

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

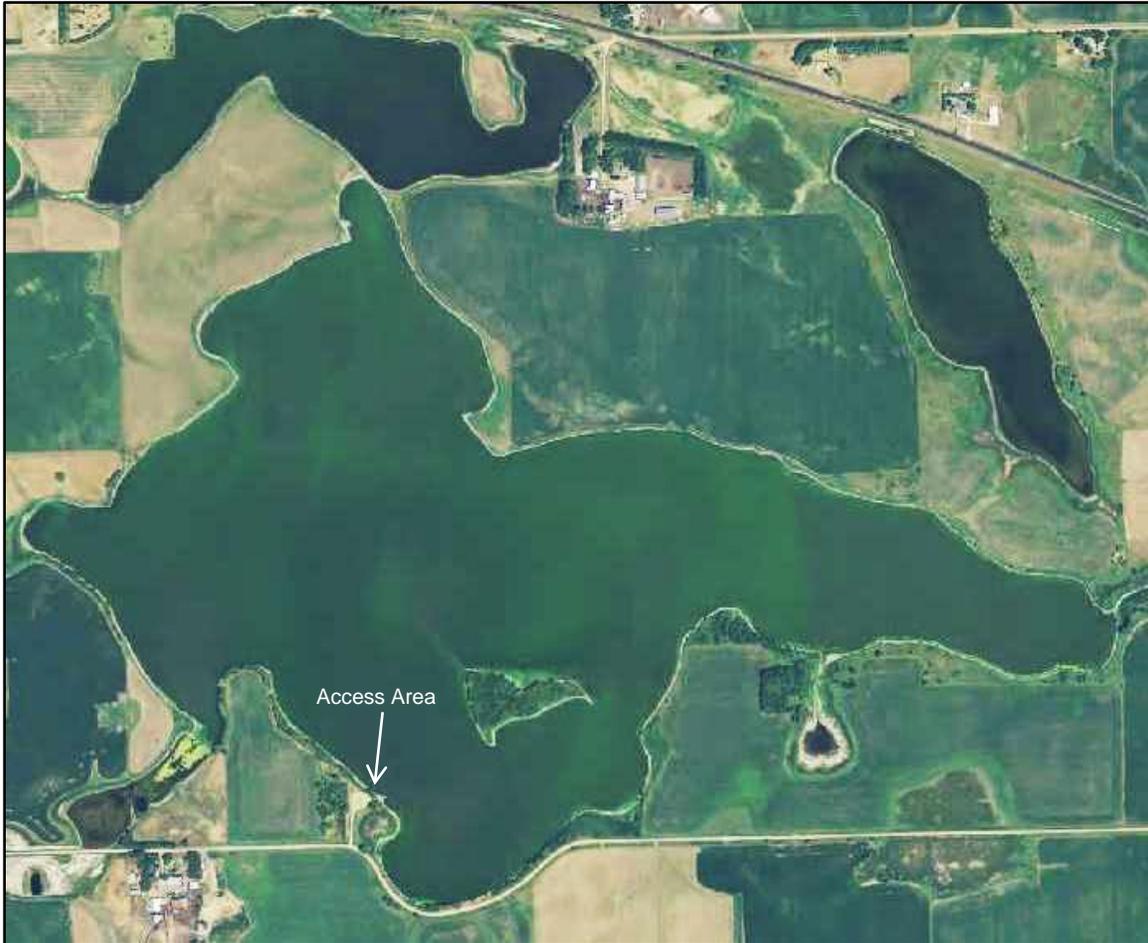


Figure 1. Beaver Lake, Minnehaha County

Legal Description: T102N-R52W-Sec.14-15

Location from nearest town: 1 mile south and $\frac{3}{4}$ miles east of Humboldt, SD

Surface Area: 320 acres

Meandered (Y/N): Yes

OHWM elevation: 1651.6

Outlet elevation: 1651.7

Max. depth at outlet elevation: 11 feet

Observed water level: 4 feet low

Contour map available: Yes

Watershed area: No data available

Shoreline length: No data available

Date set: December, 1988

Date set: December, 1988

Mean depth at outlet elevation: 9 feet

Lake volume: No data available

Date mapped: 2012

DENR beneficial use classifications: (6) warm water marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation

Introduction

General

According to historical documents, Beaver Lake was so named because beavers used to be protected on the lake. The lakes' proximity to Sioux Falls makes it an important source of water-based recreation for the area.

Ownership of Lake and Adjacent Lakeshore Properties

Beaver Lake is located just southeast of Humboldt in west central Minnehaha County. It is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks owns and maintains a lake access area on the southwest corner of the lake (Figure 1). The remaining lakeshore is privately owned.

Fishing Access

The southwest lake access area features a concrete boat ramp, boat dock, concrete vault toilet and gravel parking area. Shoreline access is limited to the southwest road right-of-way, especially when the lake is full.

