

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Diamond Lake, Minnehaha County
2102-F-21-R-47
2014



Figure 1. Diamond Lake, Minnehaha County

Legal Description: T104N-R52W-Sec. 5

Location from nearest town: 13 miles north and 2 miles west of Humboldt, SD

Surface Area: 272 acres

Meandered (Y/N): yes

OHWM elevation: none set

Outlet elevation: none set

Max. depth at outlet elevation: 11.5 feet

Observed water level: full

Contour map available (Y/N): yes

Watershed area: no data

Shoreline length: no data

Date set: NA

Date set: NA

Mean depth at outlet elevation: 8.2 feet

Lake volume: 2,215 acre feet

Date mapped: 2011

DENR beneficial use classifications: (5) warmwater semi-permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

General

No information at this time.

Ownership of Lake and Adjacent Lakeshore Properties

Diamond Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. Game, Fish, and Parks (GFP) owns the majority of the lake basin as a Game Production Area and manages the fishery. The remainder of the shoreline is privately owned.

Fishing Access

The Diamond Lake Access Area was upgraded in 2005. It consists of a concrete plank boat ramp, gravel parking area, a boat dock and a toilet. Shore fishing access is available in the access area and along the county road grade on the south end of the lake.

Water Quality and Aquatic Vegetation

The water temperature during this year's lake survey was 24°C (76°F) and the water clarity was an excellent 114 cm (45 in). A minor algae bloom was occurring during the survey.

Fish Community

Diamond Lake has a very simple fish community consisting of eight species (Table 1).

Table 1. Fish species commonly found Diamond Lake, Minnehaha County.

Game Species	Other Species
Walleye	Common Carp
Yellow Perch	Fathead Minnow
Black Bullhead	
Green Sunfish	
Hybrid Sunfish	
Orange-spotted Sunfish	

Fish Management

Fish kills have occasionally decreased fishing opportunity in Diamond Lake (Table 2). The lake is actively managed for walleyes and yellow perch by stocking as needed to achieve management objectives (Table 3).

Table 2. Fish kill history for Diamond Lake, Minnehaha County.

Year	Severity	Comments
2011	Severe	Winterkill - only a few perch and bullheads survived
2001	Light	Winterkill of carp, bullheads, suckers, perch. Live fish sampled.
1998	Moderate	Summer fish kill (August) small perch and bullheads

Table 3. Stocking history for Diamond Lake, Minnehaha County, 2005-2014.

Year	Number	Species	Size
2005	24	Walleye	Adult
	8,320	Walleye	Small Fingerling
2006	25,680	Walleye	Small Fingerling
	1,771	Yellow Perch	Adult
	1,107	Yellow Perch	Juvenile
	6,645	Walleye	Large Fingerling
2007	2,232	Walleye	Large Fingerling
	476	Yellow Perch	Adult
2008	4,325	Walleye	Large Fingerling
2009	100,700	Yellow Perch	Fingerling
2011	27,040	Walleye	Small Fingerling
	104,960	Yellow Perch	Fingerling
2012	40,350	Walleye	Small Fingerling
	81,210	Yellow Perch	Fingerling
2013	26,220	Walleye	Small Fingerling
	104,030	Yellow Perch	Fingerling
2014	256,000	Walleye	Fry

Methods

Diamond Lake was sampled on June 25-26, 2014 with three overnight gill nets. 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

Black bullheads were the most abundant species sampled the gill nets (Table 4). However, good numbers of yellow perch and few walleyes were also sampled.

Table 4. Total catch from three overnight gill nets set in Diamond Lake, Minnehaha County, June 25-26, 2014.

<i>Species</i>	<i>#</i>	<i>%</i>	<i>CPUE</i> ¹	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
Black bullhead	456	76.3	152.0	+36.6	60.5	4	0	--
Yellow perch	67	11.2	22.3	+6.3	11.5	0	0	103
Common carp	60	10.0	20.0	+7.1	16.1	84	2	--
Walleye	15	2.5	5.0	+2.2	4.8	0	0	85

*10 years (2005-2014)

Table 5. CPUE by length category for selected species sampled with gill nets in Diamond Lake, Minnehaha County, June 25-26, 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>
Black bullhead	3.3	148.7	142.3	6.3	--	152.0	+36.6
Yellow perch	--	22.3	22.3	--	--	22.3	+6.3
Common carp	5.7	14.3	2.3	11.7	0.3	20.0	+7.1
Walleye	5.0	--	--	--	--	5.0	+2.2

*No length categories established. Length categories can be found in Appendix A.

