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

Figure 1. Lake Madison, Lake County

Legal Description: T106-R51, 52-Sec. 21-23, 25-27, 29, 30-32
Location from nearest town: 5 miles southeast of Madison, SD

Surface Area: 2,642 acres
Meandered (Y/N): Yes
OHWM elevation: 1603.7
Outlet elevation: 1603.2
Max. depth at outlet elevation: 16 feet
Observed water level: Full
Contour map available: Yes

Watershed area: 29,191 acres
Shoreline length: 15.7 miles
Date set: November, 1980
Date set: November, 1980
Mean depth at outlet elevation: 8 feet
Lake volume: 27,153 acre feet
Date mapped: 2002

DENR beneficial use classifications: (4) warm water permanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering

Introduction

General

Lake Madison is the second in a chain of four natural lakes (Herman, Madison, Round and Brant) formed by receding glacial ice. It was named for the 1875 town of Madison, originally located on the south shore of the lake. William Van Eps, the surveyor who platted the original town, named it Madison because he thought it resembled his hometown of Madison, Wisconsin.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Madison is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. GFP also owns and manages access areas on the south, west and north shores of the lake. The remainder of the shoreline property is privately owned.

Fishing Access

The Payne Access Area on the west side of Lake Madison has a double lane boat ramp, boat dock, public toilet and excellent shore fishing access. The Johnson Point Access Area on the north side of the lake has a double wide boat ramp, boat dock, public toilet, a handicapped-accessible fishing dock and excellent shore fishing access. The Stratton Access Area is located on the north shore of the lake and offers limited shore fishing opportunity. The Walker's Point Recreation Area on the south shore of the lake offers a double wide boat ramp, boat dock, fish cleaning station, public toilets, and camping facilities with electric hookups as well as excellent shore fishing areas.

Water Quality and Aquatic Habitat

The Secchi depth measurement in Lake Madison this year was 0.91 m (36 in) (Table 1). Some sago pondweed and clasping-leaf pondweed was observed during the survey.

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

Year	*Water Temp ^{o}C (^{o}F)*	*Secchi Depth cm (in)*	*Observations/Comments (algae, aquatic vegetation, water quality, etc.)*
2014	26 (78)	91 (36)	Small amount of sago pondweed
2013	27 (80)	104 (41)	Sparse sago pondweed
2012	28 (82)	79 (31)	Sago pondweed
2011	29 (85)	244 (96)	Sparse sago and clasping leaf pondweed
2010	-- (--)	86 (34)	Algae bloom
2009	25 (77)	135 (53)	Algae bloom, sparse sago
2008	29 (84)	100 (39)	Algae bloom, no aquatic vegetation
2007	26 (79)	229 (90)	No aquatic vegetation
2006	26 (79)	135 (53)	Blue green algae bloom, little sago
2005	23 (74)	69 (27)	No aquatic vegetation

Fish Community

Lake Madison contains a diverse fish community comprised of many different species (Table 2). Except for walleyes, these populations are almost entirely maintained by natural reproduction. Panfish abundance has been highly variable with extended periods of low and high abundance. Although nine fish kills have been documented since 1997 (Table 3), they did not seem to significantly affect game fish abundance.

Table 2. Fish species commonly found in Lake Madison, Lake County.

Game Species	***Other Species***
Walleye	Common Carp
Yellow Perch	White Sucker
Northern Pike	Bigmouth Buffalo
Black Crappie	Spottail Shiner
White Bass	
Bluegill	
Smallmouth Bass	
Channel Catfish	
Black Bullhead	
Green Sunfish	
Hybrid Sunfish	

Fish Management

Walleye reproduction is sporadic in Lake Madison and the population is maintained by frequent fingerling stockings (Table 4). Small walleyes were protected under a 35.6 cm (14 inch) minimum length limit (MLL) from 1992 through 1999; however, stockpiling of small fish and subsequent slow growth under the MLL prompted removal of this regulation in 2000. Survival of stocked walleyes to fall age-0 is typically good, but return of fish to the angler has at times been disappointing. Panfish grow quickly in Lake Madison, but are short-lived which creates highly variable fisheries.

Table 3. Fish kill history for Lake Madison, Lake County.

Year	***Severity***	***Comments***
2014	Light	Aeromonas infection; only affected age-1 BLB and BIB
2012	Light	7/23/12 – West end – algae bloom; BLB, WAE, YEP, BLC, WHS dead
2011	Light	Minor fall kill in various locations; dead BLC observed
2008	Light	Winterkill- all species found alive; all species killed
2007	Moderate	7/11/07 – Harbor – algae bloom; small fish, multiple species
2006	Moderate	7/5/06 – Peninsula Bay – algae; small fish, multiple species
2003	Light	7/27/03 – Hilde's Marina – algae; multiple species
2001	Moderate	8/10/01 – Marr's Beach – algae; WAE, BLB, misc. species
1998	Moderate	Late May – Aeromonas infection; BLB killed
1997	Light	Light kill of mostly carp

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

Year	*Number*	*Species*	*Size*
2005	264,200	Walleye	Small Fingerling
2007	264,440	Walleye	Small Fingerling
	187,000	Yellow Perch	Fingerling
2008	218,020	Walleye	Small Fingerling
2010	280,320	Walleye	Small Fingerling
2011	35,200	Northern Pike	Fry
	70,000	Walleye	Fry
2013	280,150	Walleye	Small Fingerling
2014	196,200	Walleye	Small Fingerling

Methods

Lake Madison was sampled on July 21-23, 2014 with five overnight gill-net sets and 10 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. Madison was also electrofished for two hours the night of September 1, 2014 to evaluate walleye recruitment.

Results and Discussion

Net Catch Results

Black bullheads comprised 50% of the gill net catch followed by yellow perch, white sucker and walleyes (Table 4). Nearly all fish sampled in gill nets were stock length and longer (Table 5), except for walleyes which were split between substock and stock size fish.

Black bullheads dominated the trap net catch (Table 6). Non-game species including common carp and bigmouth buffalo were also abundant in the trap net catch. Most fish captured were stock length and longer (Table 7). Catch of panfish was low again in 2014 relative to 2010 through 2012 (Table 8).

Table 4. Total catch from five overnight gill nets set in Lake Madison, Lake County, July 21-23, 2014.

