SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Brant Lake, Lake County
2102-F-21-R-49
2016

Figure 1. Brant Lake, Lake County

Legal Description: T105N- R51W-Sec. 3, 4, 9, 10
Location from nearest town: 2 miles north of Chester, SD

Surface Area: 1,037 acres
Meandered (Y/N): Yes
OHWM elevation: 1598.3
Outlet elevation: 1597.3
Max. depth at outlet elevation: 14 feet
Observed water level: Full
Contour map available: Yes

Watershed area: 7,658 acres
Shoreline length: 6.2 miles
Date set: December, 1981
Date set: February, 1987
Mean depth at outlet elevation: 9.5 feet
Lake volume: 11,000 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

Brant Lake is last in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. It derived its name from the large number of white brant (snow geese) that used to occupy the area during the spring and fall migrations.

Ownership of Lake and Adjacent Lakeshore Properties

Brant Lake 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 (GFP) manages the fishery and also owns and maintains access areas on the east, south, and west sides of the lake (Figure 1). The remainder of land surrounding the shoreline is privately owned.

Fishing Access

The East Brant Access Area has a double lane boat ramp, boat dock, concrete vault toilet and large parking lot. The West Brant Access Area also has a double lane boat ramp, boat dock, concrete vault toilet, large parking lot and several shore fishing areas. The South Brant Access Area offers many shore fishing locations.

Water Quality and Aquatic Habitat

Most of the water entering Brant comes from lakes Herman, Madison and Round, the upper three lakes in the chain. Outflows form the headwaters of Skunk Creek, which flows into the Big Sioux River in Sioux Falls.

Because it is the last lake in the chain, water quality and clarity in Brant is generally better than Round, Madison and Herman (Table 1). As a result, submerged aquatic vegetation is usually more abundant and emergent cattails are common in the west end bay. The lake also has a diversity of inlake habitat that includes an irregular, rocky shoreline, rocky points, and offshore humps (Figure 10).

Table 1. Water temperature, Secchi depth and observations/comments on water quality and aquatic vegetation in Brant Lake, Lake County, 2007-2016.

Year	*Water Temp ^{o}C (^{o}F)*	*Secchi Depth cm (in)*	*Observations/Comments (algae, aquatic vegetation, water quality, etc.)*
2016	27 (80)	130 (51)	Floating leaf and sago pondweed
2015	26 (79)	155 (61)	Sparse sago beds
2014	27 (81)	246 (97)	Floating leaf and sago pondweed
2013	26 (79)	127 (50)	Water was green with algae, some sago
2012	28 (82)	104 (41)	Sago pondweed
2011	29 (84)	33 (13)	Sago pondweed
2010	-- (--)	-- (--)	Sago pondweed
2009	23 (74)	183 (72)	Algae bloom, some sago
2008	27 (80)	99 (39)	Algae bloom, some sago
2007	27 (80)	122 (48)	

Fish Community

Brant Lake contains a fish community consisting of several species (Table 2).

Table 2. Fish species commonly found in Brant Lake, 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	

Fish Management

Brant Lake is actively managed for walleye and yellow perch, but black crappie, bluegill, smallmouth bass, northern pike and white bass frequently provide additional fishing opportunity. Although three fish kills have been documented since 1999 (Table 3), they had no significant effects on game fish populations. Occasional stockings of yellow perch and walleye are made to maintain population abundance and fishing opportunity when natural reproduction is lacking (Table 4).

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

Year	***Severity***	***Comments***
2007	Light	August – parasites, bacterial infection
2005	Moderate	July – bacterial infection
1999	Light	December – west end - stress

Table 4. Stocking history for Brant Lake, Lake County, 2007-2016.

Year	***Number***	***Species***	***Size***
2007	33,905	Yellow Perch	Fingerling
	4,000	Fathead Minnow	Adult
2008	103,540	Yellow Perch	Fingerling
2009	103,900	Walleye	Small Fingerling
	5,254,000	Yellow Perch	Fry
2013	102,660	Walleye	Small Fingerling
2014	103,602	Walleye	Small Fingerling
	499,000	Yellow Perch	Small Fingerling
2015	68,320	Walleye	Small Fingerling

Methods

Brant Lake was sampled on July 18-20, 2016 with five overnight gill-net sets and 10 overnight trap-net sets. The gill nets were 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 were 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

Although more black bullheads were sampled in the gill and trap nets than other species this year (Tables 5, 7), their abundance is not a management concern. Several game fish species also experienced slight increases in abundance.

