

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-44

Name: Lake Thompson

Counties: Kingsbury and Miner

Legal Description: T110N-R55W-Sec.20-22, 28-33; T109N-R55W-Sec.4-9, 16-17;
T110N-R56W-Sec.36; T109N-R56W-Sec.1.

Location from nearest town: 6 miles south and 4 miles east of DeSmet, SD.

Dates of present survey: August 1-3, 2011 (netting); Sept. 7, 2011 (electrofishing)

Dates of last survey: August 2-4, 2010 (netting); Sept. 28, 2010 (electrofishing)

Managed Species	Other Species
Walleye	Northern Pike
Yellow Perch	Black Crappie
Smallmouth Bass	Black Bullhead
	White Sucker
	Common Carp

PHYSICAL DATA

Surface area: 16,236 acres

Maximum depth: 26 feet

Volume: 148,692 acre-feet

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: Full

Beneficial use classifications: (4) Warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: 263,044 acres

Mean depth: 14.5 feet

Shoreline length: 44.6 miles

Date mapped: 2002

Date set: NA

Date set: NA

Introduction

Lake Thompson, located in central Kingsbury County, was named for John Thompson, a pioneer farmer and Civil War veteran. Lake Thompson had been nothing but a shallow marsh until heavy precipitation in the early 1980s caused the lake to grow to over 16,000 acres and almost 30 feet in depth. It is now one of the more important fisheries in eastern South Dakota.

Ownership of Lake and Adjacent Lakeshore Properties

The State of South Dakota Listing of Meandered Lakes lists 8,000 acres of the original lakebed as meandered. The balance of lake ownership is divided between private landowners, the South Dakota Department of Game, Fish, and Parks (GFP), and the United States Fish and Wildlife Service. The GFP Wildlife Division manages the fishery and Game Production Areas while the Parks Division manages the Recreation and Lake Access Areas.

Fishing Access

The Northeast Access Area, located on the northeast corner of the lake, has a double lane boat ramp, boat dock, parking lot, public toilet and shore fishing access. The Lake Thompson Recreation Area, also located on the northeast shore of the lake, has a double lane boat ramp, boat dock, public toilet, parking lot, campgrounds, swim beach, and shore fishing access. The North Access Area, located on the northwestern shore of the lake, has a boat ramp, boat dock, public toilet and shore fishing access. The West Access Area, located on the west shore of the lake, has a double lane boat ramp, boat dock, public toilet, parking lot, and shore fishing access.

Field Observations of Water Quality and Aquatic Vegetation

During the lake survey, the Secchi depth measurement was 0.584 m (23 inches). Sago pondweed (*Potamogeton pectinatus*) was observed during the survey. Lake Thompson was full at the time of the survey, and water was flowing into the lake from all of the inlets.

BIOLOGICAL DATA

Methods:

Lake Thompson was sampled on August 1-3, 2011 with five overnight gill-net sets and 12 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. Two hours of nighttime electrofishing was done on September 7, 2011 to evaluate walleye recruitment. Sampling sites are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

Yellow perch, walleye, and black crappie comprised 88.7% of the fish sampled in gill nets this year (Table 1). Five other species were also sampled.

Table 1. Total catch from five overnight gill net sets at Lake Thompson, Kingsbury County, August 1-3, 2011.

Species	No.	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	145	32.1	29.0	±12.1	15.6	62	28	111
Walleye	142	31.4	28.4	±11.0	28.6	41	1	88
Black Crappie	114	25.2	22.8	±8.3	1.8	1	0	124
Common Carp	30	6.6	6.0	±2.7	3.9	7	7	109
Northern Pike	14	3.1	2.8	±0.7	0.8	21	0	87
White Bass	4	0.9	0.8	±0.5	0.5	--	--	--
Spottail Shiner	2	0.4	0.4	±0.3	0.9	--	--	--
Black Bullhead	1	0.2	0.2	±0.3	31.3	--	--	--

* 10 years (2001-2010)

Table 2. Catch per unit effort by length category for various fish species captured with gill nets in Lake Thompson August 1-3, 2011.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Yellow Perch	--	29.0	11.0	10.0	8.0	29.0	±12.1
Walleye	6.2	22.2	13.2	8.8	0.2	28.4	±11.0
Black Crappie	2.2	20.6	20.4	0.2	--	22.8	±8.3
Common Carp	0.4	5.6	5.2	--	0.4	6.0	±2.7
Northern Pike	--	2.8	2.2	0.6	--	2.8	±0.7
White Bass	0.2	0.6	0.2	0.4	--	0.8	±0.5
Spottail Shiner*	--	--	--	--	--	0.4	±0.3
Black Bullhead	--	0.2	0.2	--	--	0.2	±0.3

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

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

Trap Net Catch

Black crappie was the most abundant species in the trap net catch (Table 3). Nine other species were also sampled.