Table 6. Gill-net (GN) and trap-net (TN) CPUE for selected fish species sampled in Diamond Lake, Minnehaha County, 2005-2014.

<i>Species</i>	<i>Gear</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>
Black Bullhead	GN	33.3	12.0			6.0		59.0		100.7	152.0
	TN	289.4	256.6			17.1		184.6		96.8	
Black Crappie	GN	--	--			0.3		1.0		--	--
	TN	0.1	0.1			2.7		1.0		3.8	
Common Carp	GN	50.0	4.0			8.0		1.0		13.7	20.0
	TN	19.8	11.7			3.3		8.0		2.6	
Walleye	GN	10.0	6.7			6.7		0.5		--	5.0
	TN	5.3	4.0			6.5		0.2		--	
Yellow Perch	GN	14.7	1.7			11.0		13.0		6.0	22.3
	TN	1.9	0.6			2.6		3.6		10.8	

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

Walleye

Management Objective

- Maintain a walleye population with a total gill-net CPUE of at least 10.

Management Strategy

- Stock small walleye fingerlings at the rate of 70/acre (19,040) as needed to achieve the management objective.

The five walleyes sampled in 2014 (Table 7) likely originated from the spring fry stocking (Table 8). Stocking in nine of the last 10 years has only produced one gill-net CPUE that has met the current management objective.

Table 7. CPUE, PSD, RSD-P, and mean Wr for all walleyes sampled with gill nets in Diamond Lake, Minnehaha County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE		10.0	6.7		6.7		0.5		0.0	5.0
PSD		49	--		6		--		--	--
RSD-P		11	--		6		--		--	--
Mean Wr		85	82		81		--		--	--

Table 8. Walleyes stocked into Diamond Lake, Minnehaha County, 2005-2014.

Year	Number	Size
2005	24	Adult
	8,320	Small Fingerling
2006	25,680	Small Fingerling
	6,645	Large Fingerling
2007	2,232	Large Fingerling
2008	4,325	Large Fingerling
2011	27,040	Small Fingerling
2012	40,350	Small Fingerling
2013	26,220	Small Fingerling
2014	256,000	Fry

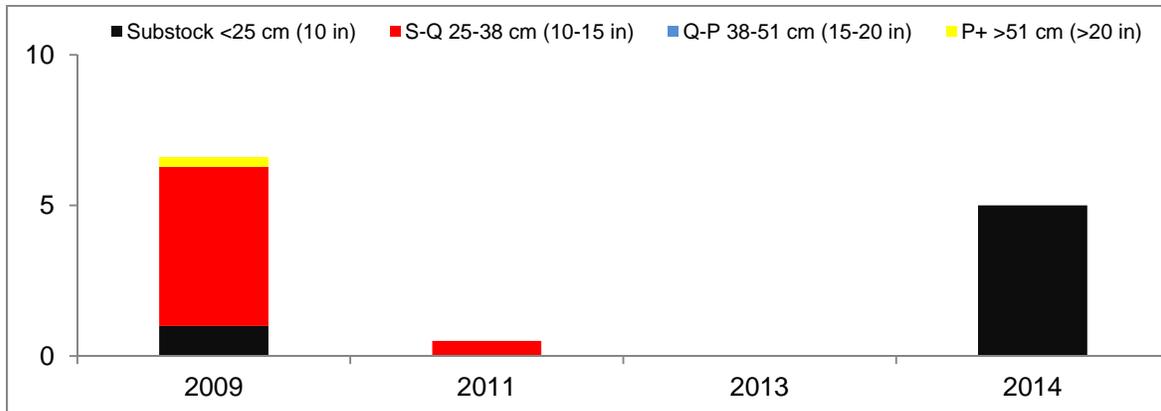


Figure 2. CPUE by length category for walleye sampled with gill nets in Diamond Lake, Lake County, 2009-2014.

