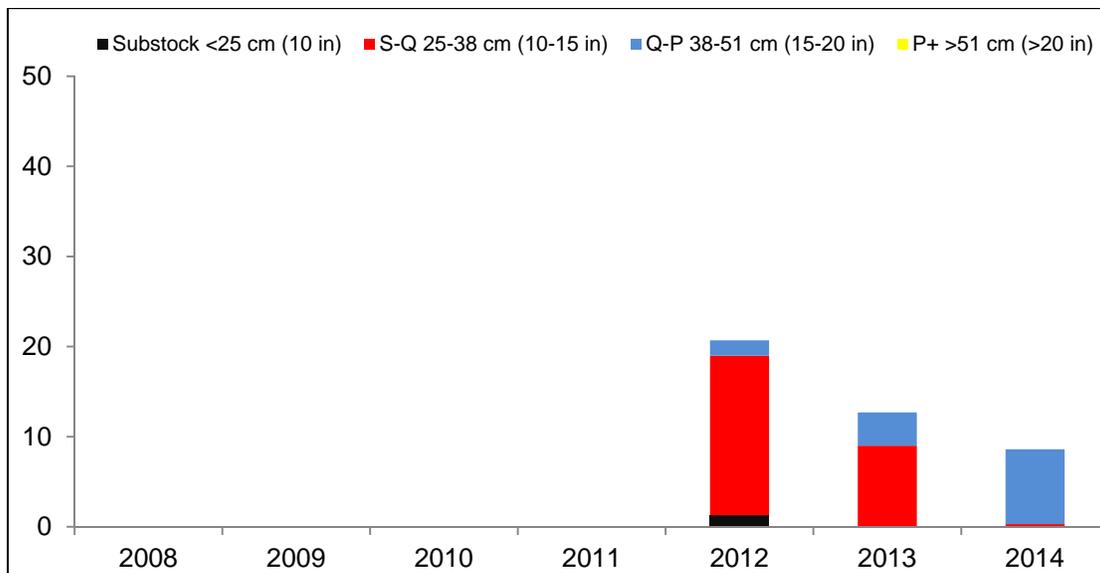


Figure 2. CPUE by length category for walleye sampled with gill nets in Spirit Lake, Kingsbury County, 2012, 2013, 2014.