Table 3. Total catch from twelve overnight trap net sets at Lake Thompson, Kingsbury County, August 1-3, 2011.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	610	68.4	50.8	±16.6	2.9	16	3	126
Common Carp	126	14.1	10.5	±4.2	5.9	34	11	108
Northern Pike	53	5.9	4.4	±2.2	2.4	64	13	87
Walleye	37	4.1	3.1	±1.4	8.5	59	3	87
Black Bullhead	31	3.5	2.6	±2.3	56.7	29	6	94
Smallmouth Bass	12	1.3	1.0	±0.6	0.7	33	17	108
White Bass	10	1.1	0.8	±0.4	0.0	100	0	100
Yellow Perch	9	1.0	0.8	±0.7	56.7	78	56	117
Bluegill	2	0.2	0.2	±0.1	0.0	--	--	--
Bigmouth Buffalo	2	0.2	0.2	±0.1	0.4	--	--	--

* 10 years (2001-2010)

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in Lake Thompson August 1-3, 2011.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Crappie	--	50.8	42.7	6.6	1.5	50.8	±16.6
Common Carp	0.1	10.4	6.8	2.4	1.2	10.5	±4.2
Northern Pike	--	4.4	1.6	2.2	0.6	4.4	±2.2
Walleye	0.7	2.4	1.0	1.3	0.1	3.1	±1.4
Black Bullhead	--	2.6	1.8	0.6	0.2	2.6	±2.3
Smallmouth Bass	--	1.0	0.6	0.2	0.2	1.0	±0.6
White Bass	--	0.8	--	0.8	--	0.8	±0.4
Yellow Perch	--	0.8	0.2	0.2	0.4	0.8	±0.7
Bluegill	--	0.2	--	--	0.2	0.2	±0.1
Bigmouth Buffalo	--	0.2	--	0.2	--	0.2	±0.1

Length categories can be found in Appendix A.

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE decreased in 2011 but is still above the management objective (Table 5). Age-4 fish were most abundant in the sample (Table 6). Gill-net CPUE of age-1+ walleyes was surprisingly high relative to the 2010 fall electrofishing CPH of age-0 fish and the 2011 CPH of age-1+ fish (Table 7). The electrofishing crew reported that newly flooded terrestrial vegetation and small trees made electrofishing difficult in 2010. Age-1+ walleyes have been observed to occupy flooded vegetation and this may have affected electrofishing efficiency again in 2011.

Walleye growth remains within previously observed ranges (Table 6) and condition (mean Wr) has varied little over the past 10 years (Table 5). Growth of age-4+ fish from the large 2007 year class was slower than with other year classes (Table 6). Age-3+ walleyes are already longer than their age-4+ counterparts.

Table 5. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for Lake Thompson, Kingsbury County, 2002-2011.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	31.7	22.8	16.0	34.0	26.0	26.5	12.8	21.8	45.0	28.4	28.6
PSD	49	27	24	38	22	33	27	1	13	41	27
RSD-P	4	8	4	3	1	2	3	0	1	1	3
Mean Wr	94	83	89	91	88	90	88	87	89	88	89

*10 years (2001-2010)

Table 6. Weighted mean length at capture (mm) for walleye captured in gill nets in Lake Thompson, Kingsbury County, 2003-2011. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size in parentheses.

Year	1	2	3	4	5	6	7	8	9	10	11	12
2011 (142)	253 (55)	328 (7)	400 (11)	385 (67)	402 (1)	--	--	--	514 (1)	--	--	--
2010 (114)	250 (11)	319 (18)	351 (83)	450 (1)	530 (1)	--	--	--	--	--	--	--
2009 (109)	213 (4)	278 (95)	360 (10)	--	--	--	--	--	--	--	--	--
2008 (64)	212 (30)	343 (24)	--	441 (7)	--	--	493 (2)	--	495 (1)	--	--	--
2007 (91)	282 (48)	331 (8)	410 (28)	438 (4)	--	409 (1)	--	654 (1)	630 (1)	--	--	--
2006 (100)	290 (4)	343 (83)	403 (4)	--	466 (3)	464 (6)	--	--	--	--	--	--
2005 (133)	260 (73)	350 (6)	370 (15)	419 (24)	409 (10)	433 (1)	427 (1)	626 (2)	617 (1)	--	--	--
2004 (88)	262 (5)	321 (17)	347 (38)	375 (19)	472 (5)	508 (1)	532 (1)	607 (1)	--	681 (1)	--	--
2003 (138)	245 (10)	312 (86)	372 (9)	453 (10)	497 (15)	508 (6)	600 (1)	599 (1)	--	--	--	--

A strong year class of walleyes was produced in 2011 (Table 7). Eight million walleye fry were stocked in 2011 and 50 percent of the stocked fry were marked with OTC. Marks were present on 13 of 51 fish examined indicating that 51% of 2011 year class was produced by the stocking. Size and condition of age-0 walleyes was at the low end of the range which is surprising given the rising water levels and flooded vegetation. Age-1 walleye CPH was low as expected based on the 2010 CPH of age-0 fish, but was in conflict with the strong gill net catch of age-1+ fish. Growth and condition were about average for Lake Thompson.