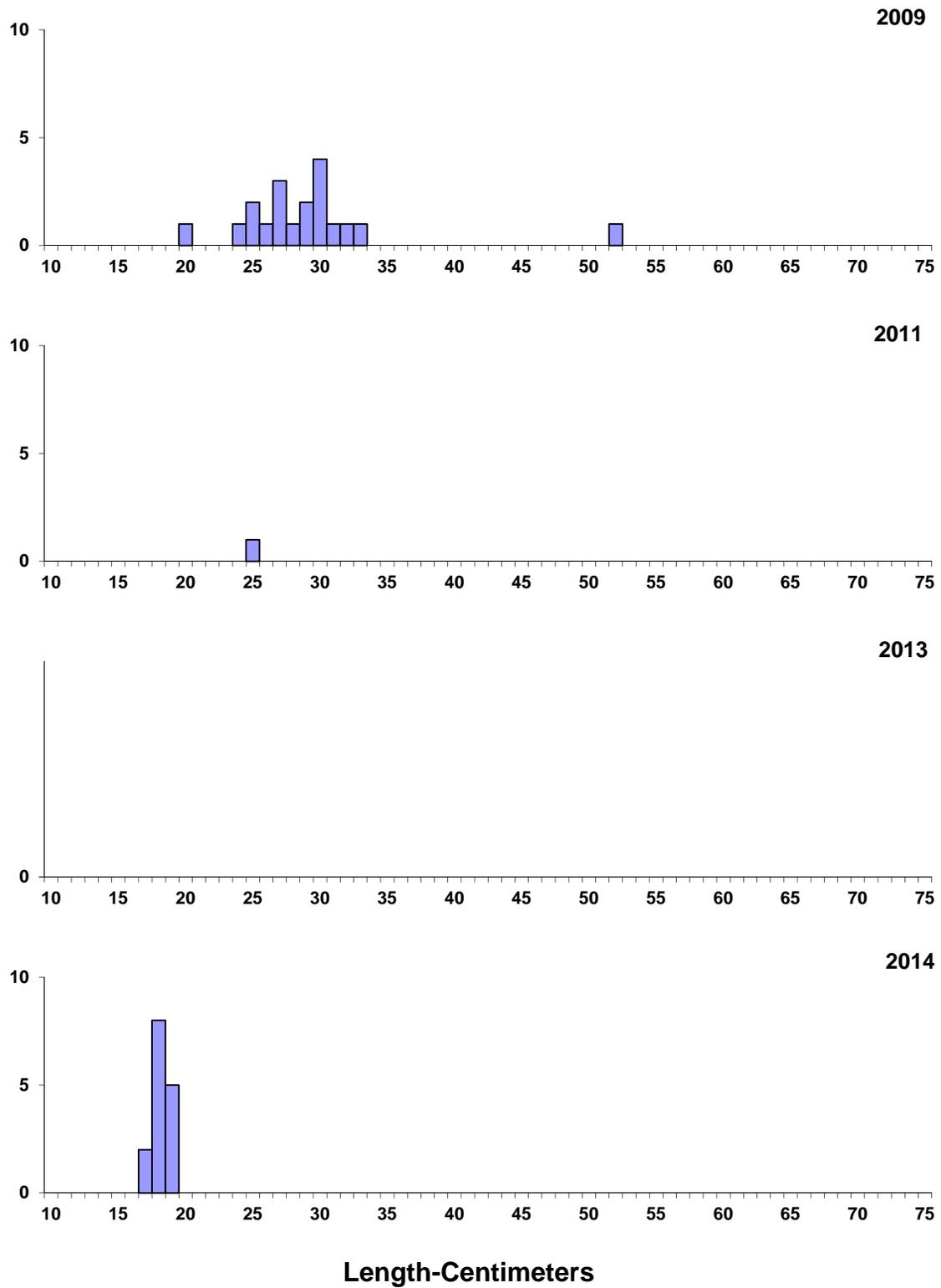


Figure 3. Length frequency histogram for walleye sampled with gill nets in Diamond Lake, Minnehaha County, 2009, 2011, 2013 and 2014.

Yellow Perch

Management Objective

- maintain a yellow perch population with a total gill-net CPUE of at least 25

Management Strategies

- stock small fingerling yellow perch as needed to achieve the management objective
- mark stocked small fingerlings with oxytetracycline (OTC) to enable evaluation of stocking contribution to the fishery

Yellow perch gill-net CPUE increased in 2014 and is just below the management objective (Table 10). All of the fish sampled were 13-16 cm (5-6 in) long (Figures 4, 5) and likely produced by stocking (Table 11) or natural reproduction in 2013.

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

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE		15.0	1.7		11.0		13.0		6.0	22.3
PSD		87	--		85		38		0	0
RSD-P		16	--		12		0		0	0
Mean Wr		81	--		101		109		103	103

Table 11. Yellow perch stocked into Diamond Lake, Minnehaha County, 2005-2014.

