

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-44

Name: Swan Lake

County: Turner

Legal Description: T97N-R53W-Sec 15-16

Location from nearest town: 3 miles north and 1 mile west of Viborg, SD

Dates of present survey: August 8-9, 2011

Dates of last survey: August 19-20, 2009

Managed Species	Other Species
Walleye	Northern Pike
White Crappie	Black Bullhead
Black Crappie	White Sucker
Yellow Perch	Common Carp
	Shorthead Redhorse
	Green Sunfish
	Bigmouth Buffalo
	Channel Catfish

PHYSICAL DATA

Surface area: 208 acres

Maximum depth: 6 feet

Volume: 719 acre-feet

Contour map available: Yes

OHWM elevation: 1252.9

Outlet elevation: 1252.4

Lake elevation observed during the survey: Full

Beneficial use classifications: (5) warmwater semipermanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: 81,913 acres

Mean depth: 3 feet

Shoreline length: 3.8 miles

Date mapped: 1985

Date set: April, 1983

Date set: April, 1983

Introduction

Swan Lake, a shallow, marginal lake located near the town of Viborg, was so named because it is supposedly shaped like a swan. The lake receives heavy use because of its proximity to Sioux Falls and the number of people living around it. Throughout history, the lake has been plagued with heavy nutrient and sediment loading from the watershed. Compounding the problem was a poorly-designed water diversion system that directed untreated water from Turkey Ridge Creek into the lake to maintain water levels. From 1992-1998, the diversion was closed, erodable shorelines were rip-rapped and over 400,000 cubic yards of sediment were dredged from the basin. A prolonged period of drought with subsequent declines in lake levels prompted the redesign and construction of a new diversion structure accompanied by an operating plan that only allows diversion of high-quality water in the fall and winter. This new system has restored lake levels.

Ownership of Lake and Adjacent Lakeshore Properties

Swan Lake is listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and maintains an access area on the south shore of the lake. The remaining lakeshore property is privately owned and heavily developed.

Fishing Access

The Swan Lake Access Area contains a boat ramp with a dock. The north shore of the lake contains several shore fishing areas.

Field Observations of Water Quality and Aquatic Vegetation

Some cattails (*Typha spp.*) were present along the west shore and small, scattered beds of sago (*Potamogeton pectinatus*) were observed. The water was very turbid with a Secchi reading of only 23 cm (9.0 in).

BIOLOGICAL DATA

Methods:

Swan Lake was sampled on August 8-9, 2011 with three overnight gill-net sets and five overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ 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. 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. Sampling locations are displayed in Figure 2.

Results and Discussion:

Gill Net Catch

Black bullhead and white sucker comprised 59.1% of the sample (Table 1). Other species sampled included walleye, common carp, yellow perch, white crappie, channel catfish, and shortnose gar.

Table 1. Total catch from three overnight gill net sets at Swan Lake, Turner County, August 8-9, 2011.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	64	38.6	21.3	<u>+6.6</u>	14.3	0	0	93
White Sucker	34	20.5	11.3	<u>+2.6</u>	0.5	91	21	95
Walleye	31	18.7	10.3	<u>+4.8</u>	3.3	7	0	92
Common Carp	23	13.9	7.7	<u>+3.0</u>	2.2	--	--	--
Yellow Perch	10	6.0	3.3	<u>+0.4</u>	2.3	0	0	100
White Crappie	2	1.2	0.7	<u>+0.9</u>	4.6	--	--	--
Channel Catfish	1	0.6	0.3	<u>+0.4</u>	2.3	--	--	--
Shortnose Gar	1	0.6	0.3	<u>+0.4</u>	0.0	--	--	--

* 5 years (2001,2003, 2005, 2007, 2009)