Table 5. Total catch from five overnight gill nets set in Brant Lake, Lake County, July 18-20, 2016.

Species	***#***	***%***	***CPUE[1]***	***80% C.I.***	***Mean CPUE****	***PSD***	***RSD-P***	***Mean Wr***
Black Bullhead	178	41.3	35.6	±11.0	15.9	33	15	--
Yellow Perch	94	21.8	18.8	±12.4	14.8	73	24	104
Smallmouth Bass	64	14.8	12.8	±11.0	4.2	14	0	91
Walleye	33	7.7	6.6	±4.6	11.3	0	0	85
White Bass	18	4.2	3.6	±2.8	3.6	100	24	98
White Sucker	13	3.0	2.6	±1.7	5.0	100	92	--
Common Carp	12	2.8	2.4	±1.0	1.0	1	0	--
Channel Catfish	8	1.9	1.6	±1.7	0.4	--	--	--
Black Crappie	7	1.6	1.4	±1.0	0.8	--	--	--
Bluegill	2	0.5	0.4	±0.3	0.4	--	--	--
Bigmouth Buffalo	1	0.2	0.2	±0.3	1.5	--	--	--
Northern Pike	1	0.2	0.2	±0.3	2.3	--	--	--

*10 years (2007-2016)

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

Table 6. CPUE by length category for selected species sampled with gill nets in Brant Lake, Lake County, July 18-20, 2016.

Species	*Substock*	*Stock*	*S-Q*	*Q-P*	*P+*	*All sizes*	*80% C.I.*
Black Bullhead	1.4	34.2	23.0	6.2	5.0	35.6	±11.0
Yellow Perch	--	18.8	5.0	9.2	4.6	18.8	±12.4
Smallmouth Bass	10.0	2.8	2.4	0.4	--	12.8	±11.0
Walleye	2.8	3.8	3.8	--	--	6.6	±4.6
White Bass	0.2	3.4	--	2.6	0.8	3.6	±2.8
White Sucker	--	2.6	--	0.2	2.4	2.6	±1.7
Common Carp	0.2	2.2	2.0	0.2	--	2.4	±1.0
Channel Catfish	--	1.6	0.2	1.4	--	1.6	±1.7
Black Crappie	--	1.4	1.4	--	--	1.4	±1.0
Bluegill	--	0.4	--	--	0.4	0.4	±0.3
Bigmouth Buffalo	--	0.2	0.2	--	--	0.2	±0.3
Northern Pike	--	0.2	--	0.2	--	0.2	±0.3

Length categories can be found in Appendix A.

Table 7. Total catch from 10 overnight trap nets set in Brant Lake, Lake County, July 18-20, 2016.

Species	*#*	*%*	*CPUE*	*80% C.I.*	*Mean CPUE**	*PSD*	*RSD-P*	*Mean Wr*
Black Bullhead	3,232	88.2	323.2	±209.6	83.2	3	2	--
Smallmouth Bass	216	5.9	21.6	±7.2	6.0	8	2	101
Black Crappie	48	1.3	4.8	±1.9	4.5	55	28	110
White Bass	39	1.1	3.9	±2.0	1.7	97	59	94
Bigmouth Buffalo	27	0.7	2.7	±1.6	3.2	73	62	--
Walleye	24	0.7	2.4	±1.1	1.1	43	29	81
Bluegill	16	0.4	1.6	±1.0	2.6	75	38	112
Northern Pike	16	0.4	1.6	±0.7	2.4	100	31	82
White Sucker	16	0.4	1.6	±0.6	1.8	100	100	--
Common Carp	14	0.4	1.4	±1.0	2.7	8	8	--
Yellow Perch	14	0.4	1.4	±0.6	1.9	79	43	99
Hybrid Sunfish	2	0.1	0.2	±0.3	0.0	--	--	--

*10 years (2007-2016)

Table 8. CPUE by length category for selected species sampled with trap nets in Brant Lake, Lake County, July 18-20, 2016.