Species	*#*	*%*	*CPUE*[1]	*80% C.I.*	*Mean CPUE**	*PSD*	*RSD-P*	*Mean Wr*
Black Bullhead	320	50.0	64.0	±35.4	15.1	22	11	--
Yellow Perch	121	18.9	24.2	±3.4	87.1	3	2	105
White Sucker	100	15.6	20.0	±2.1	13.9	38	26	--
Walleye	68	10.6	13.6	±3.4	16.7	89	11	85
Bigmouth Buffalo	12	1.9	2.4	±1.3	1.6	--	--	--
Common Carp	8	1.3	1.6	±0.7	1.3	--	--	--
White Bass	4	0.6	0.8	±0.5	0.4	--	--	--
Smallmouth Bass	3	0.5	0.6	±0.8	0.4	--	--	--
Black Crappie	1	0.2	0.2	±0.3	3.4	--	--	--
Northern Pike	1	0.2	0.2	±0.3	0.3	--	--	--
Channel Catfish	1	0.2	0.2	±0.3	0.0	--	--	--
Spottail Shiner	1	0.2	0.2	±0.3	0.0	--	--	--

*10 years (2005-2014)

Table 5. CPUE by length category for selected species sampled with gill nets in Lake Madison, Lake County, July 21-23, 2014.

Species	*Substock*	*Stock*	*S-Q*	*Q-P*	*P+*	*All sizes*	*80% C.I.*
Black Bullhead	0.6	63.4	49.2	7.4	6.8	64.0	±35.4
Yellow Perch	--	24.2	23.4	0.4	0.4	24.2	±3.4
White Sucker	--	20.0	12.4	2.4	5.2	20.0	±2.1
Walleye	6.6	7.0	0.8	5.4	0.8	13.6	±3.4
Bigmouth Buffalo	1.6	0.8	0.8	--	--	2.4	±1.3
Common Carp	--	1.6	1.6	--	--	1.6	±0.7
White Bass	--	0.8	--	--	0.8	0.8	±0.5
Smallmouth Bass	--	0.6	0.4	--	0.2	0.6	±0.8
Black Crappie	--	0.2	0.2	--	--	0.2	±0.3
Northern Pike	--	0.2	--	0.2	--	0.2	±0.3
Channel Catfish	--	0.2	--	--	0.2	0.2	±0.3
Spottail Shiner*	--	--	--	--	--	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, RSD, RSD-P and mean Wr.

Table 6. Total catch from 10 overnight trap nets set in Lake Madison, Lake County, July 21-23, 2014.

Species	*#*	*%*	*CPUE*	*80% C.I.*	*Mean CPUE**	*PSD*	*RSD-P*	*Mean Wr*
Black Bullhead	3,049	85.5	304.9	±218.9	58.7	25	16	--
Common Carp	177	5.0	17.7	±13.5	6.9	8	7	--
Bigmouth Buffalo	112	3.1	11.2	±7.3	8.2	66	10	--
Bluegill	86	2.4	8.6	±5.1	3.5	6	2	123
Smallmouth Bass	55	1.5	5.5	±5.7	1.0	0	0	100
Walleye	23	0.6	2.3	±1.3	3.3	--	--	--
Yellow Perch	22	0.6	2.2	±1.4	31.9	9	0	93
Black Crappie	21	0.6	2.1	±1.3	12.1	14	14	107
White Sucker	8	0.2	0.8	±0.5	8.9	--	--	--
Hybrid Sunfish	8	0.2	0.8	±0.5	0.3	--	--	--
Green Sunfish	4	0.1	0.4	±0.3	1.1	--	--	--
Northern Pike	2	0.2	0.2	±0.2	0.4	--	--	--

*10 years (2005-2014)

Table 7. CPUE by length category for selected species sampled with trap nets in Lake Madison, Lake County, July 21-23, 2014.

Species	*Substock*	*Stock*	*S-Q*	*Q-P*	*P+*	*All sizes*	*80% C.I.*
Black Bullhead	3.0	301.9	225.9	27.3	48.7	304.9	±218.9
Common Carp	1.1	16.6	15.2	0.2	1.2	17.7	±13.5
Bigmouth Buffalo	3.2	8.0	2.4	3.3	2.3	11.2	±7.3
Bluegill	--	8.6	8.1	0.3	0.2	8.6	±5.1
Smallmouth Bass	2.0	3.5	3.5	--	--	5.5	±5.7
Walleye	2.0	0.3	0.2	0.1	--	2.3	±1.3
Yellow Perch	--	2.2	2.0	0.2	--	2.2	±1.4
Black Crappie	--	2.1	1.8	--	0.3	2.1	±1.3
White Sucker	--	0.8	0.4	--	0.4	0.8	±0.5
Hybrid Sunfish*	--	--	--	--	--	0.8	±0.5
Green Sunfish	--	0.4	0.3	0.1	--	0.4	±0.3
Northern Pike	--	0.2	--	0.1	0.1	0.2	±0.2

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

Table 8. Gill-net (GN) and trap-net (TN) CPUE for selected fish species sampled in Lake Madison, Lake County, 2005-2014.

Species	*Gear*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Bigmouth	GN	3.8	5.0	0.5	2.2	0.2	0.7	--	1.3	--	2.4
Buffalo	TN	7.5	20.5	7.2	6.1	11.1	4.1	4.5	6.3	3.6	11.2
Black	GN	0.7	8.0	4.5	2.0	2.7	6.3	26.8	19.7	15.8	64.0
Bullhead	TN	5.4	3.0	53.5	8.9	5.5	28.7	78.0	74.6	24.0	304.9
Black	GN	3.2	2.5	9.5	5.2	0.2	2.3	10.8	--	--	0.2
Crappie	TN	31.5	8.9	14.2	18.0	3.3	7.4	27.2	8.3	0.1	2.1
	GN	--	--	0.3	--	--	0.3	1.0	0.3	--	--
Bluegill	TN	4.6	6.1	1.0	0.9	0.1	7.7	3.9	1.4	0.7	8.6
Channel	GN	--	--	--	--	--	--	--	--	--	0.2
Catfish	TN	0.1	--	0.6	0.1	--	--	0.1	--	--	--
Common	GN	1.7	2.0	2.8	0.7	0.3	--	2.5	0.3	1.0	1.6
Carp	TN	4.8	6.1	12.5	5.0	3.2	2.0	2.3	8.2	6.7	17.7
Green	GN	--	--	0.3	--	--	--	0.3	--	0.2	--
Sunfish	TN	0.2	1.0	0.9	0.6	--	5.5	2.5	--	0.2	0.4
Hybrid	GN	--	--	--	--	--	--	--	--	--	--
Sunfish	TN	--	0.5	0.3	--	0.1	--	--	--	0.8	0.8
Northern	GN	--	--	0.3	0.8	0.2	--	0.3	0.7	--	0.2
Pike	TN	0.1	--	0.1	0.3	1.2	--	0.5	0.9	0.4	0.2
Smallmouth	GN	--	1.5	1.8	--	--	--	--	--	--	0.6
Bass	TN	--	2.1	1.6	--	--	0.2	0.2	0.1	0.1	5.5
Spottail	GN	--	--	--	--	0.2	--	--	--	--	0.2
Shiner	TN	--	--	--	--	--	--	--	--	--	--
	GN	10.7	14.3	17.3	5.8	16.8	29.0	24.5	24.7	9.8	13.6
Walleye	TN	1.0	2.1	1.0	2.4	1.7	0.5	3.8	17.8	0.2	2.3
White	GN	--	--	--	--	--	--	1.5	0.7	1.2	0.8
Bass	TN	--	--	--	--	0.2	0.1	0.3	5.2	0.2	--
White	GN	22.5	6.8	8.5	12.2	18.0	9.0	15.8	15.0	11.6	20.0
Sucker	TN	74.2	1.5	0.7	1.2	0.7	0.2	2.3	5.6	2.2	0.8
Yellow	GN	30.7	17.5	115.3	101.3	18.3	162.3	265.8	130.0	6.0	24.2
Perch	TN	1.2	0.4	8.5	32.2	1.5	165.9	100.9	5.5	0.6	2.2