Table 2. Catch per unit effort by length category for various fish species captured with gill nets in Swan Lake August 8-9, 2011.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	--	21.3	21.3	--	--	21.3	<u>+6.6</u>
White Sucker	--	11.3	1.0	8.0	2.3	11.3	<u>+2.6</u>
Walleye	0.3	10.0	9.3	0.7	--	10.3	<u>+4.8</u>
Common Carp	6.7	1.0	0.7	0.3	--	7.7	<u>+3.0</u>
Yellow Perch	--	3.3	3.3	--	--	3.3	<u>+0.4</u>
White Crappie	--	0.7	0.7	--	--	0.7	<u>+0.9</u>
Channel Catfish	0.3	--	--	--	--	0.3	<u>+0.4</u>
Shortnose Gar*						0.3	<u>+0.4</u>

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

Trap Net Catch

Black bullhead and white sucker also comprised the majority of the trap net sample (Table 2). Other species sampled included green sunfish, white crappie, walleye, yellow perch, bluegill, channel catfish, orange-spotted sunfish, shortnose gar, common carp, and northern pike.

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

Table 3. Total catch from five overnight trap net sets at Swan Lake, Turner County, August 8-9, 2011.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	810	77.8	162.0	<u>+64.1</u>	131.3	1	0	93
White Sucker	94	9.0	18.8	<u>+5.0</u>	2.9	98	45	91
Green Sunfish	65	6.2	13.0	<u>+6.6</u>	1.1	11	0	113
White Crappie	29	2.8	5.8	<u>+1.4</u>	16.5	34	0	92
Walleye	14	1.3	2.8	<u>+0.5</u>	1.9	21	7	86
Yellow Perch	10	1.0	2.0	<u>+1.1</u>	0.7	0	0	108
Bluegill	4	0.4	0.8	<u>+0.7</u>	0.1	--	--	--
Channel Catfish	4	0.4	0.8	<u>+0.7</u>	0.8	--	--	--
O. S. Sunfish	3	0.3	0.6	<u>+0.5</u>	0.2	--	--	--
Shortnose Gar	3	0.3	0.6	<u>+0.3</u>	0.1	--	--	--
Common Carp	3	0.3	0.6	<u>+0.3</u>	1.6	--	--	--
Northern Pike	2	0.2	0.4	<u>+0.5</u>	0.0	--	--	--

* 5 years (2001,2003, 2005, 2007, 2009)

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in Swan Lake August 8-9, 2011.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	--	162.0	160.4	1.6	--	162.0	<u>+64.1</u>
White Sucker	--	18.8	0.4	10.0	8.4	18.8	<u>+5.0</u>
Green Sunfish	--	13.0	11.6	1.4	--	13.0	<u>+6.6</u>
White Crappie	--	5.8	3.8	2.0	--	5.8	<u>+1.4</u>
Walleye	--	2.8	2.2	0.4	0.2	2.8	<u>+0.5</u>
Yellow Perch	--	2.0	2.0	--	--	2.0	<u>+1.1</u>
Bluegill	--	0.8	0.2	0.6	--	0.8	<u>+0.7</u>
Channel Catfish	0.2	0.6	--	0.4	0.2	0.8	<u>+0.7</u>
O. S. Sunfish*	--	--	--	--	--	0.6	<u>+0.5</u>
Shortnose Gar*	--	--	--	--	--	0.6	<u>+0.3</u>
Common Carp	0.2	0.4	0.2	0.2	--	0.6	<u>+0.3</u>
Northern Pike	--	0.4	0.2	0.2	--	0.4	<u>+0.5</u>

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

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 10.

Walleye CPUE was the highest ever recorded but was still below the management objective. Sampled walleyes ranged in length from 12 to 48 cm (4.7- 18.9 in) (Figure 1) this year and likely originated from the 2010 fingerling stocking and the fall 2009 large fingerling stocking (Table 6).

Table 5. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for Swan Lake, Turner County, 2003-2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	6.7		4.5		4.0		1.3		10.3	3.3
PSD	0		--		0		--		7	2
RSD-P	0		--		0		--		0	0
Mean Wr	78		--		79		--		92	83

*5 years (2001, 2003, 2005, 2007, 2009)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 15.

Yellow perch CPUE increased in 2011 but is still far below the management objective (Table 6). Yellow perch adults (2,260) were stocked in October 2011 (Table 10).