Water Quality and Aquatic Vegetation

Like many shallow lakes, Beaver Lake experiences wide variations in water clarity and aquatic vegetation abundance (Table 1). The exceptional clarity observed in 2009 was produced by the near total winter fish kill in the winter of 2008-2009 (Table 3).

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

Year	Water Temp °C (°F)	Secchi Depth cm (in)	Observations/Comments (algae, aquatic vegetation, water quality, etc.)
2014	22 (72)	112 (44)	Some sago pondweed was observed
2013	25 (77)	97 (38)	Algae and sago
2009	23 (74)	400 (157)	Sago, clasping leaf, cattail and bulrush abundant
2007	26 (78)	25 (10)	Scattered sago and abundant cattail and bullrush
2006	-- (--)	46 (18)	Thick beds of sago pondweed observed
2005	-- (--)	15 (6)	Heavy algae bloom

Fish Community

Beaver Lake contains relatively few species (Table 2) and black bullheads are usually the most abundant.

Table 2. Fish species commonly found in Beaver Lake, Minnehaha County.

Game Species	Other Species
Walleye	Common Carp
Yellow Perch	
Black Crappie	
Northern Pike	
Black Bullhead	

Fish Management

Beaver Lake is very shallow and prone to significant water level fluctuations. This results in frequent fish kills (Table 3) and makes it difficult to maintain consistent fishing opportunity. The lake is primarily managed for walleye, yellow perch and black crappie and frequent stocking is needed to maintain these populations (Table 4).

Table 3. Fish kill history for Beaver Lake, Minnehaha County.

Year	Severity	Comments
2008	Severe	Near total winterkill. Just 7 bullheads sampled.
2006	Moderate	7/5/06 – south side – about 75, 4-6 in walleye
1993	Total	No live fish sampled.
1991	Moderate	Partial winterkill. A few bullheads and pike survived.

Table 4. Stocking history for Beaver Lake, Minnehaha County, 2005-2014.

Year	Number	Species	Size
2005	20,460	Fathead Minnow	Adult
	10,240	Walleye	Large Fingerling
2006	30,250	Walleye	Fingerling
	6,666	Walleye	Large Fingerling
	310	Walleye	Juvenile
	24,700	Fathead Minnow	Adult
2007	825	Walleye	Large Fingerling
2008	3,283	Black Crappie	Adult
	820	Northern Pike	Juvenile
	300,000	Walleye	Fry
	30,340	Walleye	Fingerling
	37,185	Yellow Perch	Fingerling
2010	500	Walleye	Juvenile
	27,000	Walleye	Fingerling
2011	29,900	Walleye	Fingerling
2012	60,500	Walleye	Fingerling
	54,670	Yellow Perch	Fingerling
2013	161,182	Yellow Perch	Fingerling
2014	300,000	Walleye	Fry

Methods

Beaver Lake was sampled June 18-19, 2014 with three overnight gill-net sets and five overnight trap-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 (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads.

Results and Discussion

Net Catch Results

As usual, black bullheads comprised the majority of the gill net and trap net samples in 2014 (Tables 5, 6). However, significant numbers of yellow perch and walleyes were sampled in the gill nets indicating these populations are starting to recover. In addition, no black crappies were sampled and a common carp was caught for the first time since 2008 (Table 9).

Table 5. Total catch from three overnight gill nets set in Beaver Lake, Minnehaha County, June 18-19, 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	222	81.3	74.0	+13.3	45.7	100	7	--
Yellow Perch	29	10.6	9.7	+8.0	1.3	0	0	97
Walleye	19	7.0	6.3	+2.3	3.3	79	11	98
Northern Pike	3	1.1	1.0	+0.0	2.7	--	--	--

*10 years (2005-2014)

Table 6. CPUE by length category for selected species sampled with gill nets in Beaver Lake, Minnehaha County, June 18-19, 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	--	74.0	--	68.7	5.3	74.0	+13.3
Yellow Perch	2.0	7.7	7.7	--	--	9.7	+8.0
Walleye	--	6.3	1.3	4.3	0.7	6.3	+2.3
Northern Pike	--	1.0	--	0.3	0.7	1.0	+0.0

Length categories can be found in Appendix A.

Table 7. Total catch from five overnight trap nets set in Beaver Lake, Minnehaha County, June 18-19, 2014.