Year	Number	Size
2006	1,771	Adult
	1,107	Juvenile
2007	476	Adult
2009	100,700	Small Fingerling
2011	104,960	Small Fingerling
2012	81,210	Small Fingerling
2013	104,030	Small Fingerling

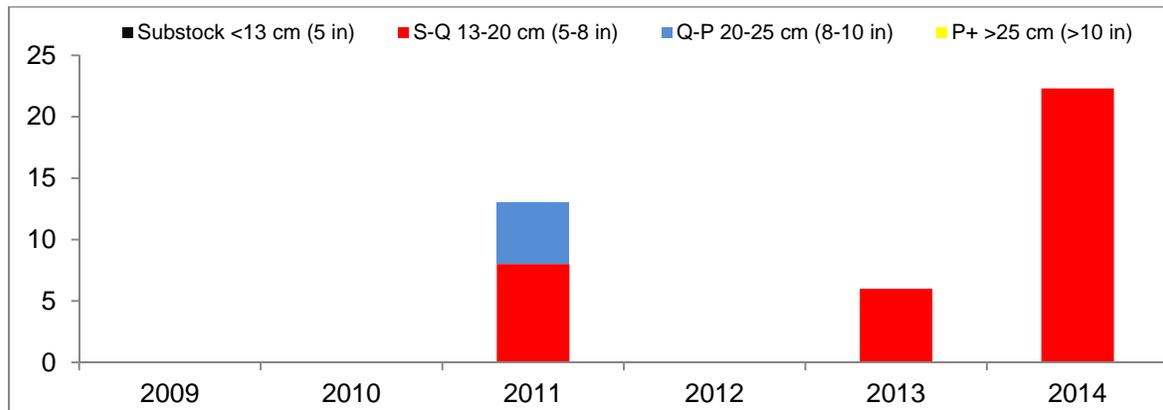


Figure 4. CPUE by length category for yellow perch sampled with gill nets in Diamond Lake, Minnehaha County, 2009-2014.