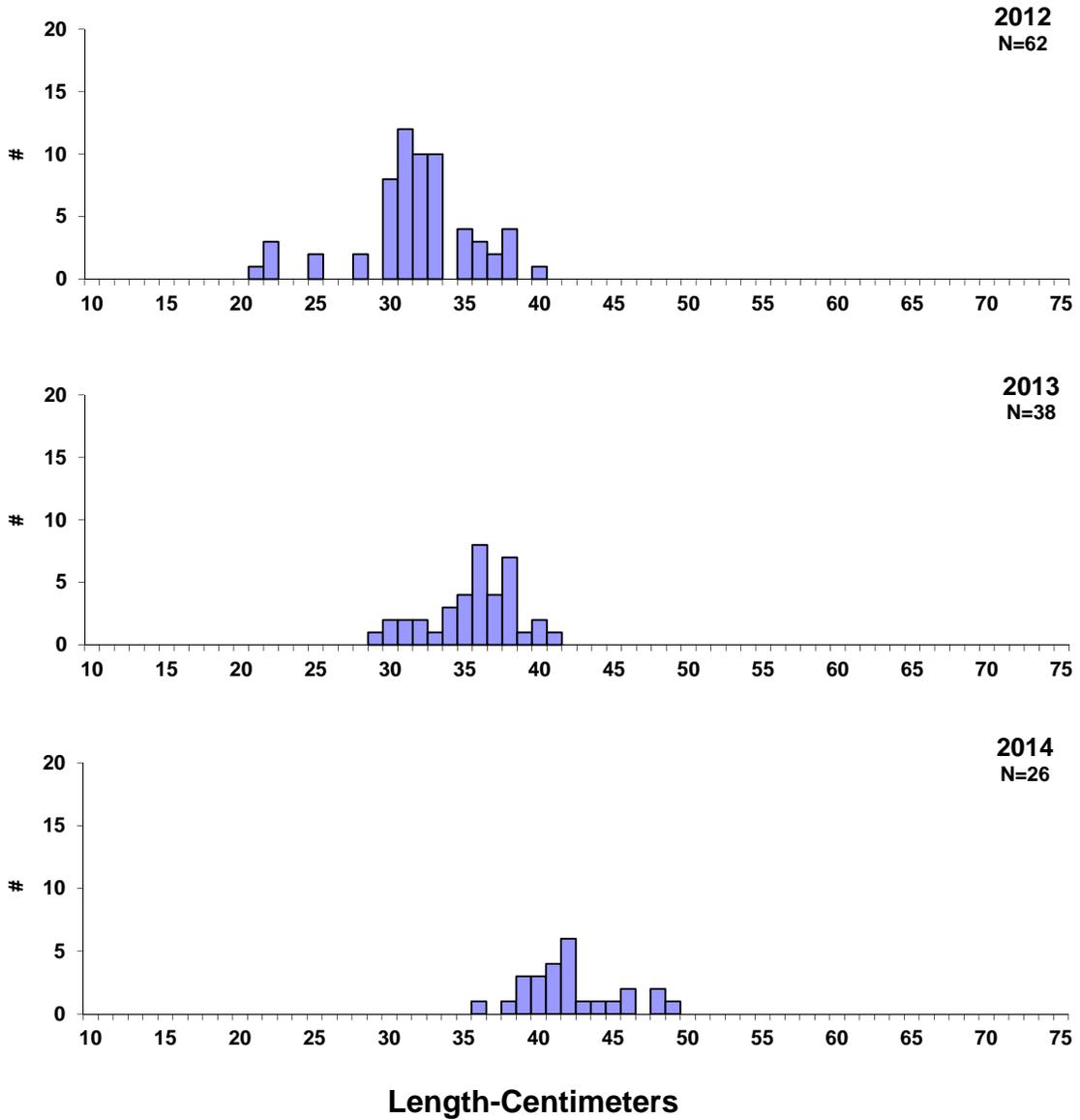


Figure 3. Length frequency histograms for walleyes sampled with gill nets in Spirit Lake, Kingsbury County, 2012, 2013 and 2014.

Yellow Perch

Management Objective

- to maintain a yellow perch population with a total gill net CPUE of at least 25 whenever the lake is deep enough to minimize the risk of fish kills

Management Strategy

- stock yellow perch small fingerlings at the rate of 500/acre (629,500) as needed to achieve the management objective only if ongoing yellow perch stocking evaluation research shows this type of stocking can be effective

Yellow perch abundance declined in 2014 and is now below the management objective (Table 10). Larger yellow perch, abundant in 2013 gill nets, were absent in 2014 (Figures 4 and 5) indicating high natural mortality of adult fish. Only fish from the 2013 year class were present in 2014 net catches (Figure 5).

Table 10. CPUE, PSD, RSD-P, and mean Wr for all yellow perch sampled with gill nets in Spirit Lake, Kingsbury County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE								12.7	85.0	17.3
PSD								82	57	4
RSD-P								76	20	4
Mean Wr								106	86	115

Table 11. Yellow perch stocked into Spirit Lake, Kingsbury County, 2005-2014.