Walleye

Management Objective

- maintain a walleye population with a total gill-net CPUE of at least 15

Management Strategies

- stock small walleye fingerlings at the rate of 70/acre (184,940) as needed to achieve the management objective
- mark all or a percentage of stocked small fingerlings to allow evaluation
- electrofish in the fall to sample age-0 and age-1 walleye abundance

Walleye gill-net CPUE increased to just below the management objective (Table 9). Age-1+ fish comprised about half of the catch and most of the remaining fish originated from the strong 2010 and moderate 2011 year classes (Table 11). Contribution from the 2011 year class, which originated in part (47%) from a small experimental fry-stocking into Bourne Slough, has been surprisingly strong (Tables 10, 11 and 12). Most of these fish are 38-50 cm (15-20 in, Figures 2 and 3) and provided a good fishery during the summer of 2014.

A moderate year class was produced by the 2013 small fingerling stocking (Table 9). Oxytetracycline (OTC) marks were present on 29 of 50 fish examined indicating a 58% contribution by the stocking. Naturally-produced walleyes were slightly larger than stocked fish, but the difference was not significant. Age-0 fish were relatively large and in good condition. No age-1 walleyes were sampled which wasn't surprising given the weak natural reproduction in 2012.

Another moderate year class was produced in 2014. OTC marks were present on all of the 61 fish examined indicating a 100% stocking contribution. Age-0 fish were shorter than average, but in excellent condition. Age-1 walleyes were abundant indicating excellent overwinter survival of fish from the moderately-strong 2013 year class. Age-1 fish grew slowly averaging only 217 mm (8.5 inches) in length at the end of their second year of growth. Condition (Wr) was average for yearling fish.

Table 9. CPUE, PSD, RSD-P, and mean Wr for all walleyes sampled with gill nets in Lake Madison, Lake County, 2005-2014. Stocked years are shaded.

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
CPUE	10.7	14.3	17.3	5.8	16.8	29.0	24.5	24.7	9.8	13.6
PSD	6	23	25	93	15	39	49	6	48	89
RSD-P	2	4	0	7	2	0	10	3	0	11
Mean Wr	79	88	89	86	89	91	87	77	100	85

Table 10. Walleyes stocked into Lake Madison, Lake County, 2005-2014.

Year	***Number***	***Size***
2005	264,200	Small Fingerling
2007	264,440	Small Fingerling
2008	218,020	Small Fingerling
2010	280,320	Small Fingerling
2011	70,000	Fry
2013	280,150	Small Fingerling
2014	196,200	Small Fingerling

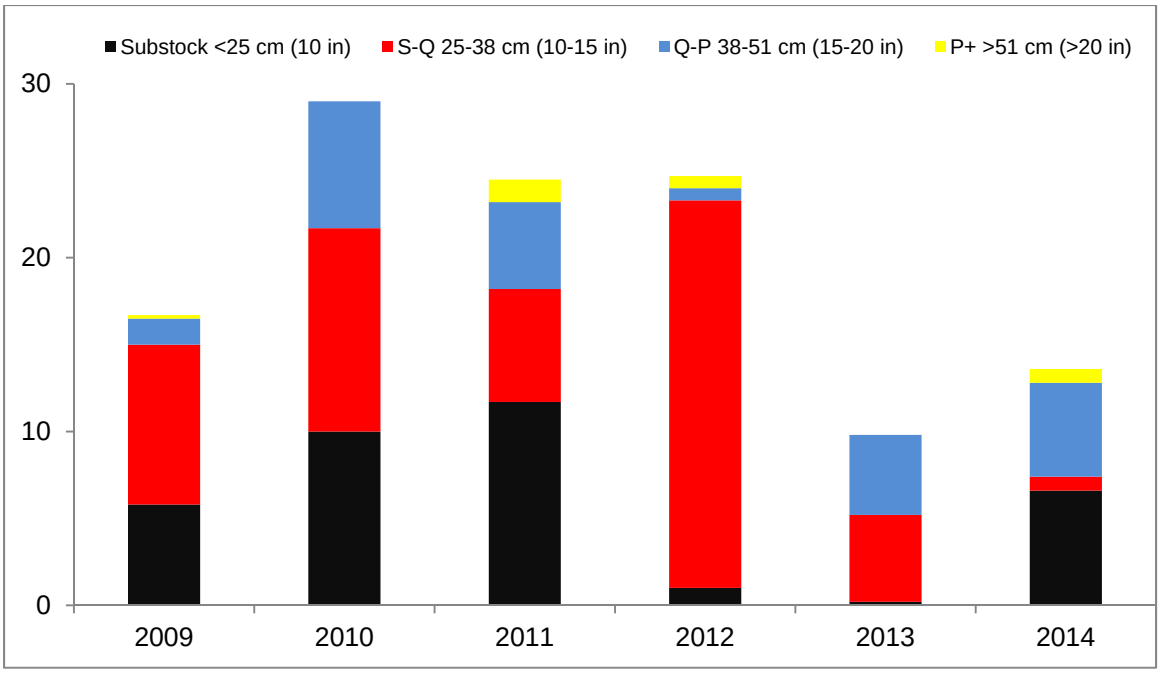

Figure 2. CPUE by length category for walleye sampled with gill nets in Lake Madison, Lake County, 2009-2014.

Table 11. Weighted mean length at capture (mm) for walleyes sampled with gill nets in Lake Madison, Lake County, 2005-2014. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size is in parentheses.