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr for Swan Lake, Turner County, 2003-2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	1.0		0.5		0.3		0.7		3.3	2.3
PSD	--		--		--		--		0	15
RSD-P	--		--		--		--		0	0
Mean Wr	--		--		--		--		100	106

*5 years (2001, 2003, 2005, 2007, 2009)

White Crappie

Management objective: Maintain a white crappie population with a trap-net CPUE of at least 15.

White crappie CPUE has declined considerably since 2009 (Table 7). In July of 2010 there was a crappie die-off and many black and white crappies were observed floating and washed up on shore.

Sampled crappies ranged in length from 17 to 24 cm (6.7-9.4 in)(Figure 2) and condition (mean Wr) was near the 10 year mean (Table 7).

Table 7. White crappie trap-net CPUE, PSD, RSD-P and mean Wr for Swan Lake, Turner County, 2003-2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	0.0		1.4		7.8		73.2		5.8	16.5
PSD	--		--		71		0		34	36
RSD-P	--		--		6		0		0	3
Mean Wr	--		--		98		92		92	95

*5 years (2001, 2003, 2005, 2007, 2009)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of no more than 100.

Black bullhead CPUE decreased in 2011 but is still slightly higher than the management objective (Table 8). The bullheads sampled ranged in length from 15 to 27 cm (5.9-10.6 in) (Figure 3). Condition was above average with a mean Wr of 93 (Table 8).

Table 8. Black bullhead trap-net CPUE, PSD, RSD-P and mean Wr for Swan Lake, Turner County, 2003-2011.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	55.4		14.8		9.8		539.4		162.0	136.5
PSD	5		18		18		44		1	16
RSD-P	0		0		0		0		0	0
Mean Wr	74		87		83		69		93	81

*5 years (2001, 2003, 2005, 2007, 2009)

All Species

Swan Lake has a diverse fish community with 12 species sampled this year (Table 5).

Table 9 Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Swan Lake, Turner County, 2003-2011.

Species	2003	2004	2005	2006	2007	2008	2009	2010	2011
SHG (GN)	--		--		--		--		0.3
SHG (TN)	--		0.2		0.5		--		0.6
COC (GN)	0.3		1.5		2.7		2.3		7.7
COC (TN)	0.6		2.0		4.0		0.4		0.6
RIC (GN)	--		--		--		--		--
RIC (TN)	0.1		--		--		--		--
WHS (GN)	--		--		1.0		1.3		11.3
WHS (TN)	0.4		--		2.3		11.0		18.8
BIB (GN)	23.3		15.0		7.3		1.7		--
BIB (TN)	2.6		0.4		2.3		2.8		--
BLB (GN)	22.0		10.0		6.3		16.3		21.3
BLB (TN)	55.4		14.8		9.8		539.4		162.0
CCF (GN)	1.0		4.5		3.7		2.0		0.3
CCF (TN)	1.6		1.0		0.3		1.0		0.8
GSF (GN)	--		--		--		--		--
GSF (TN)	--		--		1.0		4.0		13.0
OSF (GN)	--		--		--		--		--
OSF (TN)	--		--		--		--		0.6
BLG (GN)	--		--		--		--		--
BLG (TN)	--		--		0.5		--		0.8
WHC (GN)	1.3		1.5		2.3		18.0		0.7
WHC (TN)	--		1.4		7.8		73.2		5.8
BLC (GN)	--		--		1.0		--		--
BLC (TN)	--		--		22.8		12.4		--
YEP (GN)	1.0		0.5		0.3		0.7		3.3
YEP (TN)	--		0.4		0.3		1.6		2.0
SXW (GN)	1.7		--		--		--		--
SXW (TN)	4.1		0.4		--		--		--
WAE (GN)	6.7		4.5		4.0		1.3		10.3
WAE (TN)	3.7		0.4		5.5		--		2.8

SHG (Shortnose Gar), COC (Common Carp), RIC (River Carpsucker), WHS (White Sucker), BIB (Bigmouth Buffalo), SHR (Shorthead Redhorse), BLB (Black Bullhead), CCF (Channel Catfish), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), BLG (Bluegill), WHC (White Crappie), BLC (Black Crappie), YEP (Yellow Perch), SXW (Saugeye), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the Swan Lake fishery by conducting biennial netting surveys.
2. Stock walleyes, yellow perch and crappies as needed to achieve and maintain management objectives.