Table 7. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Thompson, Kingsbury County, 1999-2011.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2011	fry	187	49-324	51	140 (109-198)	90	7	0-18	274 (247-300)	83
2010	none	27	6-48		175 (135-199)	90	8	2-14	² (263-328)	
2009	none	8	0-22		150 (147-154)	113	3		231 (229-233)	83
2008	none	13	7-18		149 (137-161)	103	110	73-147	236 (182-277)	83
2007	none	214	134-294		148 (111-195)	87	2	0-4	332 (324-347)	84
2006	fry ¹	43	29-57	4	203 (167-236)	91	2	0-2	324 (317-328)	85
2005	none	5	2-8		197 (181-200)	104	50	34-67	289 (250-323)	88
2004	fry	290	132-447	74	131 (110-170)	93	2	1-3	283 (270-290)	85
2003	none	16	6-26		169 (158-181)	94	4	2-6	255 (232-271)	83
2002	none	78	42-114		154 (127-186)	104	13	4-21	260 (218-188)	87
2001	none	202	136-268		169 (129-216)	105	10	6-13	257 (245-269)	89
2000	none	231	117-345		153 (120-192)	93	52	38-66	238 (203-290)	83
1999	none	155	99-211							

¹ Stocked with 17,935 large fingerlings (5.0/lb) after electrofishing was completed.

² Only the smallest and largest age-1 individuals were measured to provide a range of lengths.

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 30 and a PSD range of 30-60.

Yellow perch gill-net CPUE increased to just below the management objective (Table 8). The population age structure shows the largest year class since 2001 was produced in 2010 (Table 9). Two age-10 and ten age-7 fish were caught this year (Table 9). Lake Thompson yellow perch are always in excellent condition (Table 8) and grow very quickly reaching 254 mm (10 in) at age-3 (Table 9).

Table 8. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 2002-2011.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	54.7	6.5	16.3	7.3	3.3	4.0	2.8	3.8	12.0	29.0	15.6
PSD	20	87	89	76	100	100	57	95	69	62	76
RSD-P	7	3	36	59	54	50	50	11	50	28	35
Mean Wr	117	110	112	107	112	122	117	119	112	111	115

*10 years (2001-2010)

Table 9. Weighted mean length at capture (mm) for yellow perch captured in gill nets in Lake Thompson, Kingsbury County, 2003-2010. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size in parentheses.

Year	1	2	3	4	5	6	7	8	9	10
2011 (145)	175 (54)	230 (46)	260 (2)	268 (31)	--	--	272 (10)	--	--	332 (2)
2010 (36)	168 (11)	--	250 (21)	266 (3)	310 (1)	--	--	--	--	--
2009 (19)	--	224 (18)	--	280 (1)	--	--	--	--	--	--
2008 (14)	156 (6)	--	241 (1)	276 (4)	303 (1)	--	308 (2)	--	--	--
2007 (12)	--	--	246 (5)	248 (3)	--	280 (4)	--	--	--	--
2006 (13)	--	224 (5)	--	--	272 (8)	--	--	--	--	--
2005 (29)	167 (6)	213 (3)	243 (1)	268 (18)	259 (1)	--	--	--	--	--
2004 (100)	153 (11)	--	243 (80)	263 (5)	288 (2)	261 (2)	--	--	--	--
2003 (39)	--	216 (35)	243 (4)	--	--	--	--	--	--	--

Black Crappie

Black crappie CPUE increased to record levels (Table 10) due to a large year class most likely produced in 2010. The crappies sampled ranged between 140 and 320 mm (5.5 and 12.6in) (Figure 3) and Wr increased to 126 which is above the 10-year mean. Larger individuals (>30 cm (12 in)) had lower relative weights.

Table 10. Black crappie trap-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 2002-2011.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	13.0	1.3	1.4	2.5	0.8	1.1	1.8	0.1	1.8	50.8	2.9
PSD	18	100	97	100	--	100	100	--	100	16	89
RSD-P	16	22	19	100	--	92	65	--	95	3	60
Mean Wr	125	114	92	107	--	106	103	--	93	126	108

*10 years (2001-2010)

Northern Pike

Northern pike CPUE increased significantly in 2011 (Table 11). However, the length range and mean length were unchanged indicating that few young fish have been recently recruited to the population (Figure 4). The mean length of sampled fish was 606 mm (23.8 in) in 2010 and 584 mm (23.0) in 2011 (Figure 4). The northern pike population size structure has always been excellent in Lake Thompson. Condition (mean Wr) was above average (Table 11).