Year	Number	Size
2010	53,000	Juvenile

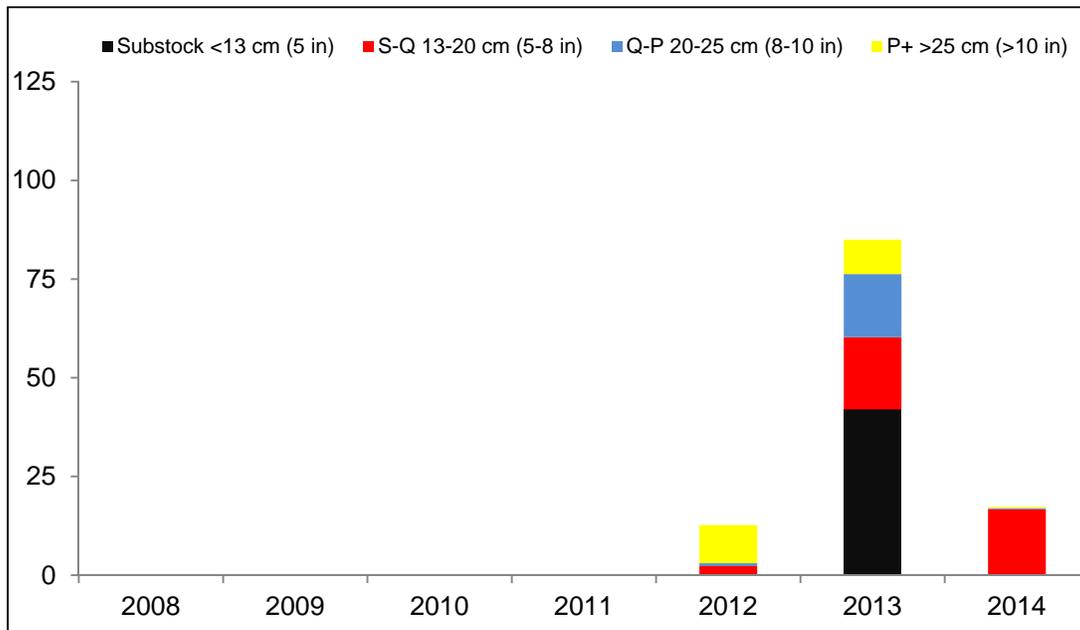


Figure 4. CPUE by length category for yellow perch sampled with gill nets in Spirit Lake Kingsbury County, 2012, 2013, 2014.