<i>Species</i>	<i>#</i>	<i>%</i>	<i>CPUE</i>	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
Black Bullhead	3,700	99.7	740.0	+235.8	347.2	100	4	--
Northern Pike	5	0.1	1.0	+0.3	0.6	--	--	--
Walleye	5	0.1	1.0	+0.5	2.5	--	--	--
Common Carp	1	0.0	0.2	+0.2	1.7	--	--	--

*10 years (2005-2014)

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

Table 8. CPUE by length category for selected species sampled with trap nets in Beaver Lake, Minnehaha County, June 18-19, 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	--	740.0	--	710.8	29.2	740.0	+235.8
Northern Pike	--	1.0	--	0.2	0.8	1.0	+0.3
Walleye	--	1.0	--	1.0	--	1.0	+0.5
Common Carp	--	0.2	--	0.2	--	0.2	+0.2

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

Table 9. Gill-net (GN) and trap-net (TN) CPUE for selected fish species sampled in Beaver 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	21.0	55.7	21.0		1.0				129.7	74.0
	TN	423.1	395.2	190.4		38.1				689.3	740.0
Black Crappie	GN	7.3	2.0	--		0.3				--	--
	TN	245.3	67.6	38.9		8.3				0.3	--
Common Carp	GN	27.8	14.7	5.7		--				--	--
	TN	2.8	1.2	4.4		--				--	0.2
Northern Pike	GN	0.3	--	--		11.0				2.0	1.0
	TN	0.6	0.1	0.1		1.9				0.3	1.0
Walleye	GN	1.3	0.4	5.3		6.7				2.7	6.3
	TN	5.0	0.1	6.8		0.4				0.3	1.0
Yellow Perch	GN	1.8	0.7	0.3		3.3				0.3	9.3
	TN	0.2	0.1	0.4		0.1				--	--

Walleye

Management Objective

- Maintain a walleye population with a total gill-net CPUE of at least 10 whenever the lake is deep enough to minimize the risk of fish kills.

Management Strategy

- Stock small walleye fingerlings at the rate of 100/acre (32,000) as needed to achieve the management objective.

Walleye abundance increased in 2014, but it remains below the management objective (Table 10). However, the size structure of the population is very good (Table 10, Figures 2, 3) and some fishing opportunity is currently available. Frequent stockings (Table 11) have not produced high gill net catches but because this fishery is located close to Sioux Falls, additional stocking effort is justified. Large numbers of age-0 walleyes were captured in small-mesh gill nets set this fall to evaluate yellow perch stocking success. This indicates there was good natural production and/or a successful fry stocking.

Table 10. CPUE, PSD, RSD-P, and mean Wr for all walleye sampled with gill nets in Beaver Lake, Minnehaha County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE	1.3	0.3	5.3		6.7				2.7	6.3
PSD	--	--	0		5				--	79
RSD-P	--	--	0		0				--	11
Mean Wr	--	--	90		99				--	98

Table 11. Walleyes stocked into Beaver Lake, Minnehaha County, 2005-2014.

Year	Number	Size
2005	10,240	Large Fingerling
2006	30,250	Small Fingerling
	6,666	Large Fingerling
	310	Juvenile
2007	825	Large Fingerling
2008	300,000	Fry
	30,340	Small Fingerling
2010	500	Juvenile
	27,000	Small Fingerling
2011	29,900	Small Fingerling
2012	60,500	Small Fingerling
2014	300,000	Fry

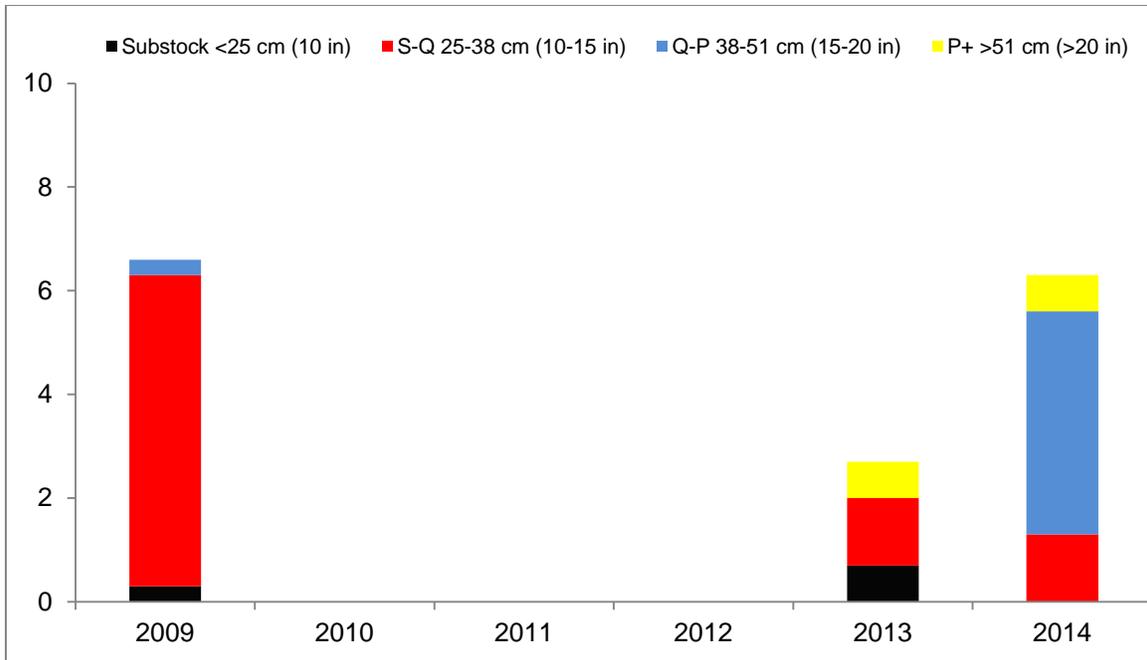


Figure 2. CPUE by length category for walleye sampled with gill nets in Beaver Lake, Minnehaha County, 2009-2014.