Table 11. Northern pike trap-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 2002-2011.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean*
CPUE	4.0	5.1	0.9	4.7	0.8	0.5	1.3	1.1	1.4	4.4	2.4
PSD	82	28	--	96	--	--	93	85	67	64	78
RSD-P	28	19	--	38	--	--	64	46	33	13	33
Mean Wr	84	72	--	80	--	--	76	75	83	87	80

*10 years (2001-2010)

All Species

Bluegills were sampled for the first time in 2011 (Table 12). CPUE for all other species was within previously observed ranges (Table 12).

Table 12. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Thompson, Kingsbury County, 2002-2011.

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SPS (GN)	1.0	--	3.0	--	0.8	0.5	--	3.2	--	0.4
SPS (TN)	--	--	--	--	--	--	--	--	--	--
COC (GN)	5.0	0.7	0.7	4.0	10.5	7.3	3.8	3.2	1.3	6.0
COC (TN)	4.2	5.1	5.8	3.7	4.2	13.7	7.5	0.7	9.5	10.5
WHS (GN)	0.3	0.2	--	0.8	0.3	--	--	--	0.3	--
WHS (TN)	0.3	--	0.3	0.5	--	--	0.3	0.2	--	--
BIB (GN)	--	--	--	--	--	0.3	2.0	0.2	--	--
BIB (TN)	--	--	--	--	--	0.2	0.4	1.8	1.7	0.2
BLB (GN)	141.7	154.5	10.8	--	--	--	--	--	--	0.2
BLB (TN)	292.4	122.1	4.0	2.3	0.7	0.1	--	--	0.1	2.6
NOP (GN)	1.7	0.8	0.8	0.3	1.5	--	0.2	0.4	0.7	2.8
NOP (TN)	4.0	5.1	0.9	4.7	0.8	0.5	1.3	1.1	1.4	4.4
WHB (GN)	--	--	--	--	0.3	--	--	3.2	1.0	0.8
WHB (TN)	--	--	--	--	--	--	--	--	--	0.8
BLG (GN)	--	--	--	--	--	--	--	--	--	--
BLG (TN)	--	--	--	--	--	--	--	--	0.1	0.2
SMB (GN)	1.7	0.3	0.2	0.8	0.3	0.3	--	--	--	--
SMB (TN)	1.8	2.0	0.3	0.2	0.4	0.4	0.3	0.8	0.4	1.0
BLC (GN)	4.3	0.3	0.8	0.5	1.0	0.3	--	0.2	0.7	22.8
BLC (TN)	13.0	1.3	1.4	2.5	0.8	1.1	1.8	0.1	1.8	50.8
YEP (GN)	54.7	6.5	16.3	7.3	3.3	4.0	2.8	3.8	12.0	29.0
YEP (TN)	0.4	0.3	--	--	--	--	0.1	--	--	0.8
WAE (GN)	31.7	22.8	16.0	34.0	26.0	26.5	12.8	21.8	45.0	28.4
WAE (TN)	7.3	6.9	1.6	26.5	1.2	3.5	14.1	9.0	9.9	3.1

SPS (Spottail Shiner), COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), NOP (Northern Pike), WHB (White Bass), BLG (Bluegill), SMB (Smallmouth Bass), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor general fish populations in Lake Thompson with annual netting surveys and conduct fall electrofishing surveys to monitor walleye recruitment.
2. Stock walleye fry when fall electrofishing indicates failed natural reproduction.

Table 13. Stocking record for Lake Thompson, Kingsbury County, 1991-2011.

Year	Number	Species	Size
1991	283	Walleye	Adult
	52,038	Largemouth Bass	Sml. Fingerling
	10,850	Largemouth Bass	Med. Fingerling
	30,000	Smallmouth Bass	Fingerling
	160	Gizzard Shad	Adult
1995	60,000	Largemouth Bass	Fingerling
	100,000	Smallmouth Bass	Fingerling
1996	99,270	Largemouth Bass	Fingerling
	151,870	Smallmouth Bass	Fingerling
2004	10,000,000	Walleye	Fry
2006	6,250,000	Walleye	Fry
	17,935	Walleye	Lrg. Fingerling
2011	8,000,000	Walleye	Fry