Species	*Substock*	*Stock*	*S-Q*	*Q-P*	*P+*	*All sizes*	*80% C.I.*
Black Bullhead	16.4	306.8	297.2	3.2	6.4	323.2	±209.6
Smallmouth Bass	4.6	17.0	15.6	1.1	0.3	21.6	±7.2
Black Crappie	0.1	4.7	2.1	1.3	1.3	4.8	±1.9
White Bass	--	3.9	0.1	1.5	2.3	3.9	±2.0
Bigmouth Buffalo	0.1	2.6	0.7	0.3	1.6	2.7	±1.6
Walleye	1.0	1.4	0.8	0.2	0.4	2.4	±1.1
Bluegill	--	1.6	0.4	0.6	0.6	1.6	±1.0
Northern Pike	--	1.6	--	1.1	0.5	1.6	±0.7
White Sucker	--	1.6	--	--	1.6	1.6	±0.6
Common Carp	0.1	1.3	1.2	--	0.1	1.4	±1.0
Yellow Perch	--	1.4	0.3	0.5	0.6	1.4	±0.6
Hybrid Sunfish*	--	--	--	--	--	0.2	±0.3

*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 Brant Lake, Lake County, 2007-2016.

Species	*Gear*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
Bigmouth	GN	3.5	1.0	4.0	4.4	--	0.8	0.3	1.0	--	0.2
Buffalo	TN	3.0	7.8	6.5	4.4	4.5	1.9	0.7	0.3	--	2.7
Black	GN	2.0	4.5	4.8	5.0	9.7	23.8	24.3	27.6	21.2	35.6
Bullhead	TN	4.8	11.9	10.4	4.8	15.4	330.3	41.1	48.6	41.7	323.2
Black	GN	0.5	1.8	1.0	0.4	--	2.5	--	--	--	1.4
Crappie	TN	5.8	7.6	5.8	5.2	4.8	5.9	2.4	1.5	1.3	4.8
	GN	0.8	1.3	0.2	0.2	--	0.3	--	0.2	0.2	0.4
Bluegill	TN	4.6	9.4	1.9	3.2	2.7	1.3	0.7	0.2	0.3	1.6
Channel	GN	--	0.2	0.2	--	--	0.3	1.3	--	--	1.6
Catfish	TN	1.1	0.3	--	0.2	--	1.5	0.2	0.1	0.1	--
Common	GN	2.5	1.0	0.2	1.2	--	0.5	0.7	0.4	0.6	2.4
Carp	TN	6.2	3.4	2.6	3.7	1.2	7.1	0.3	0.7	0.2	1.4
Northern	GN	1.3	1.0	0.2	1.8	13.0	1.8	1.7	1.8	0.4	0.2
Pike	TN	0.9	2.0	0.7	5.0	3.1	5.9	1.8	2.0	1.4	1.6
Smallmouth	GN	8.5	2.2	0.2	4.2	3.7	4.8	2.7	1.2	2.0	12.8
Bass	TN	17.4	4.3	1.9	2.0	4.8	3.2	1.5	1.5	1.8	21.6
Spottail	GN	--	0.8	0.4	2.2	--	--	--	0.2	--	--
Shiner	TN	--	--	--	--	--	--	--	--	--	--
	GN	20.0	9.2	7.4	10.8	35.0	12.5	1.3	4.0	6.4	6.6
Walleye	TN	0.8	0.9	0.5	2.8	1.3	1.3	0.1	0.2	0.3	2.4
White	GN	0.3	10.5	7.4	0.8	2.7	7.3	1.0	1.0	1.2	3.6
Bass	TN	--	1.6	0.3	0.9	0.2	3.8	3.0	1.8	1.3	3.9
White	GN	5.5	4.2	3.4	7.2	6.0	6.0	2.7	6.8	5.2	2.6
Sucker	TN	0.8	0.2	1.5	3.9	0.6	1.5	0.9	2.3	4.3	1.6
Yellow	GN	4.0	15.0	12.4	35.4	16.3	32.8	--	8.4	4.6	18.8
Perch	TN	0.2	0.3	0.5	5.0	8.5	2.2	--	0.1	0.3	1.4

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 (72,590) as needed to achieve the management objective.

Walleye gill-net CPUE barely increased in 2016 and remains below the management objective (Table 10). Interestingly, all but one of the walleyes sampled this year were 35 cm (14 in) or less in length (Figure 3) while in 2015, several fish larger than this were seen. Hopefully this is just a sampling anomaly and not an actual loss of these larger fish from the lake. During a rough fish seining operation in late January, 2017, several larger walleyes were observed by GFP fisheries staff.