Table 10. Stocking record for Swan Lake, Turner County, 1998-2011.

Year	Number	Species	Size
1998	1,568	Saugeye	Juvenile
1999	165,600	Saugeye	Fry
2000	25,000	Saugeye	Fingerling
2002	25,000	Walleye	Fingerling
	9,196	Yellow Perch	Juvenile
2005	5,984	Walleye	Fingerling
2006	4,892	Black Crappie	Adult
	18,265	Walleye	Fingerling
	3,960	Yellow Perch	Juvenile
2009	1,080	Walleye	Large Fingerling
2010	18,200	Walleye	Fingerling
2011	2,260	Yellow Perch	Adult
	438	Walleye	Large Fingerling

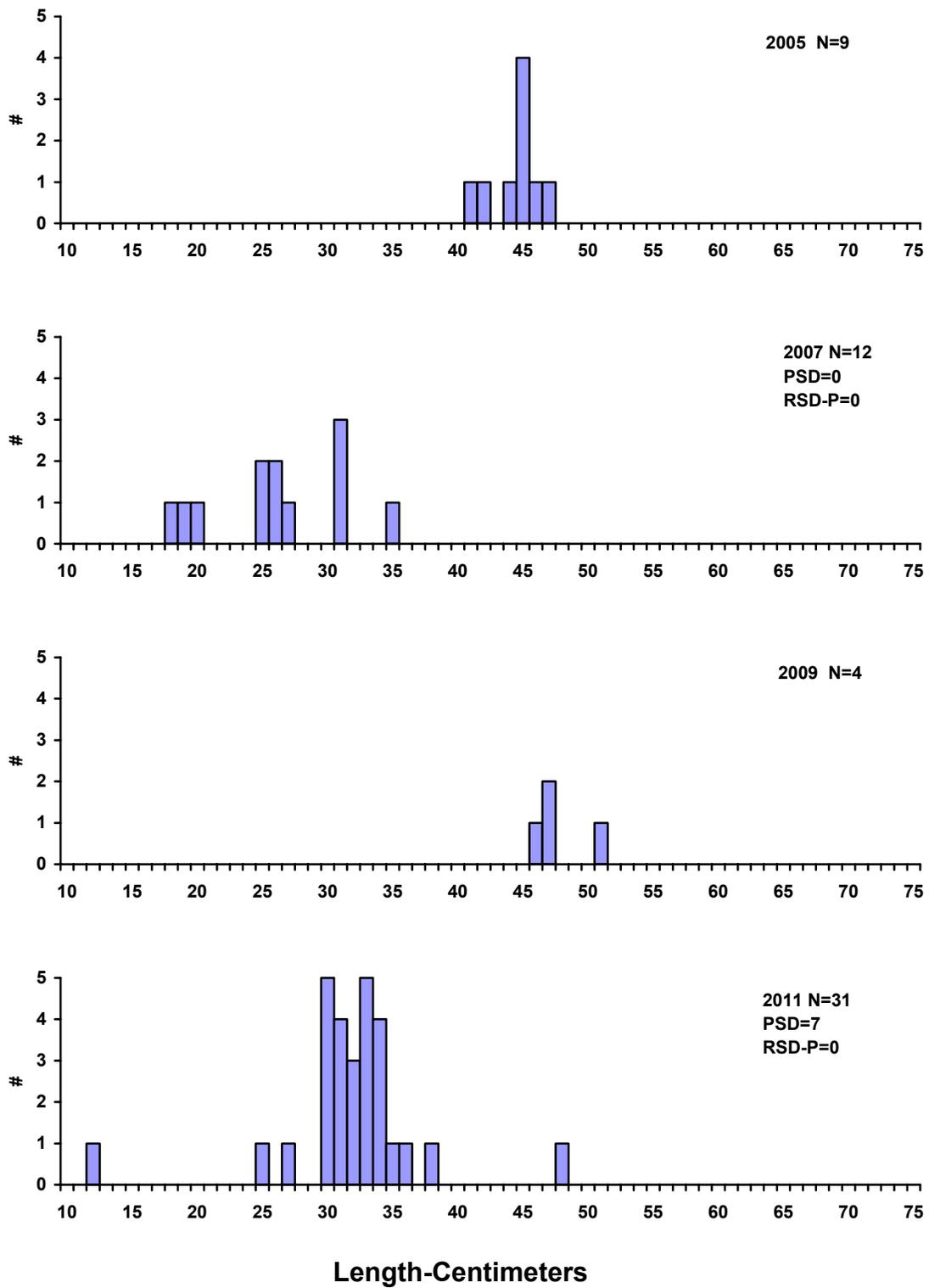


Figure 1. Length frequency histograms for walleye sampled with gill nets in Swan Lake, Turner County, 2005, 2007, 2009, and 2011.