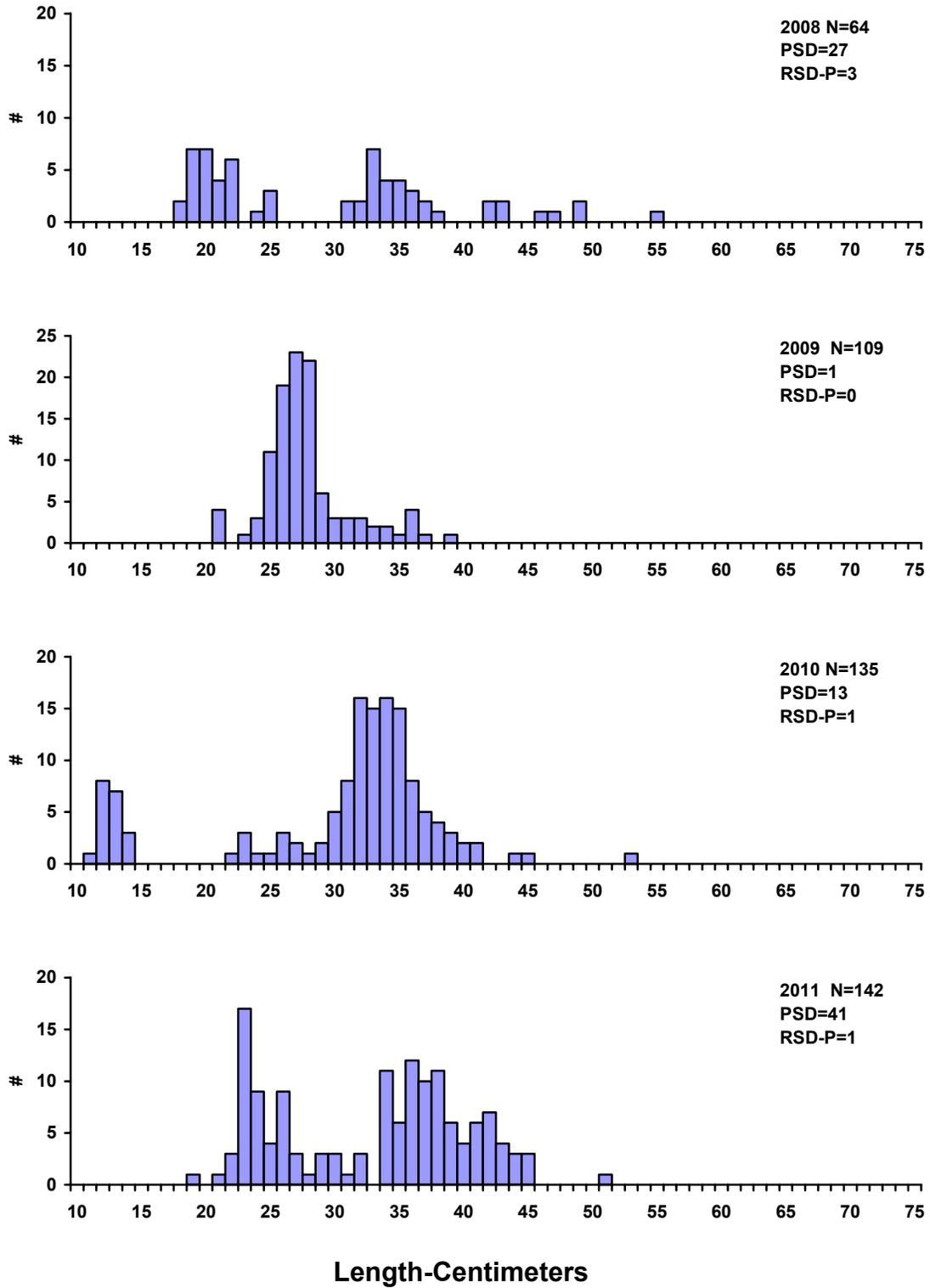


Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Thompson, Kingsbury County, 2008-2011.