Year	*Age-1*	*Age-2*	*Age-3*	*Age-4*	*Age-5*	*Age-6*	*Age-7*	*Age-8*	*Age-9*	*Age-10*	*Age-11*
2014 (68)	206 (37)	411 (1)	435 (8)	462 (19)	496 (1)	558 (2)	--	--	--	--	--
2013 (48)	--	333 (7)	386 (41)	--	--	--	--	--	--	--	--
2012 (74)	250 (8)	303 (63)	--	515 (2)	536 (1)	--	--	--	--	--	--
2011 (98)	245 (73)	401 (6)	449 (8)	493 (11)	--	--	--	--	--	--	--
2010 (57)	312 (12)	369 (37)	424 (7)	--	470 (1)	--	--	--	--	--	--
2009 (97)	240 (45)	324 (49)	--	506 (1)	--	548 (2)	--	--	--	--	--
2008 (35)	208 (21)	--	436 (9)	--	482 (5)	--	--	--	--	--	--
2007 (43)	--	360 (32)	376 (3)	457 (8)	--	--	--	--	--	--	--
2006 (57)	264 (44)	342 (1)	400 (10)	--	--	590 (1)	--	--	--	615 (1)	--
2005 (64)	257 (1)	306 (49)	337 (13)	--	--	--	--	620 (1)	--	--	--

Table 12. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Madison, Lake County, 2005-2014.

Year	*Stocking*	*Age-0 CPH*	*% stocked*	*Mean length (range; mm)*	*Wr*	*Age-1 CPH*	*Mean length (range; mm)*	*Wr*
2014	fingerling	32	100	146 (127-172)	93	60	217 (186-258)	84
2013	fingerling	112	76	153 (110 -205)	79	0		
2012	none	3		187 (176-200)	105	15	262 (243-274)	86
2011	none	28	47[3]	143 (115-167)	96	125	260 (211-310)	82
2010	fingerling	710	100	186 (152-216)	101	0		
2009	none	27		199 (140-222)	105	8	307 (292-319)	94
2008	fingerling	347	[2]	145 (119-183)	95	19	251 (216-281)	83
2007	fingerling	378	81[1]	150 (109-196)	87	0		
2006	none	4		199 (185-210)	109	10	309 (289-333)	101
2005	fingerling	128	100	158 (126-227)	90	0		

[1] Fingerlings marks (Madison stocking) were present on 71% of samples and fry marks (Herman stocking) were present on 10% of samples.

[2] Stocked fingerlings were not marked in 2008; however, approximately a third of the Madison sample exhibited faint fry marks indicating contribution from Lake Herman stocked walleye fry.

[3] About 70,000 walleye fry were stocked into Bourne Slough as part of an SDSU graduate study to evaluate the use of stocking walleye and pike into carp rearing area to control carp production.

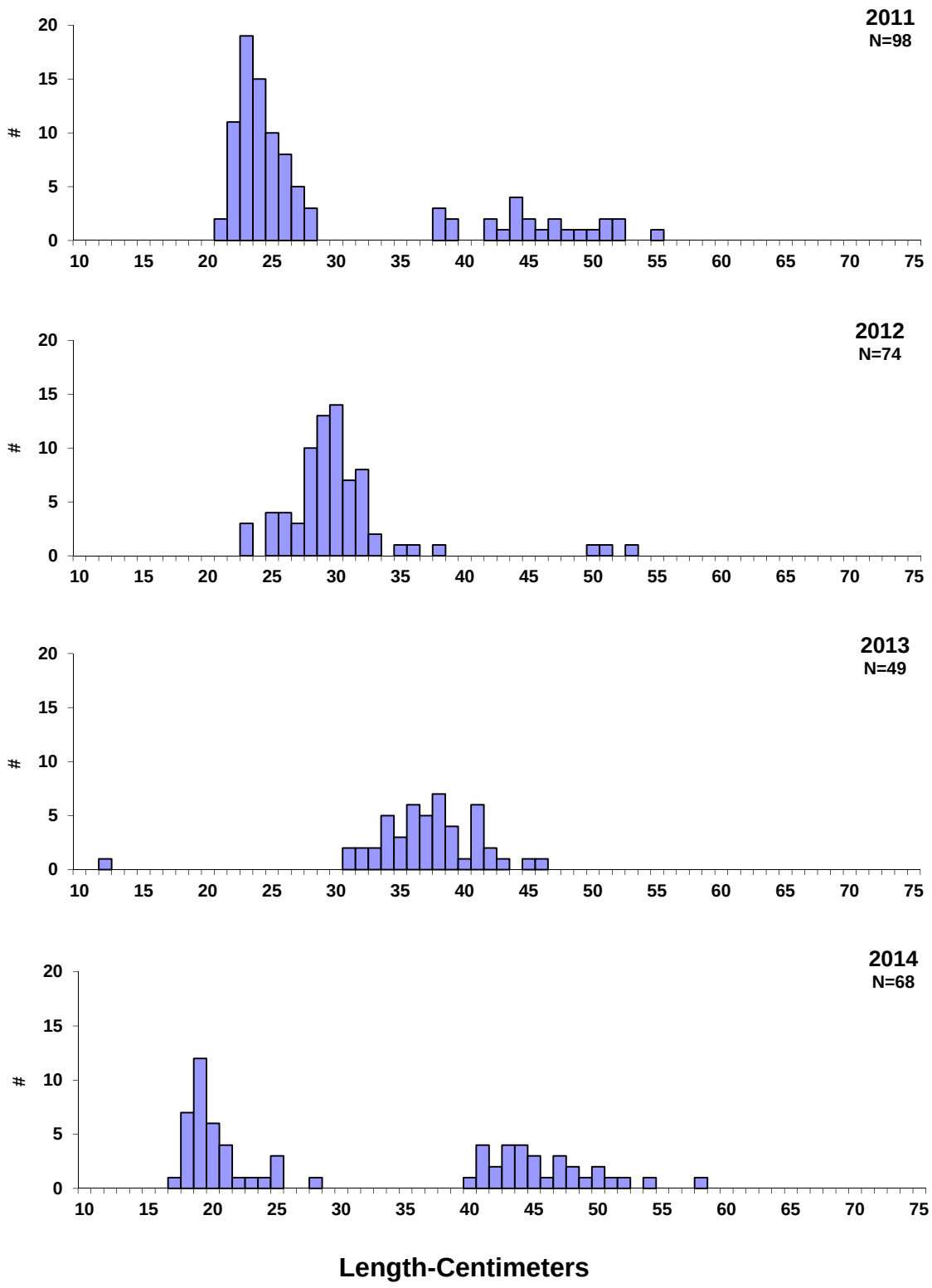

Figure 3. Length frequency histograms for walleye sampled with gill nets in Lake Madison, Lake County, 2011-2014.

Yellow Perch

Management Objective

- none

Management Strategy

- monitor the yellow perch population during annual lake surveys and report the results

Yellow perch gill net CPUE improved in 2014 (Table 13). The majority of perch sampled were age-1+ and naturally-produced in 2013 (Table 14 and Figure 4). These fish should be recruited into the fishery in 2015. Fall small-mesh gill netting and beach seining, done to evaluate gear for sampling age-0 perch, indicated low natural reproduction in Lake Madison and several other Region III lakes this year. A strong year class is needed to return the perch population and fishery to pre-2013 levels (Table 13).