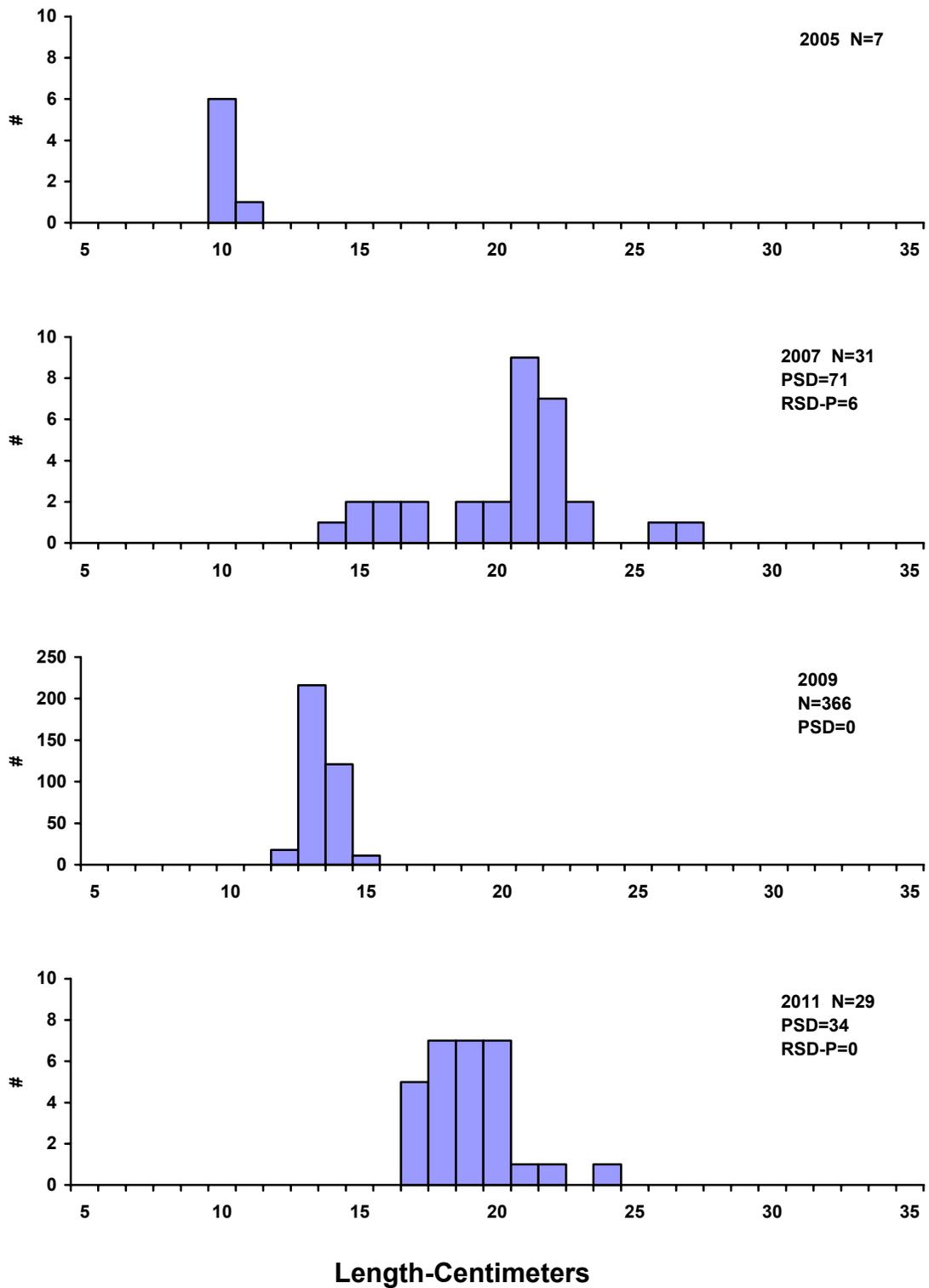


Figure 2. Length frequency histograms for white crappie sampled with trap nets in Swan Lake, Turner County, 2005, 2007, 2009, and 2011.