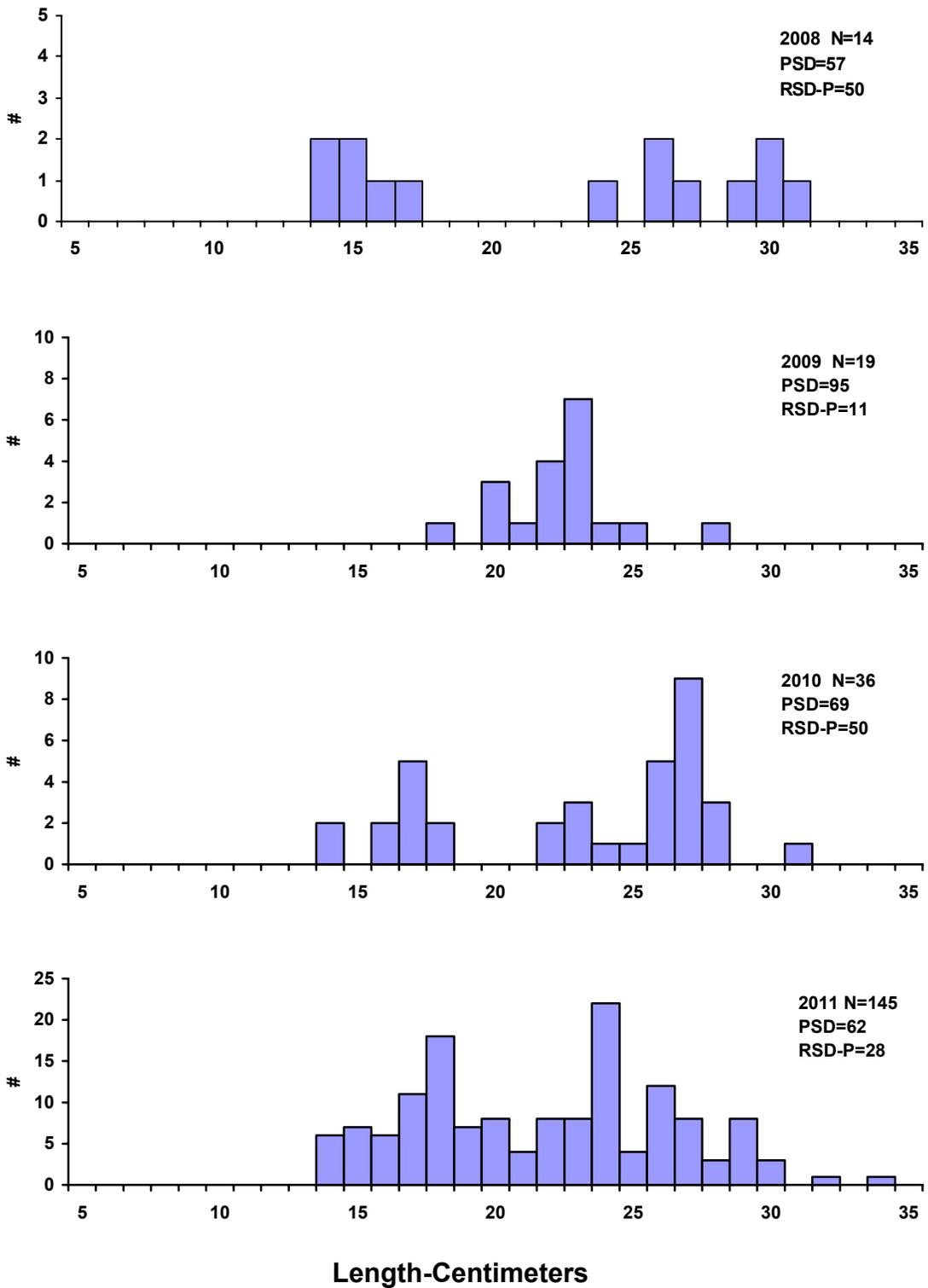


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Thompson, Kingsbury County, 2008-2011.