Table 13. CPUE, PSD, RSD-P, and mean Wr for all yellow perch sampled with gill nets in Lake Madison, Lake County, 2005-2014. Stocked years are shaded.

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
CPUE	30.7	17.5	115.3	101.3	18.3	162.3	265.8	130.0	6.0	24.2
PSD	94	49	10	25	89	34	4	87	17	3
RSD-P	47	19	5	3	11	25	1	12	3	2
Mean Wr	96	104	109	109	114	105	100	91	111	105

Table 14. Yellow perch stocked into Lake Madison, Lake County, 2005-2014.

Year	***Number***	***Size***
2007	187,000	Fingerling

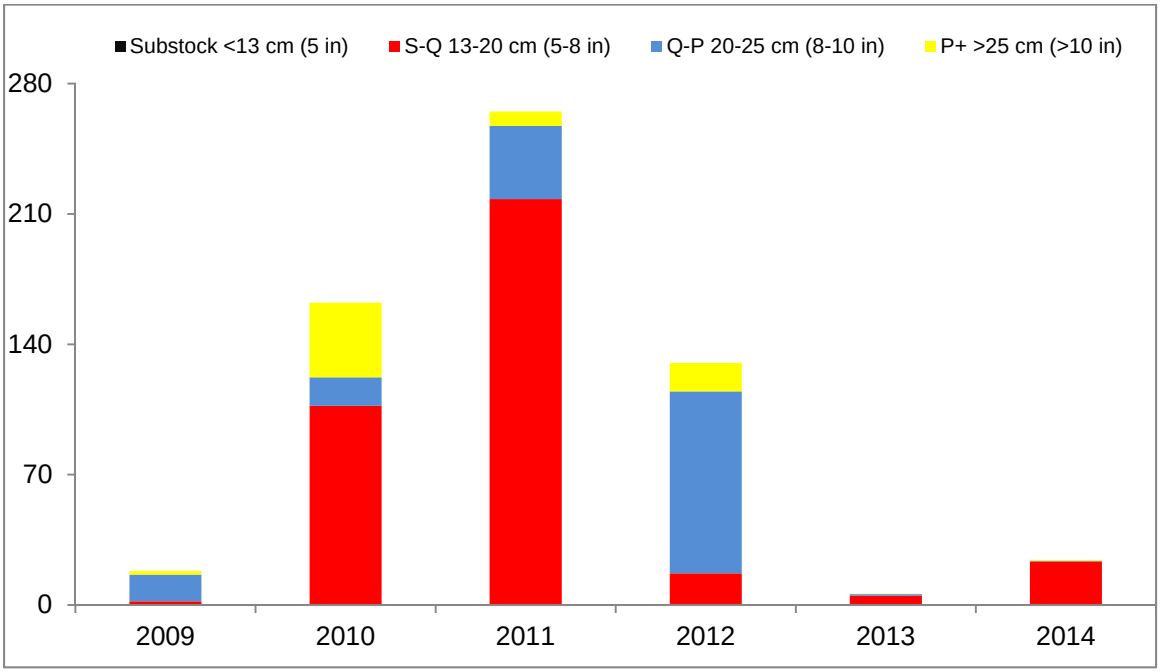

Figure 4. CPUE by length category for yellow perch sampled with gill nets in Lake Madison, Lake County, 2009-2014.

Table 15. Weighted mean length at capture (mm) for yellow perch sampled with gill nets in Lake Madison, Lake County, 2005-2014. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size is in parentheses.

Year	*Age-1*	*Age-2*	*Age-3*	*Age-4*	*Age-5*	*Age-6*	*Age-7*	*Age-8*	*Age-9*	*Age-10*
2014 (121)	206 (119)	251 (1)	--	318 (1)	--	--				
2013 (30)	165 (25)	233 (3)	256 (2)	--	--	--				
2012 (390)	155 (35)	232 (347)	264 (4)	--	325 (4)	--				
2011 (1,063)	181 (938)	242 (125)	--	--	--	--				
2010 (487)	179 (354)	261 (15)	280 (112)	303 (6)	--	--				
2009 (110)	162 (8)	228 (98)	261 (4)	--	--	--				
2008 (609)	157 (450)	228 (103)	261 (50)	220 (6)	--	--				
2007 (403)	163 (113)	182 (268)	244 (16)	--	--	253 (6)				
2006 (68)	173 (34)	223 (10)	242 (7)	--	262 (17)	--				
2005 (185)	153 (11)	234 (44)	262 (7)	250 (118)	273 (5)	--				