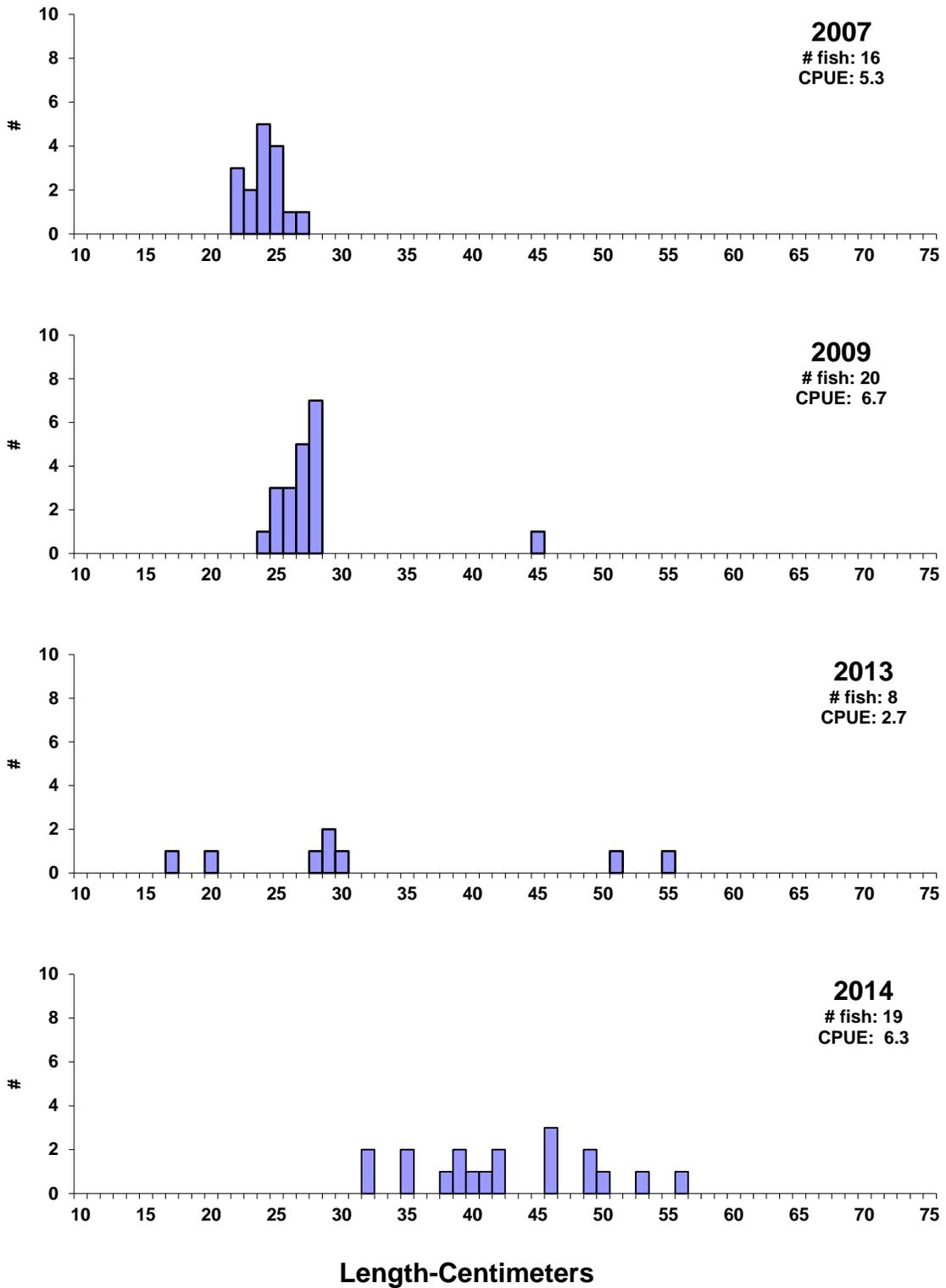


Figure 3. Length frequency histograms for walleyes sampled with gill nets in Beaver Lake, Minnehaha County, 2007, 2009, 2013, 2014.

Yellow Perch

Management Objective

- Maintain a yellow perch 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 small yellow perch fingerlings at the rate of 500/acre (160,000) as needed to achieve the management objective. Enable the evaluation of these stockings by marking the stocked fingerlings with oxytetracycline (OTC).