No walleyes were stocked in 2016 (Table 11) due to the relatively high abundance of age-1 and age-0 fish sampled in 2015. In addition, below average growth of age-2 fish (Table 13) and a mean Wr of 85 the last 2 years indicate that forage abundance may be limiting abundance at this time. However, since yellow perch numbers are increasing and there is more potential for increased forage abundance, a stocking has been scheduled for 2017.

Table 10. CPUE, PSD, RSD-P, and mean Wr for all walleyes sampled with gill nets in Brant Lake, Lake County, 2007-2016. Stocked years are shaded.

	2007	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***
CPUE	20.0	9.2	7.4	10.8	35.0	12.5	1.3	4.0	6.4	6.6
PSD	28	16	13	15	37	11	--	35	67	0
RSD-P	13	7	6	3	1	4	--	10	40	0
Mean Wr	86	83	81	87	86	90	--	89	85	85

Table 11. Walleyes stocked into Brant Lake, Lake County, 2007-2016.

Year	***Number***	***Size***
2009	103,900	Small Fingerling
2013	102,660	Small Fingerling
2014	103,602	Small Fingerling
2015	68,320	Small Fingerling

Table 13. Weighted mean length at capture (mm) for walleyes sampled with gill nets in Brant Lake, Lake County, 2007-2016. 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*
2016	255	297	--	--	--	--	--	--	--	--	--
(30)	(15)	(15)									
2015	203	351	--	--	469	540	588	471	--	--	--
(32)	(17)	(6)			(1)	(5)	(2)	(1)			
2014	266	293	398	465	578	--	--	--	--	--	--
(20)	(12)	(1)	(1)	(5)	(1)						
2013	--	--	396	541	--	--	--	--	--	--	--
(4)			(3)	(1)							
2012	236	314	419	474	539	--	--	--	--	--	718
(50)	(6)	(39)	(1)	(2)	(1)						(1)
2011	245	359	426	468	--	--	--	--	--	--	--
(105)	(54)	(32)	(8)	(11)							
2010	249	334	372	--	--	--	--	586	--	--	--
(53)	(25)	(12)	(15)					(1)			
2009	220	301	389	--	--	572	--	--	--	727	--
(37)	(6)	(25)	(4)			(1)				(1)	
2008	243	332	419	--	--	--	535	--	644	--	485
(55)	(18)	(30)	(3)				(1)		(2)		(1)
2007	241	343	379	453	478	545	611	686	--	--	--
(80)	(40)	(25)	(3)	(3)	(3)	(1)	(3)	(2)			