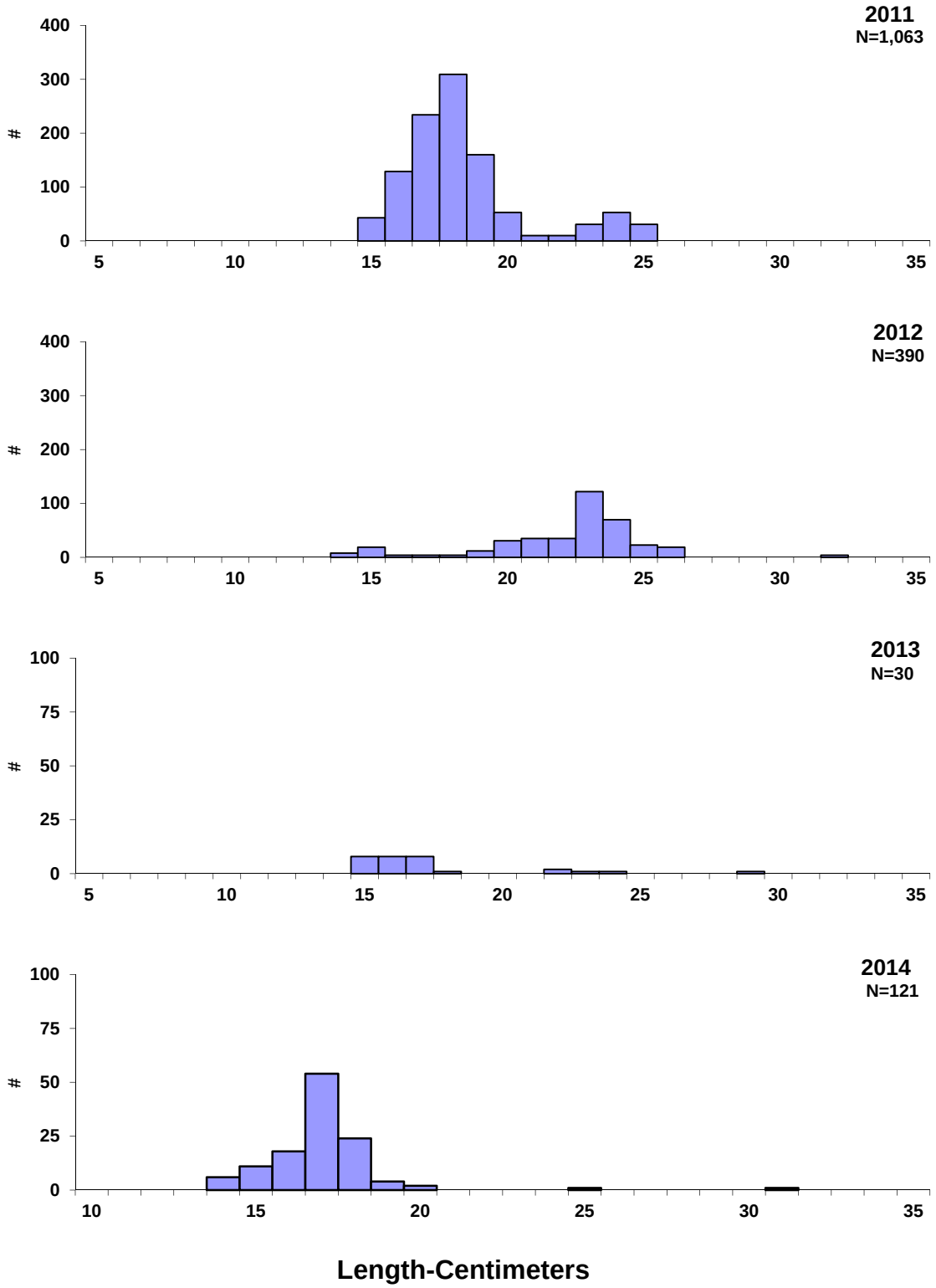

Figure 5. Length frequency histograms for yellow perch sampled in gill nets in Lake Madison, Lake County, 2011-2014.

Black Crappie

Management Objective

- none

Management Strategy

- monitor the black crappie population during annual lake surveys and report the results

Black crappie trap net CPUE improved somewhat in 2014, but is still well-below the typical survey catch over the last 10 years (Table 16). The majority of crappies sampled were 13-15 cm (5-6 in) long and naturally-produced in 2013 (Figures 8 and 9). Fall beach seining indicated some natural reproduction of crappies in 2014.

Table 16. CPUE, PSD, RSD-P, and mean Wr for all black crappie sampled with trap nets in Lake Madison, Lake County, 2005-2014.

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
CPUE	31.5	8.9	14.2	18.0	3.3	7.4	27.2	8.3	0.1	2.1
PSD	92	15	49	54	97	70	16	100	--	14
RSD-23	20	15	41	11	33	69	12	25	--	14
RSD-P	7	11	25	8	12	66	11	11	--	14
Mean Wr	114	120	110	110	109	110	130	93	--	107

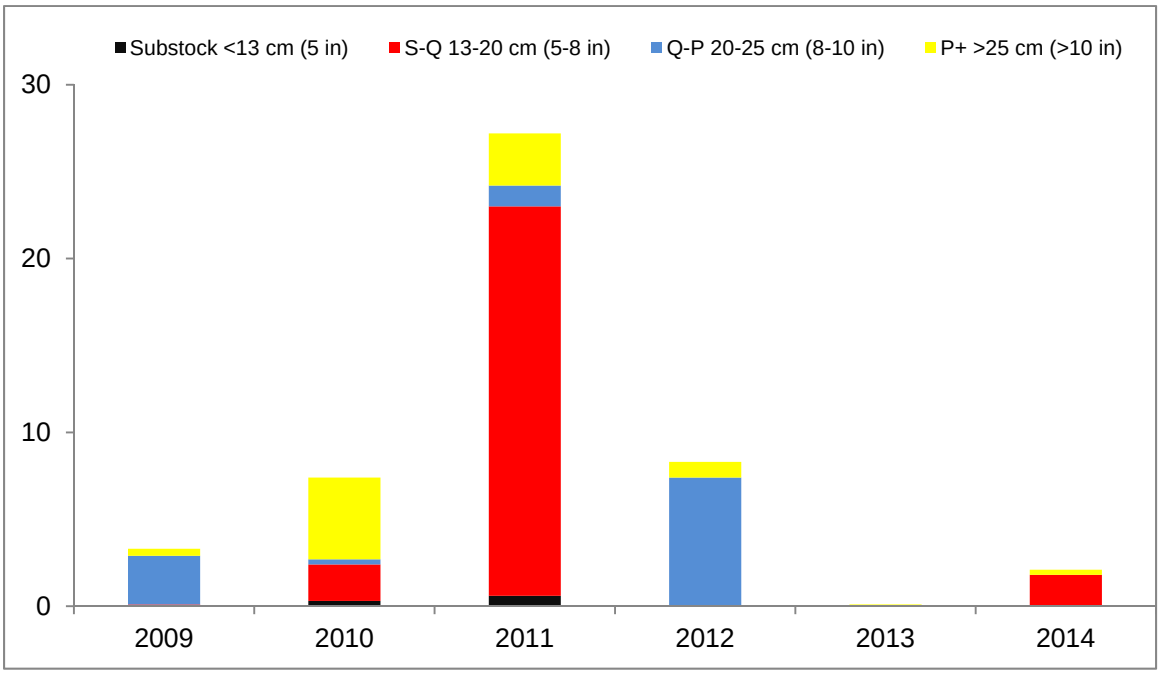

Figure 6. CPUE by length category for black crappies sampled with trap nets in Lake Madison, Lake County, 2009-2014.