Yellow perch abundance increased in 2014 but remains below the management objective (Table 12). The two year classes of small fish sampled (Figures 4, 5) may have been produced by the 2012 and 2013 stockings (Table 13). No age-0 yellow perch were sampled this fall in the small-mesh gill nets, seines or cloverleaf traps set to evaluate stocking success.

Table 12. CPUE, PSD, RSD-P, and mean Wr for all yellow perch sampled with gill nets in Beaver Lake, Minnehaha County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE	1.8	0.7	0.3		3.3				0.3	9.7
PSD	--	--	--		--				--	0
RSD-P	--	--	--		--				--	0
Mean Wr	--	--	--		--				--	97

Table 13. Yellow perch stocked into Beaver Lake, Minnehaha County, 2005-2014.

Year	Number	Size
2008	37,185	Fingerling
2012	54,670	Fingerling
2013	161,182	Fingerling

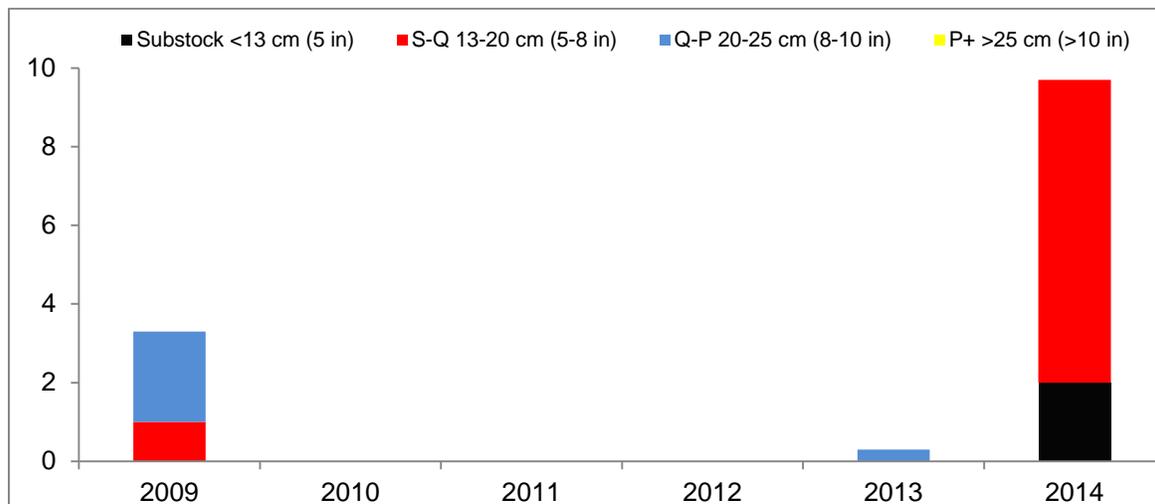


Figure 4. CPUE by length category for yellow perch sampled with gill nets in Beaver Lake, Minnehaha County, 2009-2014.