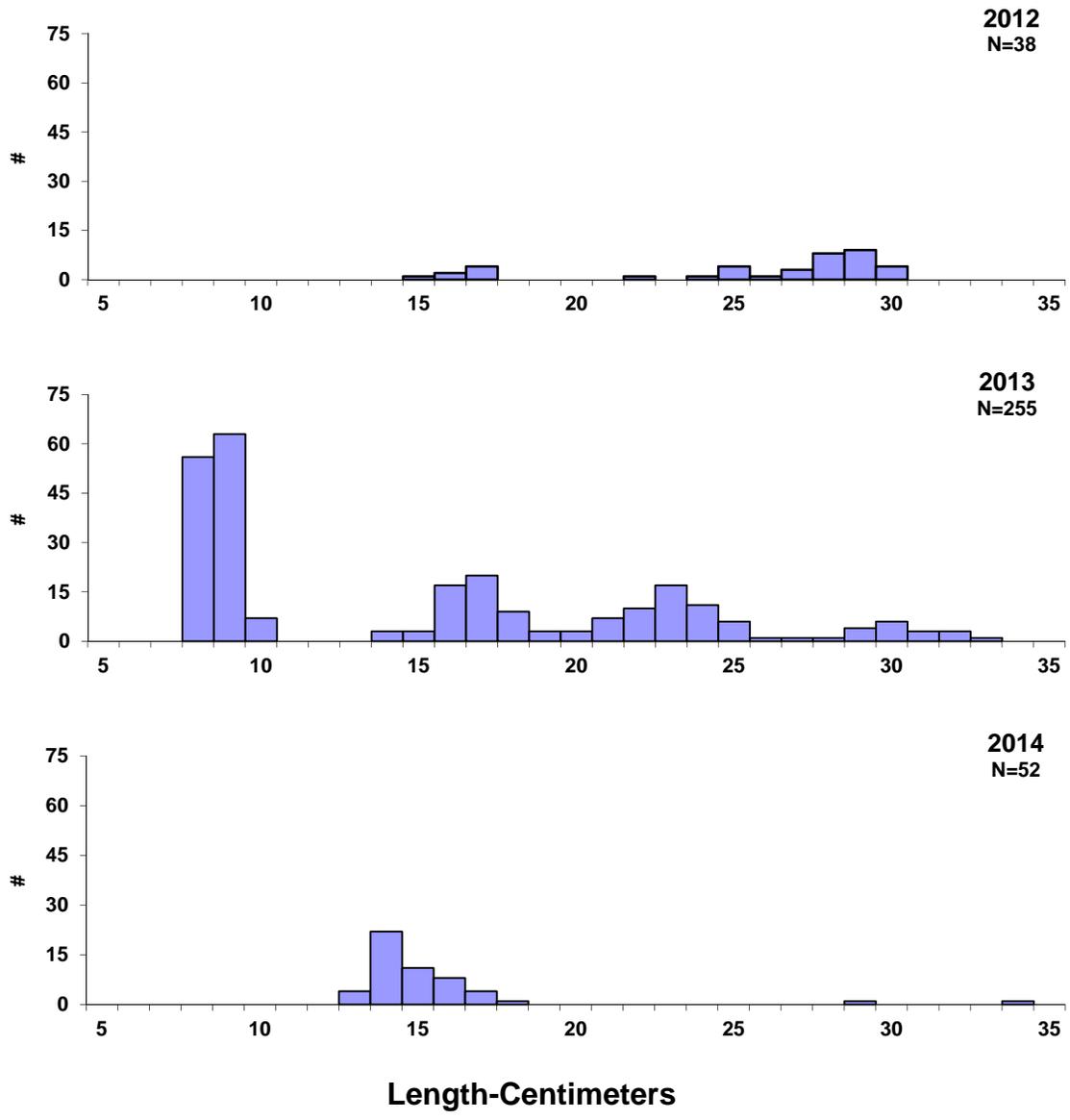


Figure 5. Length frequency histograms for yellow perch sampled with gill nets in Spirit Lake, Kingsbury County, 2012, 2013 and 2014.

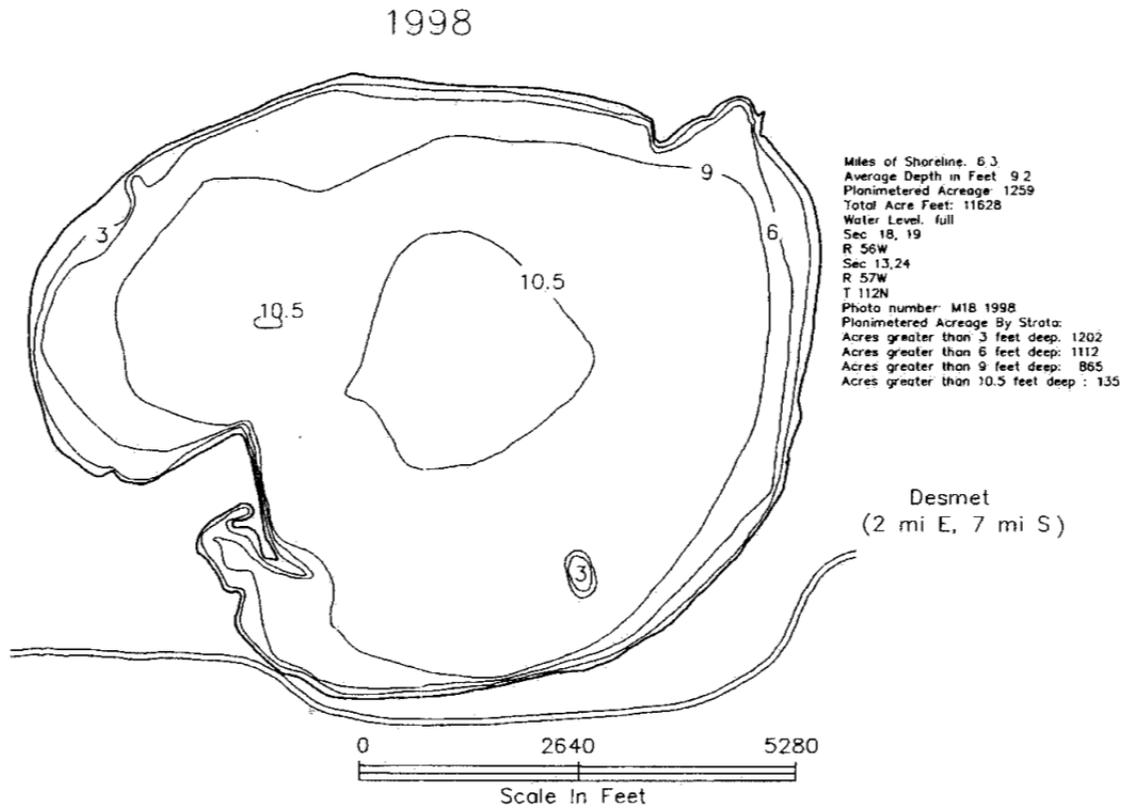


Figure 6. Contour map of Spirit Lake, Kingsbury County.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters (Inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.