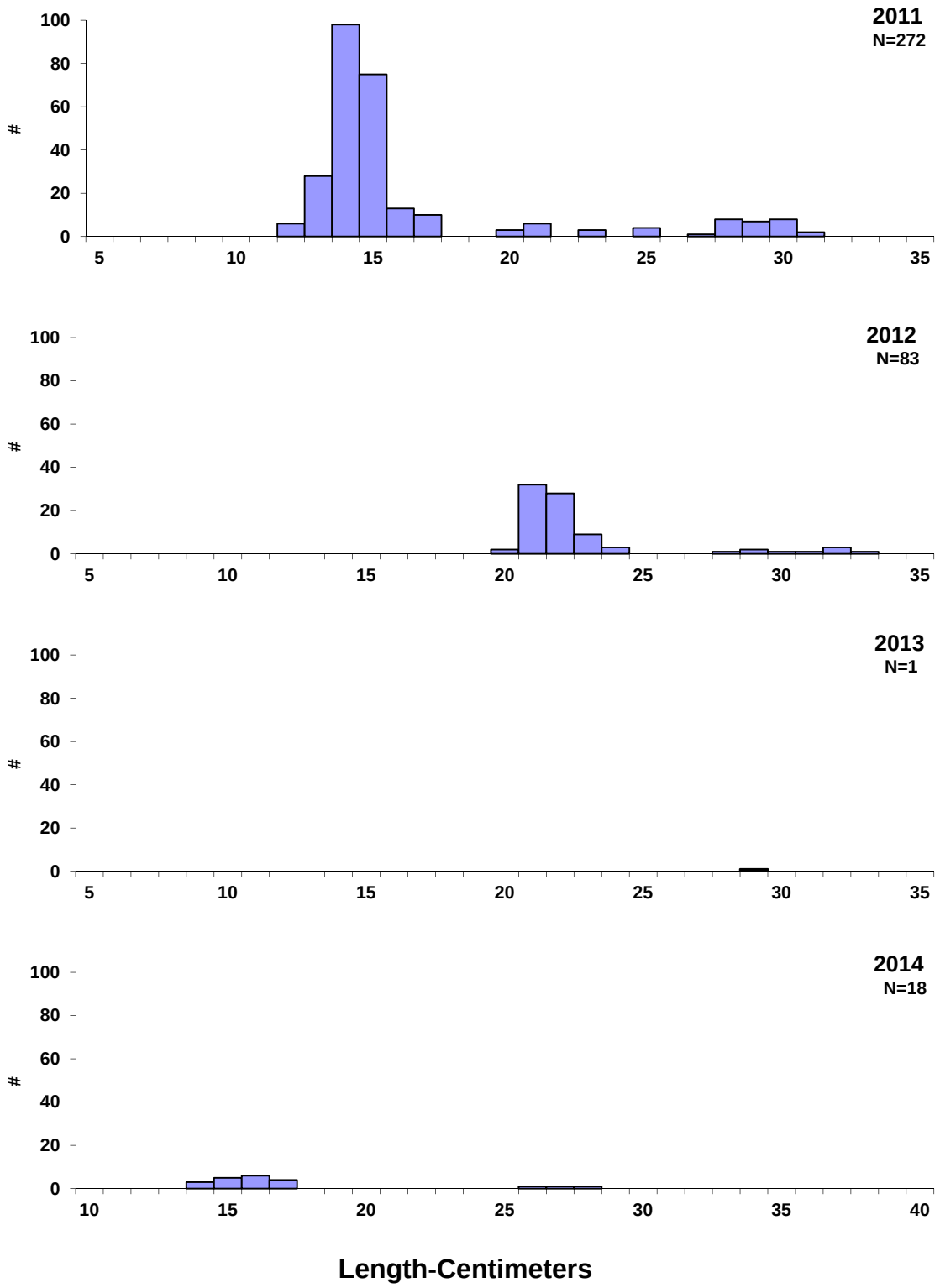

Figure 7. Length frequency histograms for black crappies sampled with trap nets in Lake Madison, Lake County, 2011-2014.

Bluegill

Management Objective

- none

Management Strategy

- monitor the bluegill population during annual lake surveys and report the results

Trap-net CPUE of bluegills was at a 10 year high in 2014 (Table 17). The majority of bluegills sampled were 13-14 cm (just over 5 in) long and naturally-produced in 2013 (Figures 6 and 7). Bluegills were in excellent condition with a mean *Wr* of 123. Fall beach seining indicated some natural reproduction in 2014.

Table 17. CPUE, PSD, RSD-P, and mean Wr for all bluegills sampled with trap nets in Lake Madison, Lake County, 2005-2014.

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***
CPUE	4.6	6.1	1.0	0.9	0.1	7.7	3.9	1.4	0.7	8.6
PSD	53	23	20	88	--	9	97	64	--	6
RSD-18	46	13	10	25	--	8	18	64	--	2
RSD-P	40	10	0	0	--	6	0	43	--	2
Mean Wr	133	126	118	108	--	130	119	89	--	123

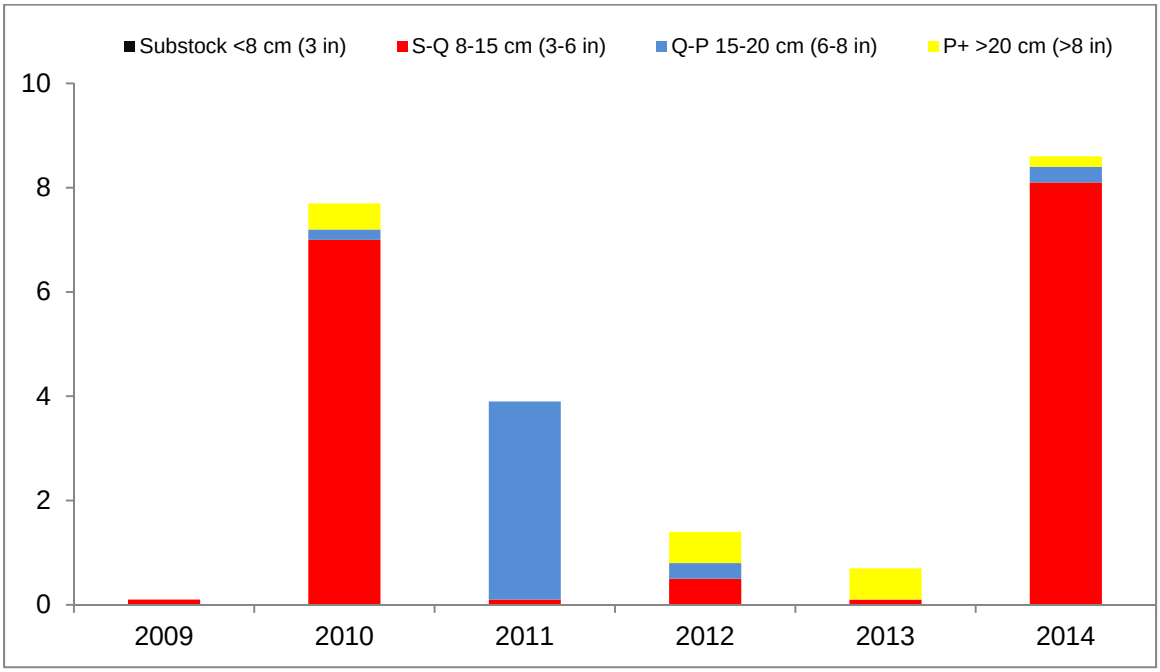

Figure 8. CPUE by length category for bluegills sampled with trap nets in Lake Madison, Lake County, 2009-2014.