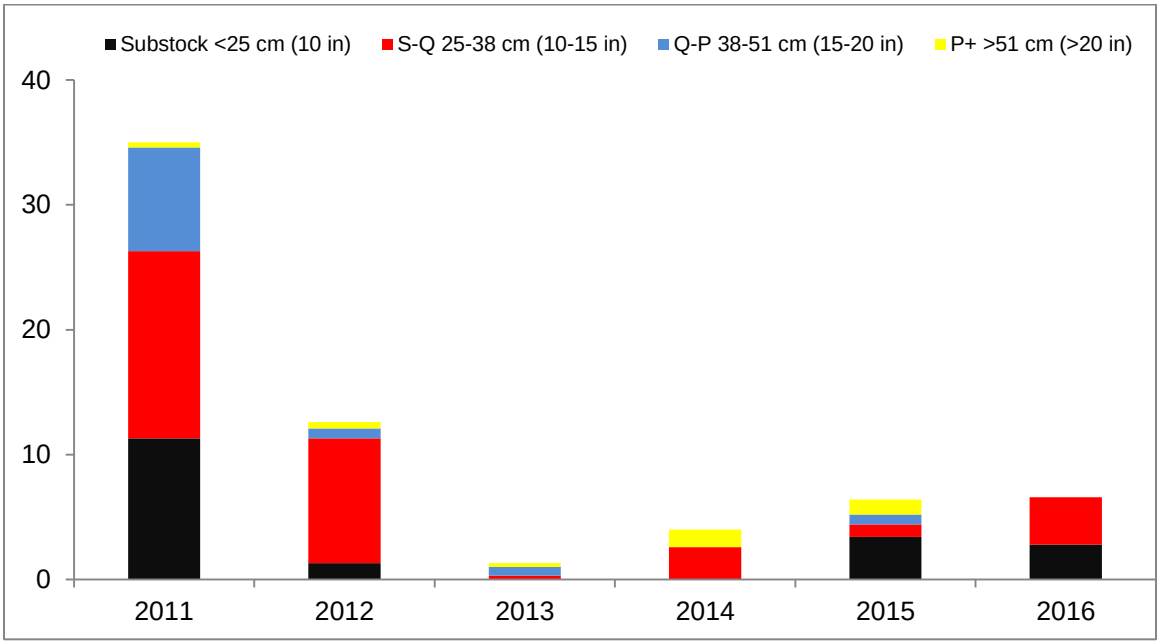

Figure 2. CPUE by length category for walleye sampled with gill nets in Brant Lake, Lake County, 2011-2016.

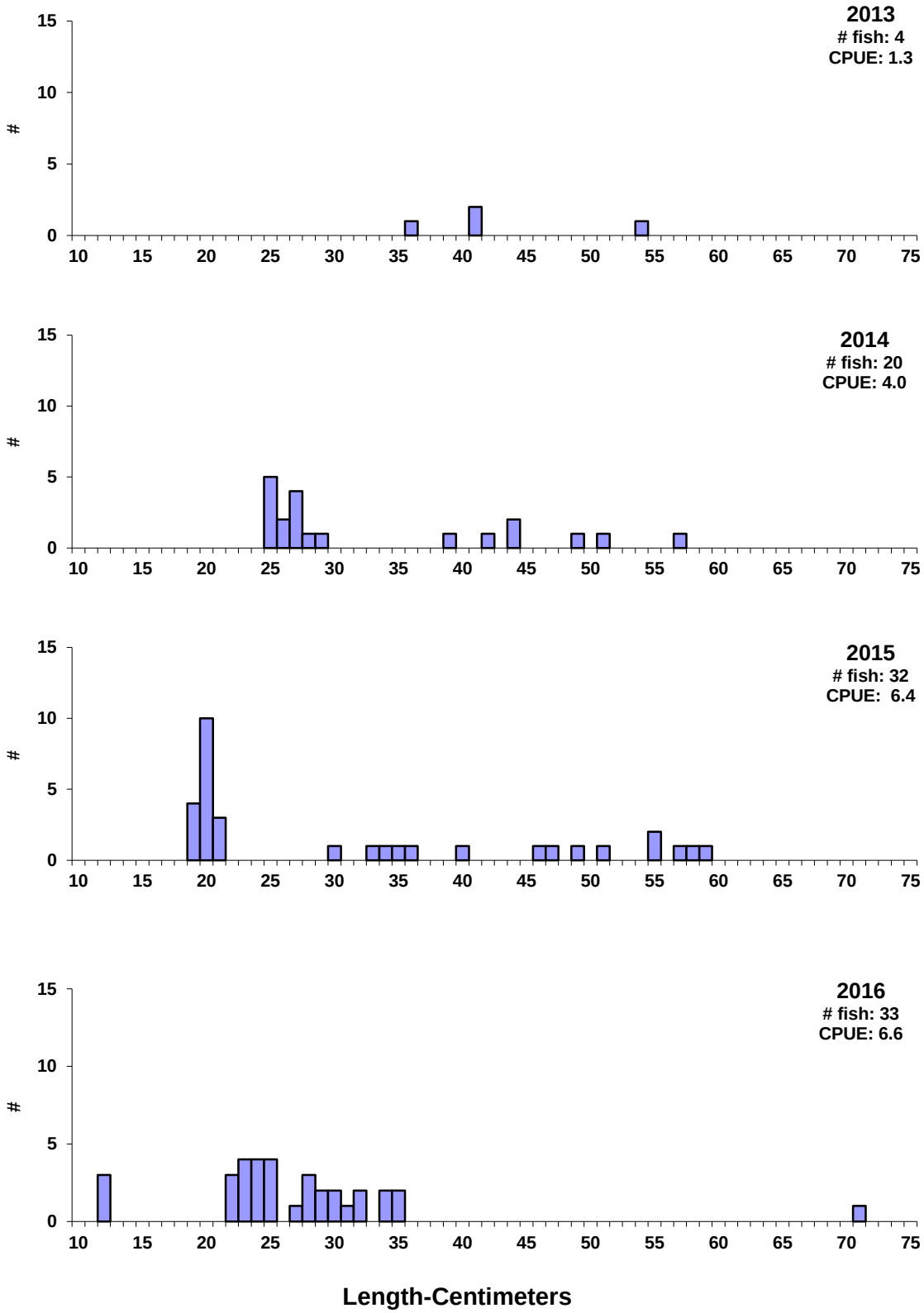

Figure 3. Length frequency histograms for walleye sampled with gill nets in Brant Lake, Lake County, 2013-2016.