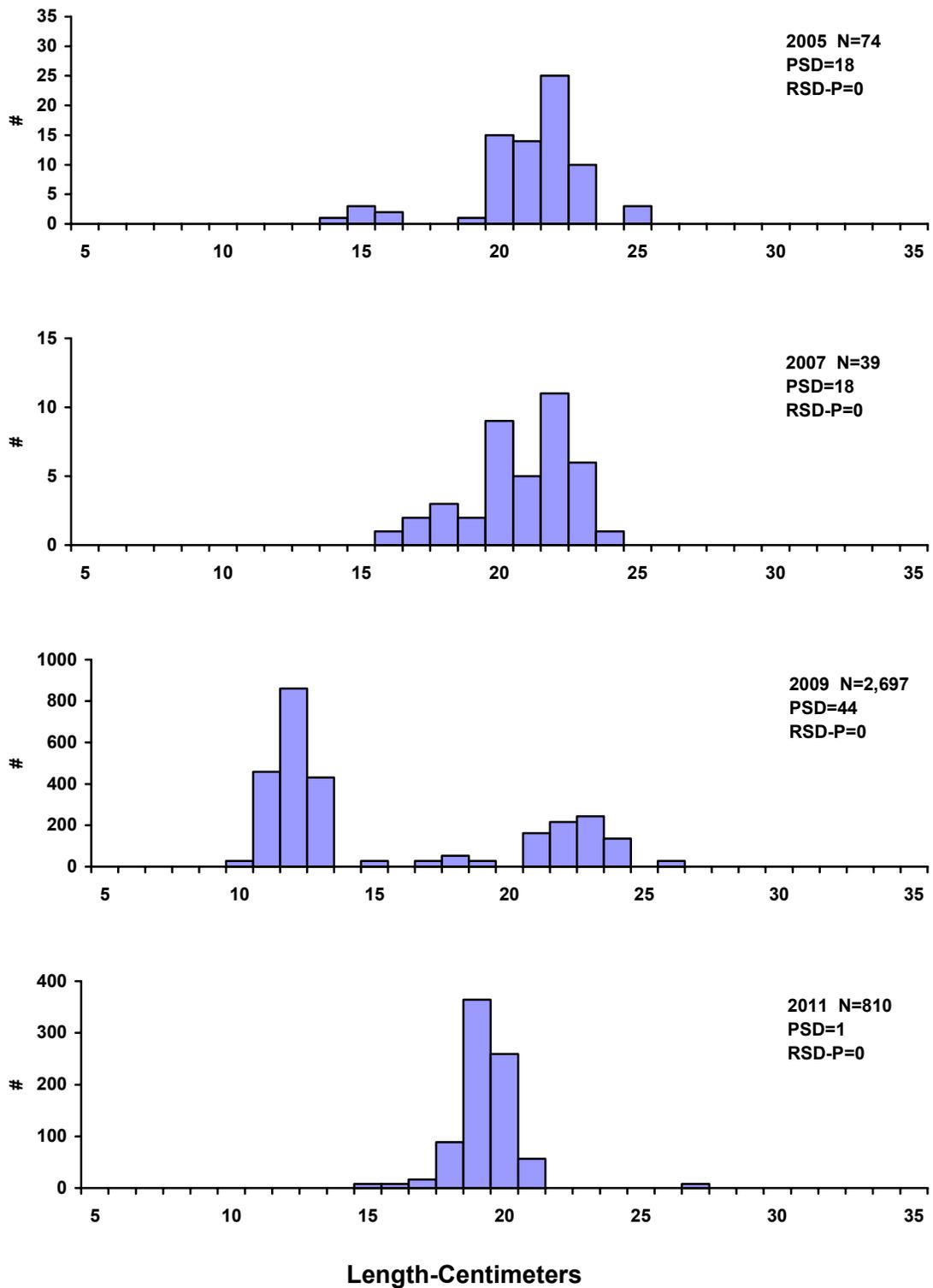


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Swan Lake, Turner County, 2005, 2007, 2009 and 2011.