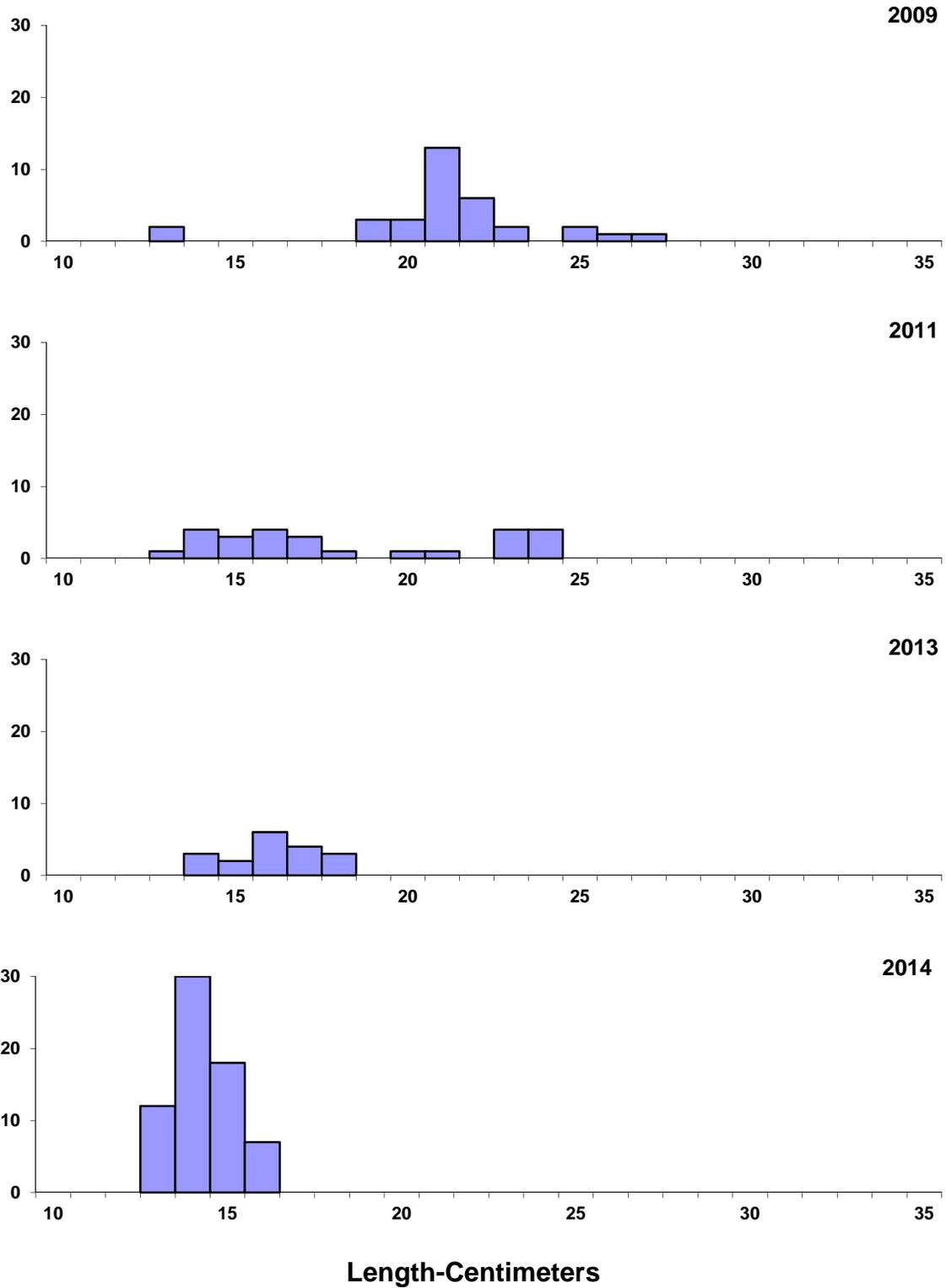


Figure 5. Length frequency histograms for yellow perch sampled with gill nets in Diamond Lake, Minnehaha County, 2009, 2011, 2013, and 2014.

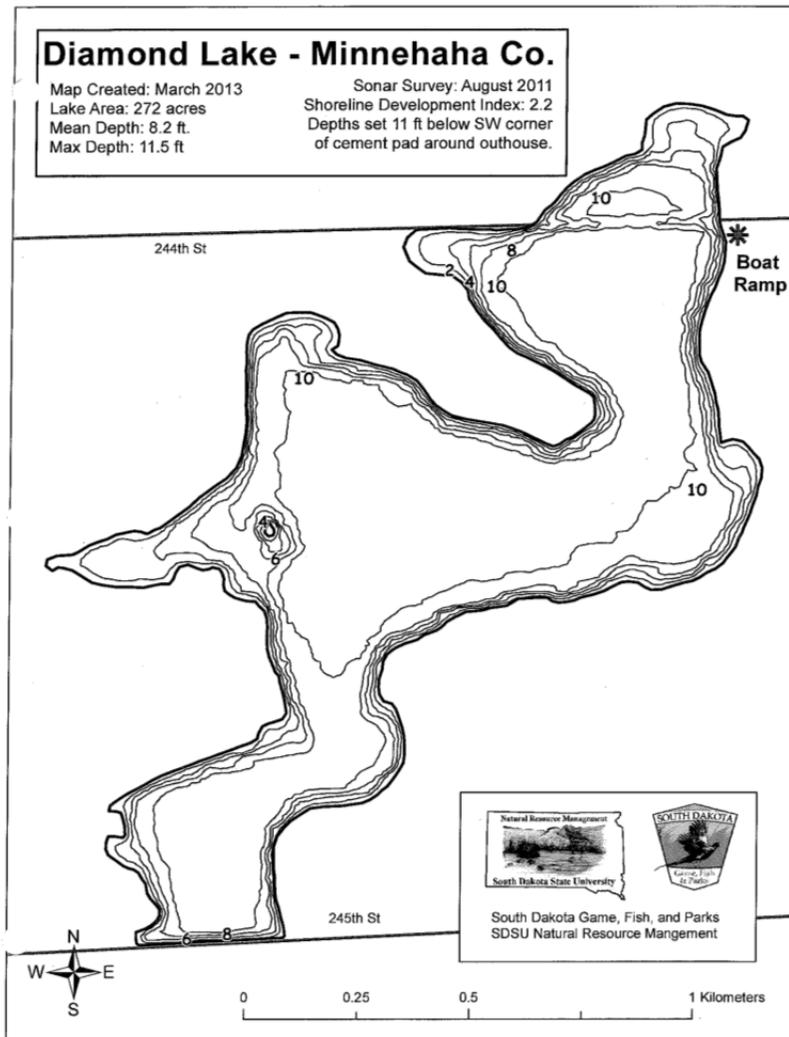


Figure 6. Contour map of Diamond Lake, Minnehaha County.

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.