Yellow Perch

Management Objective

- Maintain a yellow perch population with a total gill-net CPUE of at least 30.

Management Strategy

- Stock small yellow perch fingerlings at the rate of 500/acre (518,500) as needed to achieve the management objective. Mark the stocked fish with OTC to allow evaluation of stocking success.

Although yellow perch abundance increased substantially in 2016 (Table 14), it remains well below the management objective. About 68% of the fish sampled were two years old (Table 16). This coincides with the small fingerling stocking in 2014 (Table 15). Since these fingerlings were OTC marked and comprised 70% of age-0 perch sampled later that fall, we are confident this stocking made a significant contribution to the population. It also appears a decent year class was naturally produced in 2015. Yellow perch in Brant are growing quickly and exceeding 23 cm (9 in) in length by age-2 (Table 16).

Table 14. CPUE, PSD, RSD-P, and mean Wr for all yellow perch sampled with gill nets in Brant Lake, Lake County, 2007-2016. Stocked years are shaded.

	2007	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***
CPUE	4.0	15.0	12.4	35.4	16.3	32.8	0.0	8.4	4.6	18.8
PSD	56	47	87	68	82	96	--	19	25	73
RSD-P	13	34	11	53	35	21	--	5	4	24
Mean Wr	104	104	103	95	102	96	--	107	100	104

Table 15. Yellow perch stocked into Brant Lake, Lake County, 2007-2016.

Year	***Number***	***Size***
2007	33,905	Fingerling
2008	103,540	Fingerling
2009	5,254,000	Fry
2014	499,000	Fingerling

Table 16. Weighted mean length at capture (mm) for yellow perch sampled with gill nets in Brant Lake, Lake County, 2007-2016. 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*
2016 (94)	178 (28)	244 (64)	298 (2)	--	--	--				
2015 (23)	165 (17)	236 (5)	296 (1)	--	--	--				
2014 (42)	165 (34)	236 (5)	260 (2)	313 (1)	--	--				
2013 (0)	--	--	--	--	--	--				
2012 (131)	173 (3)	226 (106)	271 (22)	--	--	--				
2011 (49)	155 (9)	241 (32)	261 (5)	308 (2)	318 (1)	--				
2010 (177)	158 (56)	230 (21)	265 (94)	311 (2)	307 (4)	--				
2009 (61)	161 (2)	220 (53)	270 (3)	303 (3)	--	--				
2008 (90)	150 (45)	228 (16)	276 (27)	240 (2)	--	--				
2007 (16)	167 (4)	199 (6)	248 (6)	--	--	--				