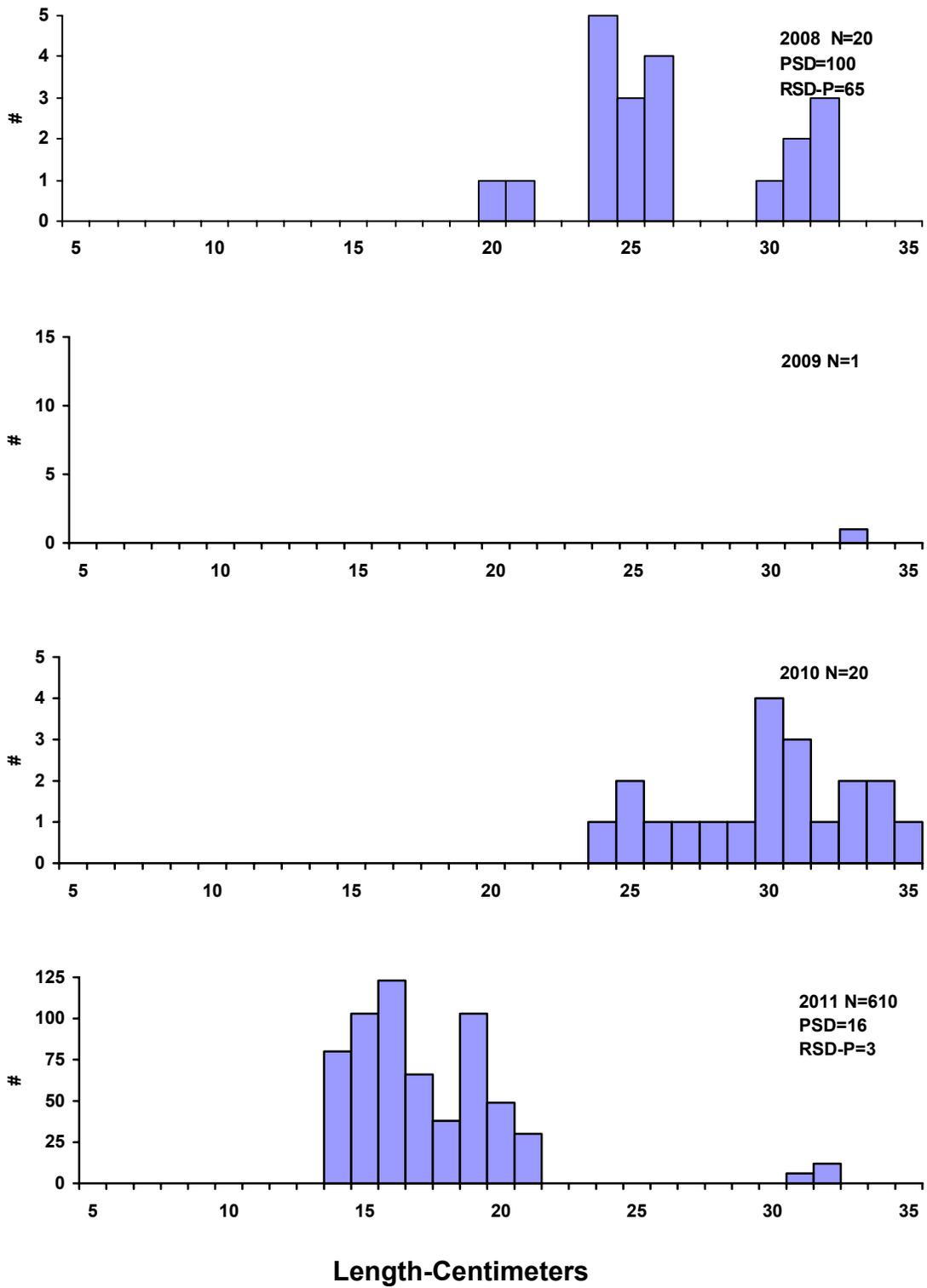


Figure 3. Length frequency histograms for black crappies sampled with trap nets in Lake Thompson, Kingsbury County, 2008-2011.