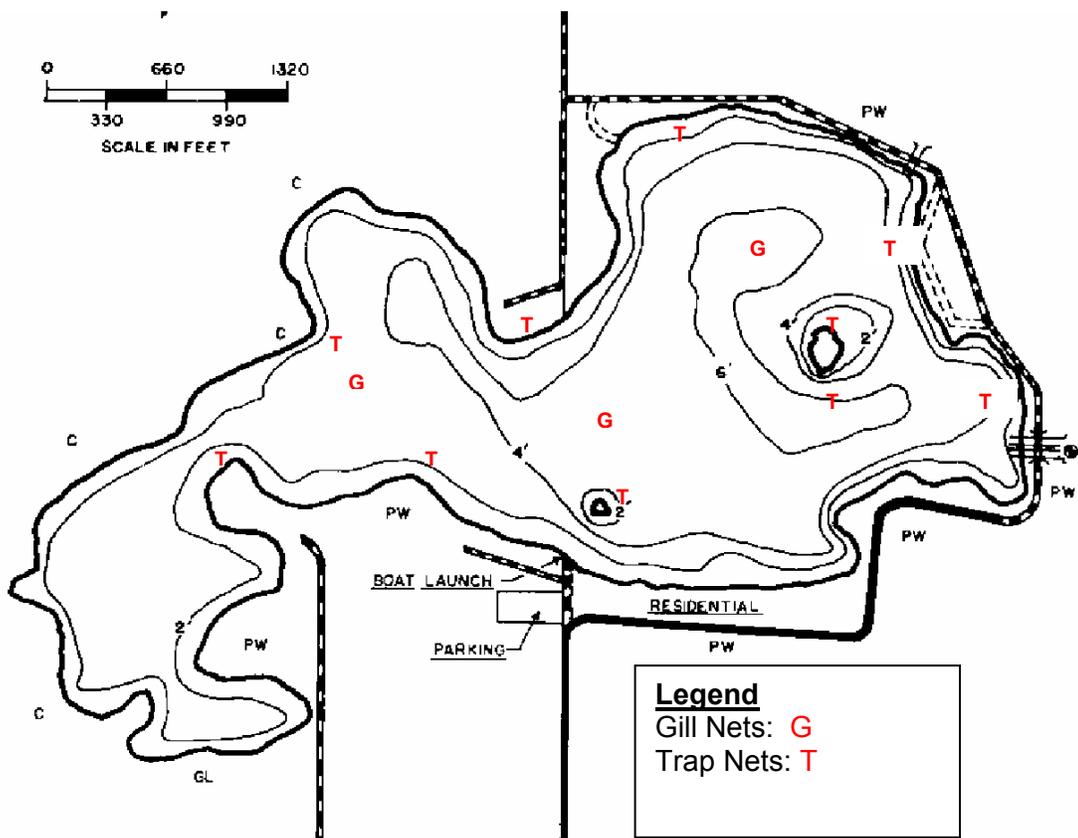


Figure 2. Sampling locations on Swan Lake, Turner County, 2011.

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.