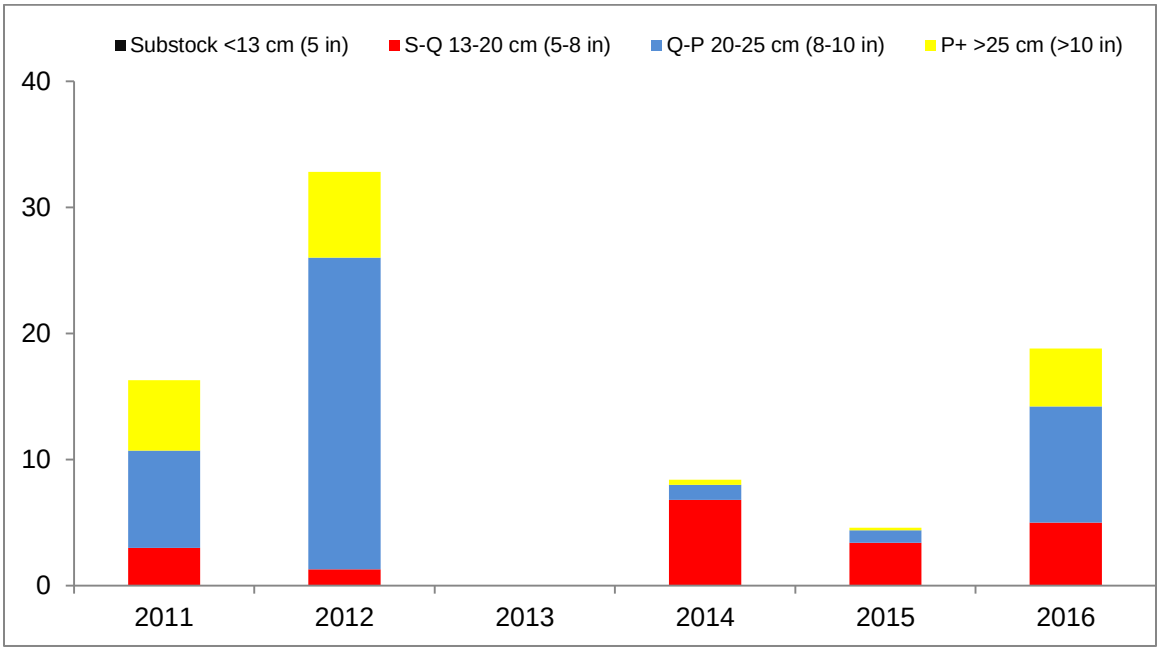

Figure 4. CPUE by length category for yellow perch sampled with gill nets in Brant Lake, Lake County, 2011-2016.