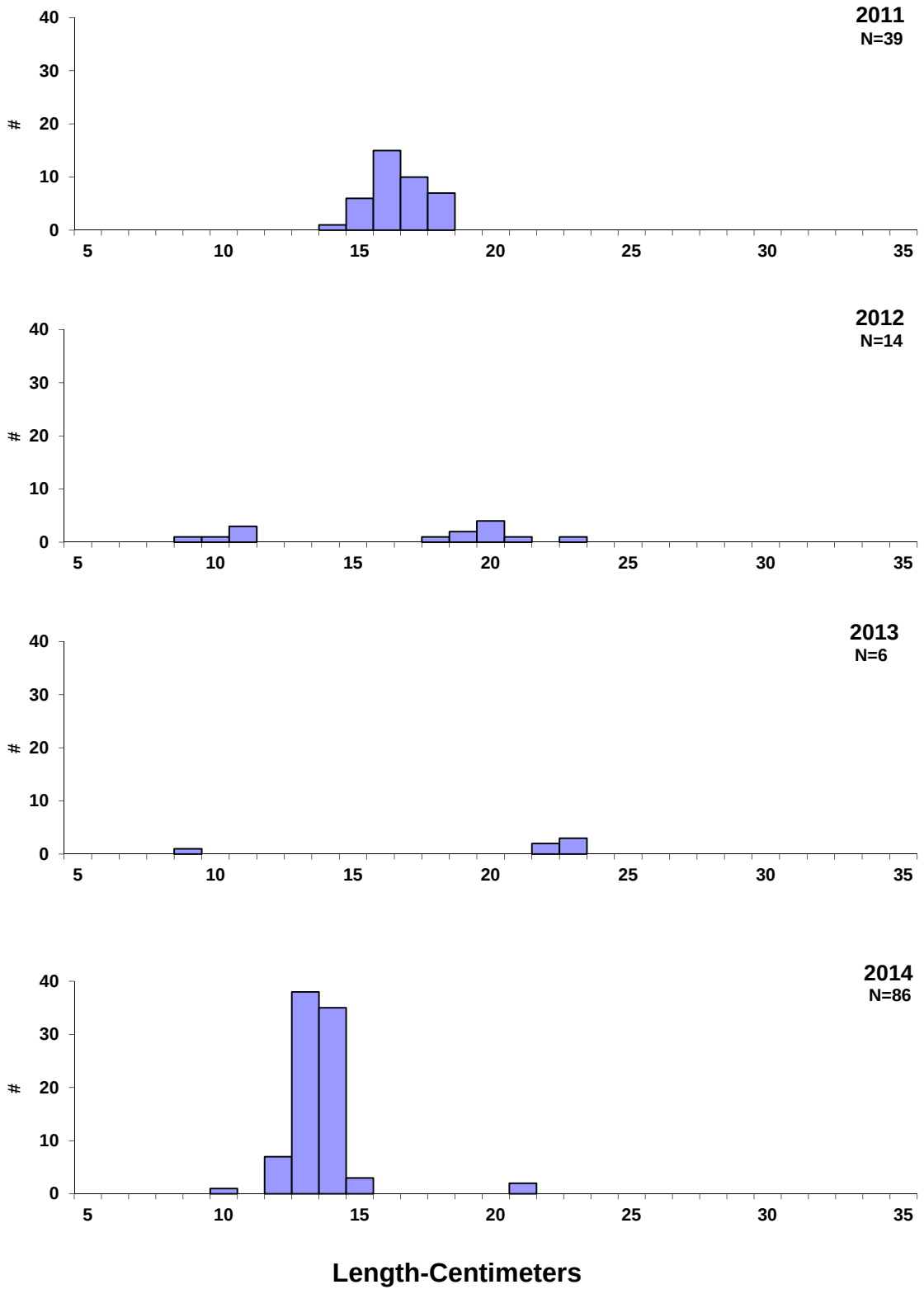

Figure 9. Length frequency histograms for bluegill sampled with trap nets in Lake Madison, Lake County, 2011-2014.

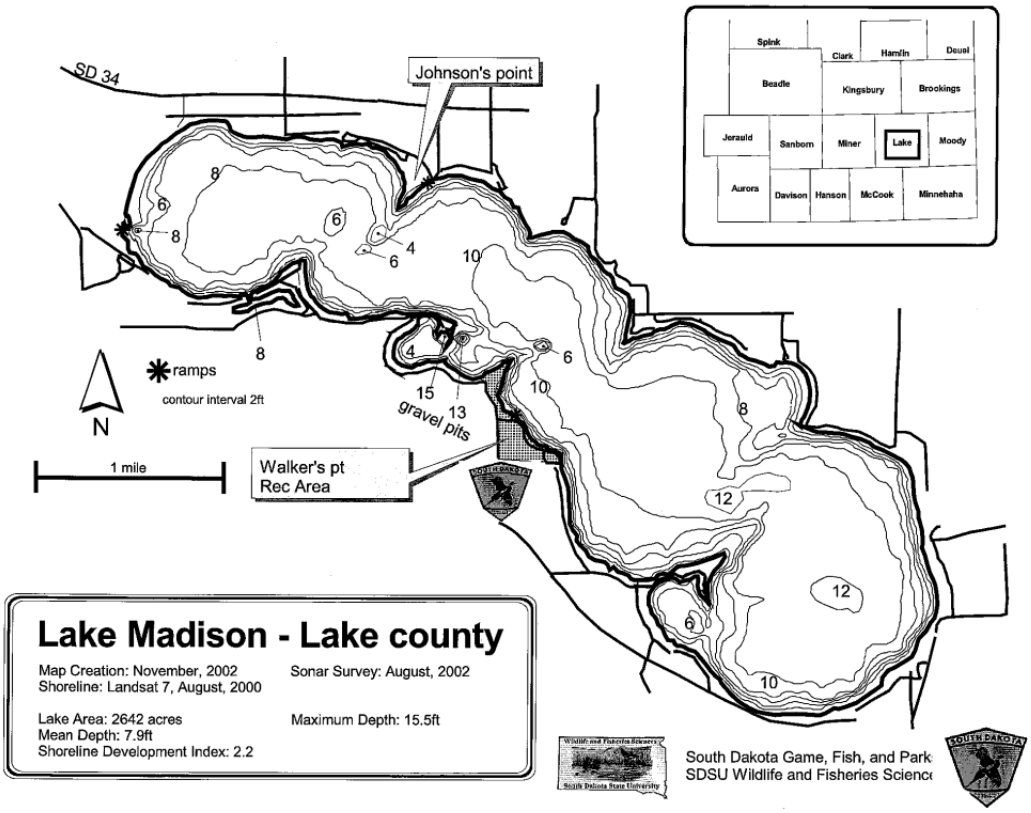

Figure 10. Contour map of Lake Madison, Lake County.

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:

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

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

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

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.