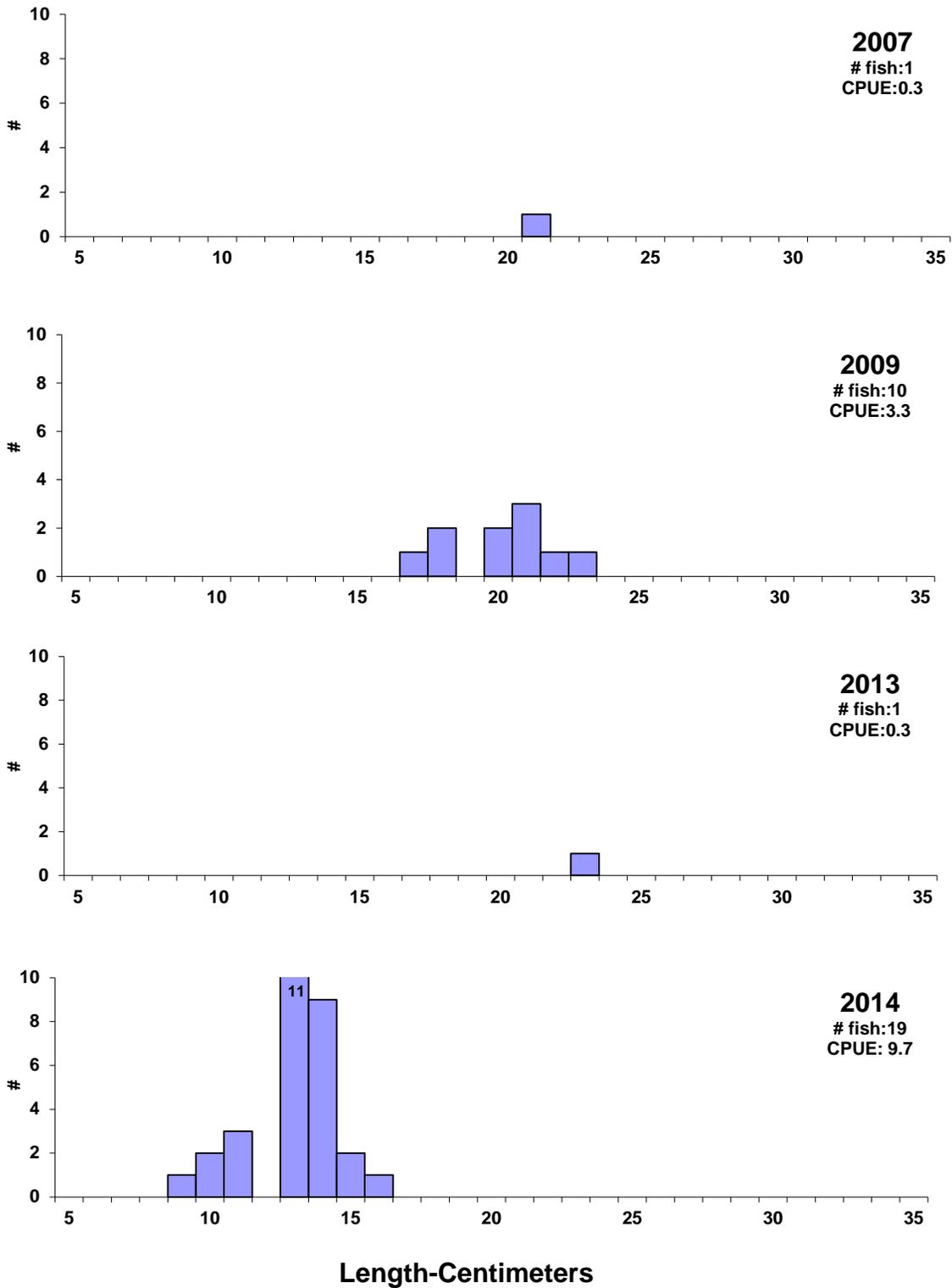


Figure 5. Length frequency histograms for yellow perch sampled with gill nets in Beaver Lake, Minnehaha County, 2007, 2009, 2013, 2014.

Black Crappie

Management Objective

- Maintain a black crappie population with a total trap-net CPUE of at least 50 and a PSD of at least 40.

Management Strategy

- Stock adult or juvenile black crappies at the rate of 10/acre to reestablish a breeding population following a fish kill.

Black crappies have traditionally done very well in Beaver Lake (Table 14). Although no adult crappies were sampled in the trap nets, age-0 fish were captured in seine hauls, small-mesh gill nets and cloverleaf traps set this fall indicating there are some adult fish in the lake.

Table 14. CPUE, PSD, RSD-P, and mean Wr for all black crappies sampled with trap nets in Beaver Lake, Minnehaha County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE	245.3	67.6	38.9		8.3				0.3	0.0
PSD	1	72	94		95				--	--
RSD-P	0	0	1		53				--	--
Mean Wr	103	99	103		105				--	--

Table 15. Black crappies stocked into Beaver Lake, Minnehaha County, 2005-2014.