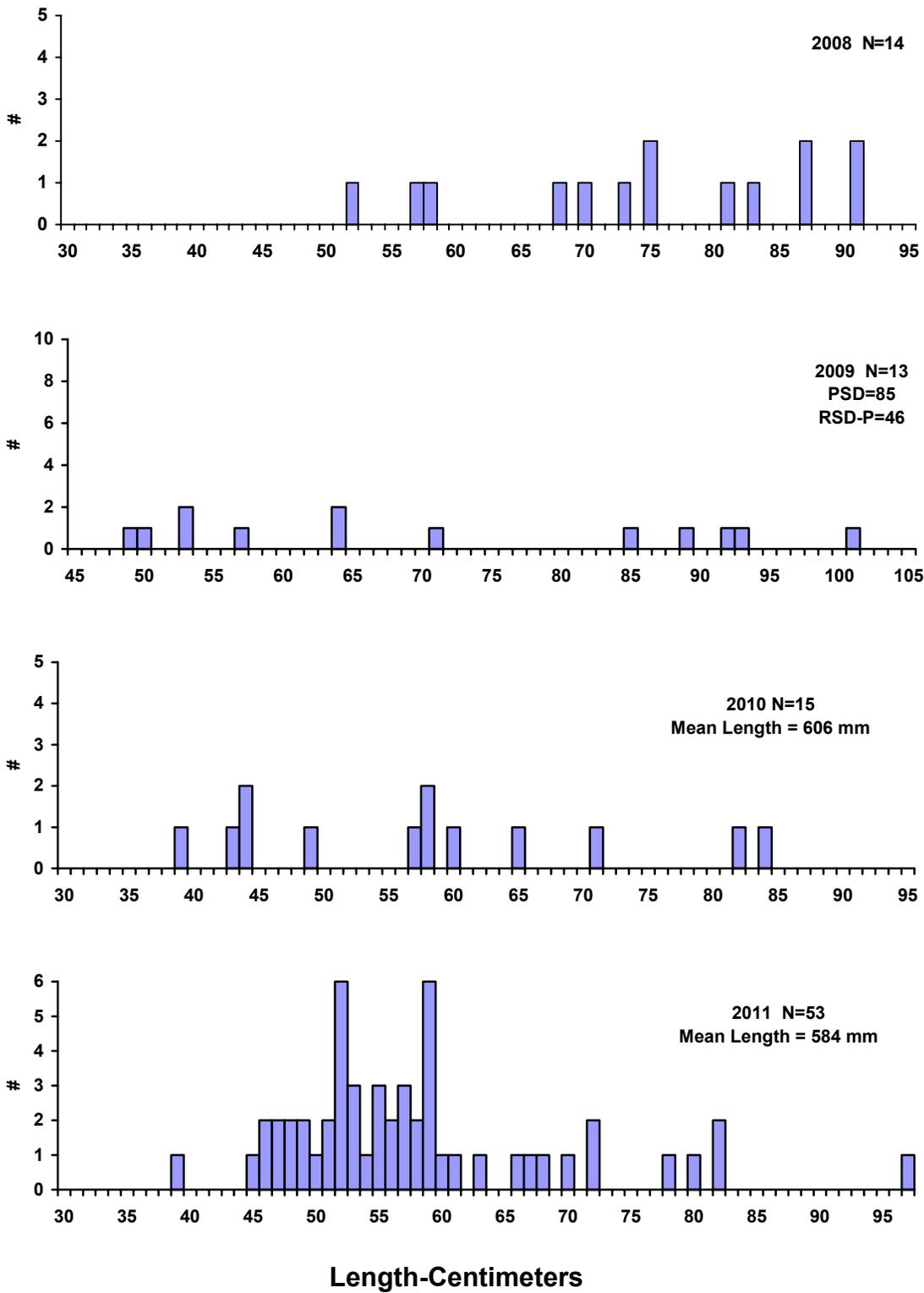


Figure 4. Length frequency histograms for northern pike sampled with trap nets in Lake Thompson, Kingsbury County, 2008-2011.

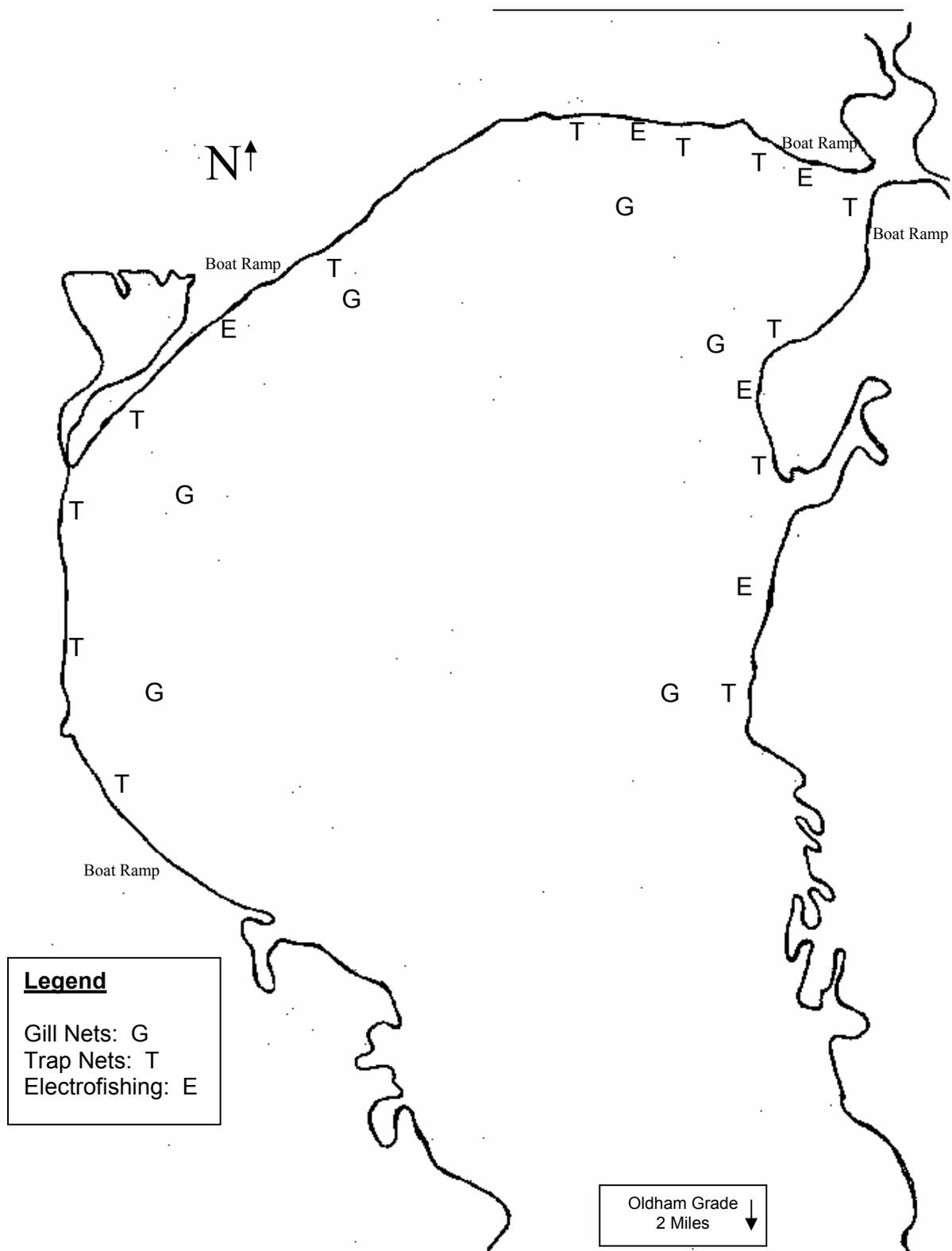


Figure 5. Sampling locations on Lake Thompson, 2011.

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.

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.