Year	Number	Size
2008	3,283	Adult

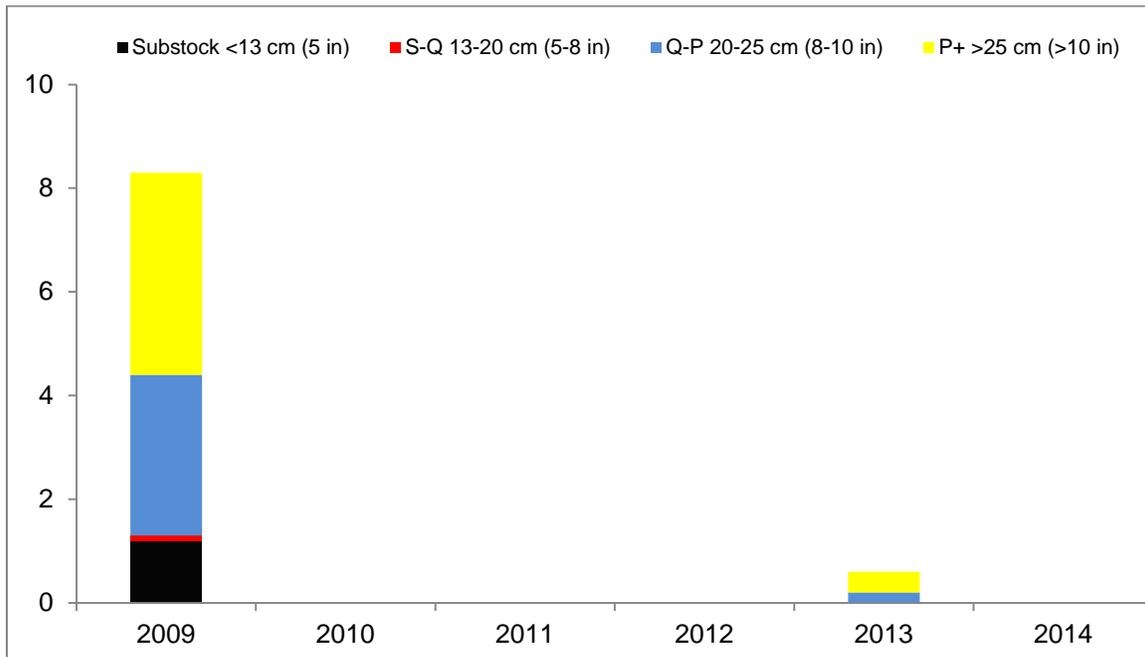
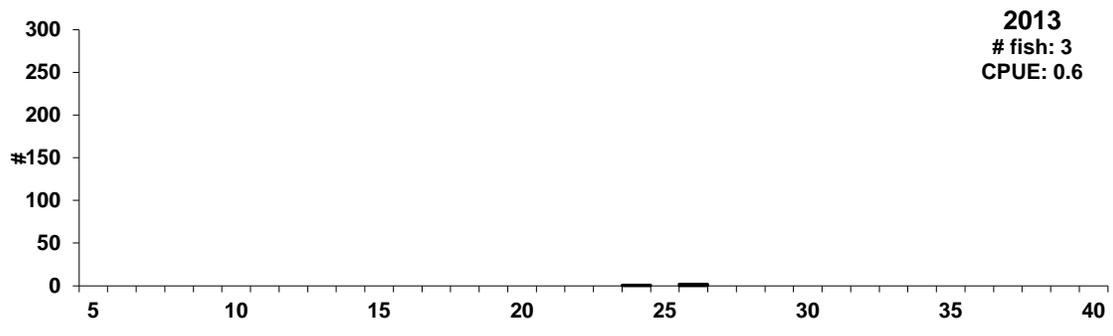
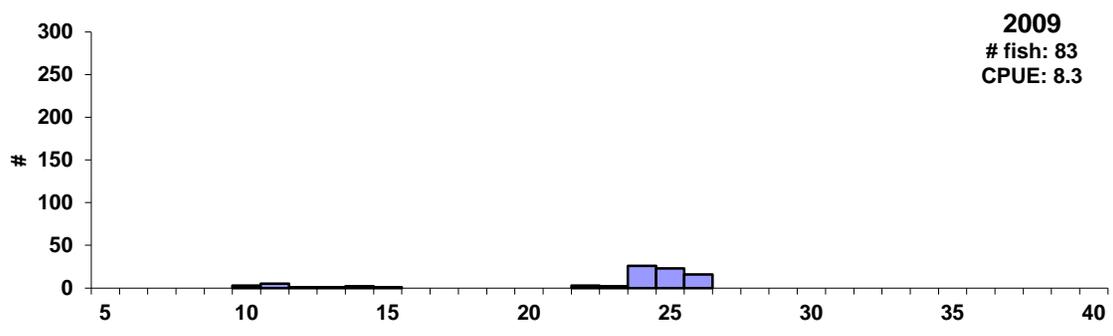
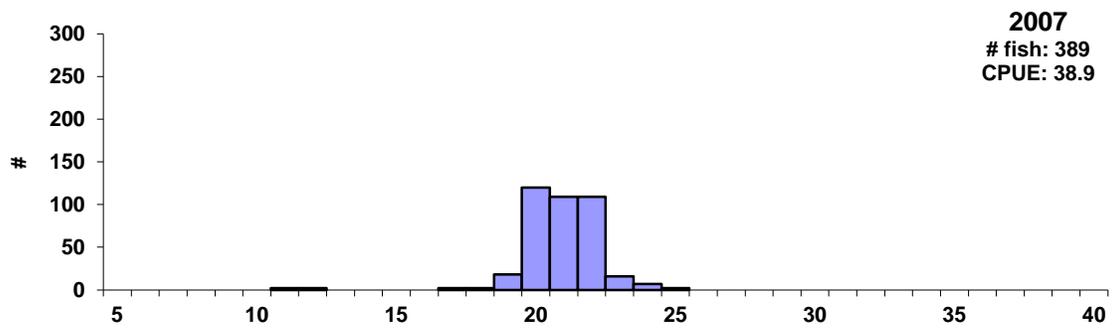
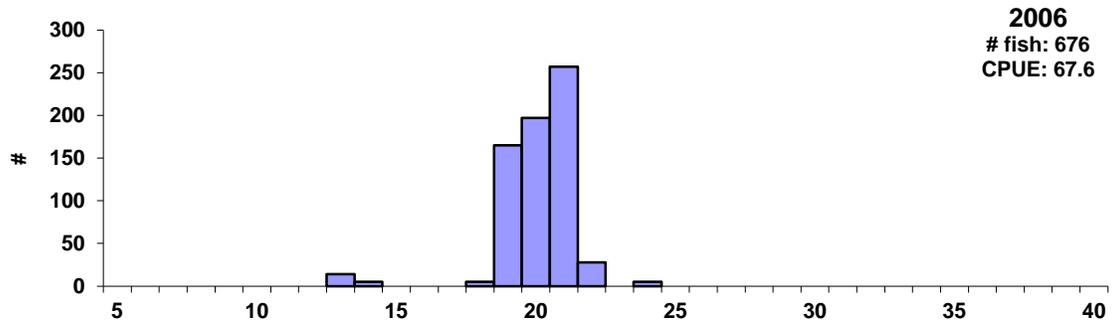


Figure 6. CPUE by length category for black crappies sampled with trap nets in Beaver Lake, Minnehaha County, 2009-2014.



Length-Centimeters

Figure 7. Length frequency histograms for black crappies sampled with trap nets in Beaver Lake, Minnehaha County, 2006, 2007, 2009, 2013.

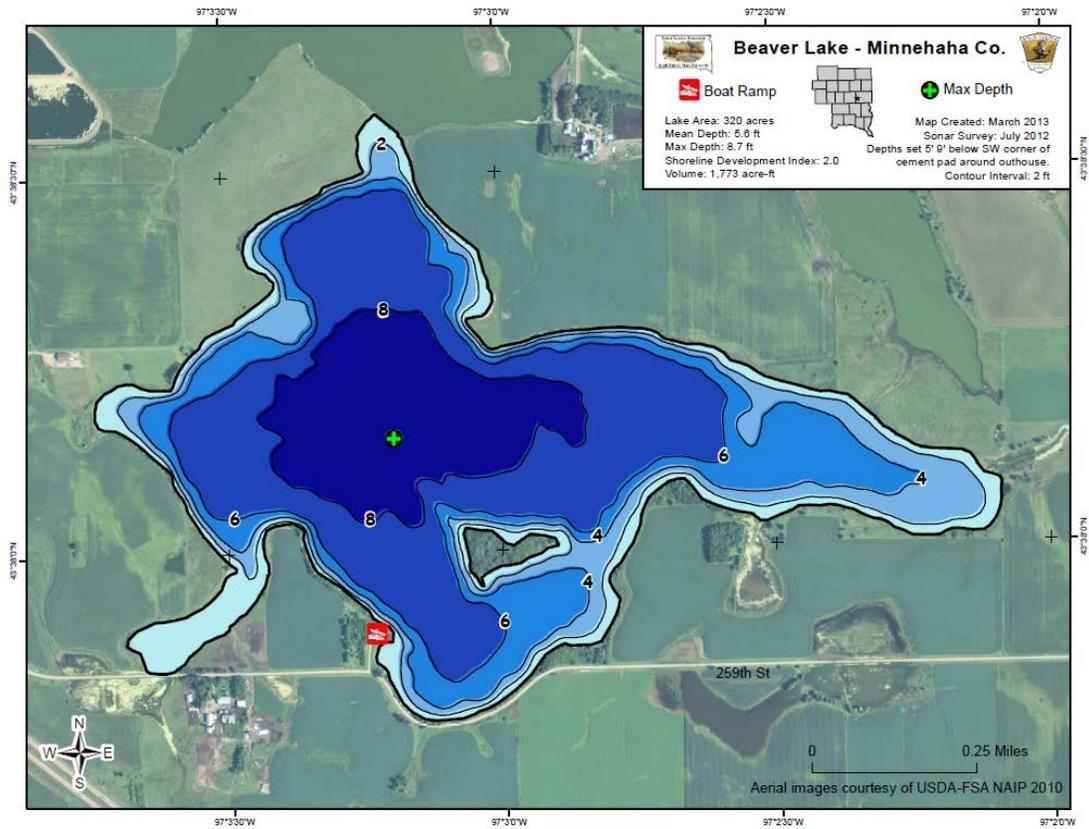


Figure 8. Contour map of Beaver Lake, Minnehaha County.

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.

Species	Stock	Quality	Preferred	Memorable	Trophy
Common carp	28	41	53	66	84
White Sucker	15	25	33	41	51
Bigmouth buffalo	28	41	53	66	84
Black bullhead	15	23	30	38	46
Channel catfish	28	41	61	71	91
Northern pike	35	53	71	86	112
White Bass	15	23	30	38	46
Green Sunfish	8	15	20	25	30
Bluegill	8	15	20	25	30
Smallmouth bass	18	28	35	43	51
Largemouth bass	20	30	38	51	63
White crappie	13	20	25	30	38
Black crappie	13	20	25	30	38
Yellow perch	13	20	25	30	38
Walleye	25	38	51	63	76
Freshwater Drum	20	30	38	51	63

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.x