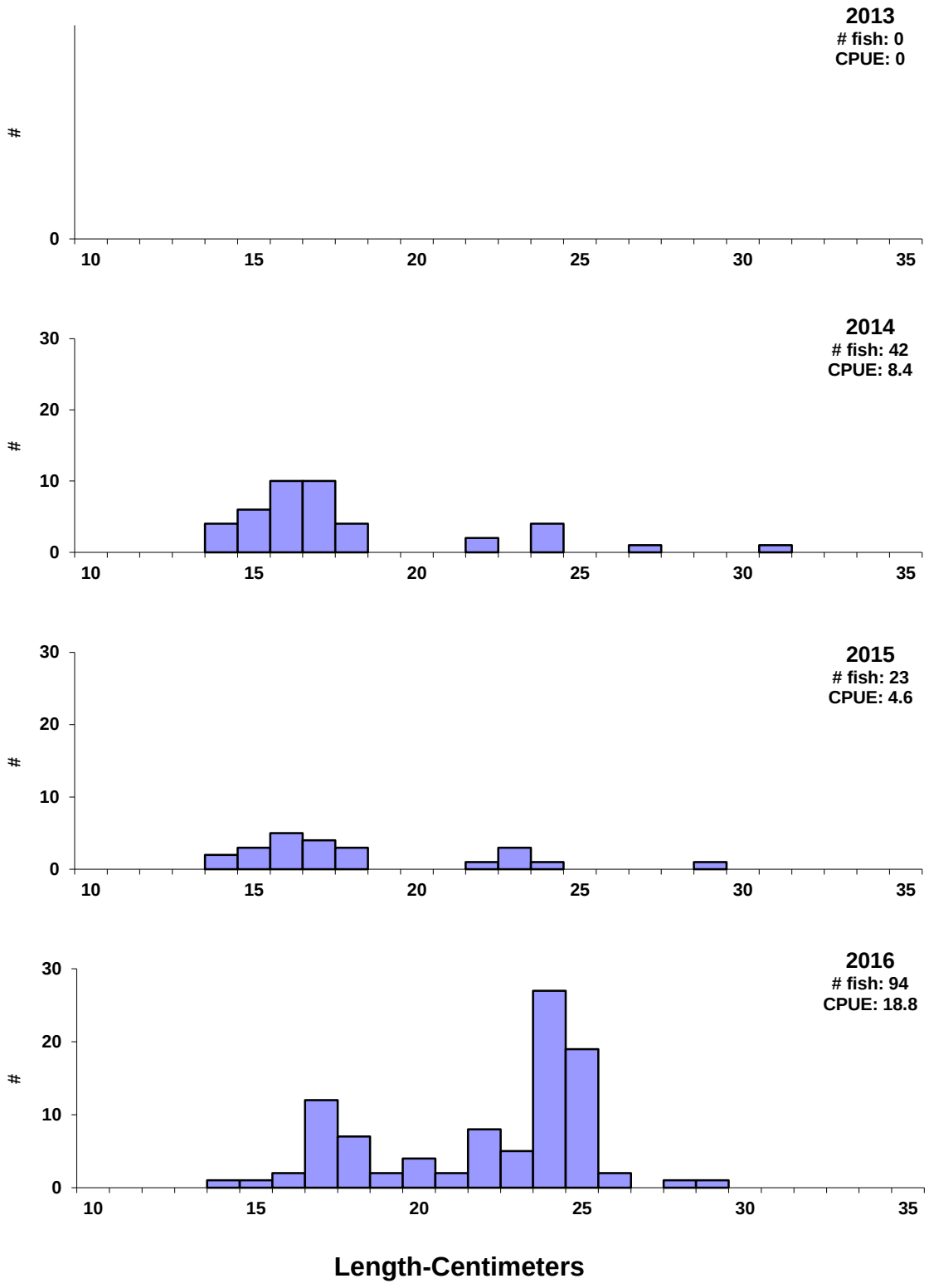

Figure 5. Length frequency histograms for yellow perch sampled in gill nets in Brant Lake, Lake County, 2013-2016.

Black Crappie

Management Objective

- none

Management Strategy

- monitor the population during annual lake surveys

Black crappie abundance increased back to the levels seen in 2007-2012 (Table 18). The population now consists of multiple year classes with many fish over 25 cm (10 in) (Figures 8-9).

Table 18. CPUE, PSD, RSD-P, and mean Wr for all black crappie sampled with trap nets in Brant Lake, Lake County, 2007-2016.

	2007	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***
CPUE	5.8	7.6	5.8	5.1	4.8	5.9	2.4	1.5	1.3	4.8
PSD	94	89	93	100	60	99	100	100	94	55
RSD-P	21	40	22	100	40	6	59	100	69	28
Mean Wr	109	104	105	102	106	108	101	102	97	110

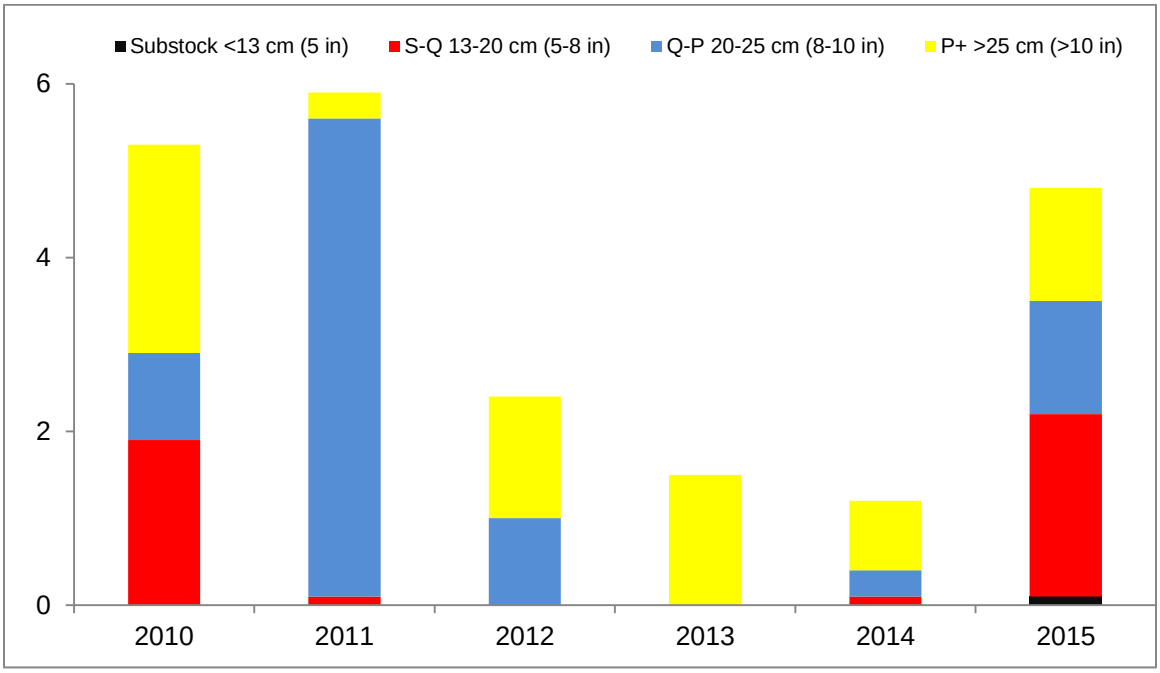

Figure 8. CPUE by length category for black crappies sampled with trap nets in Brant Lake, Lake County, 2011-2016.

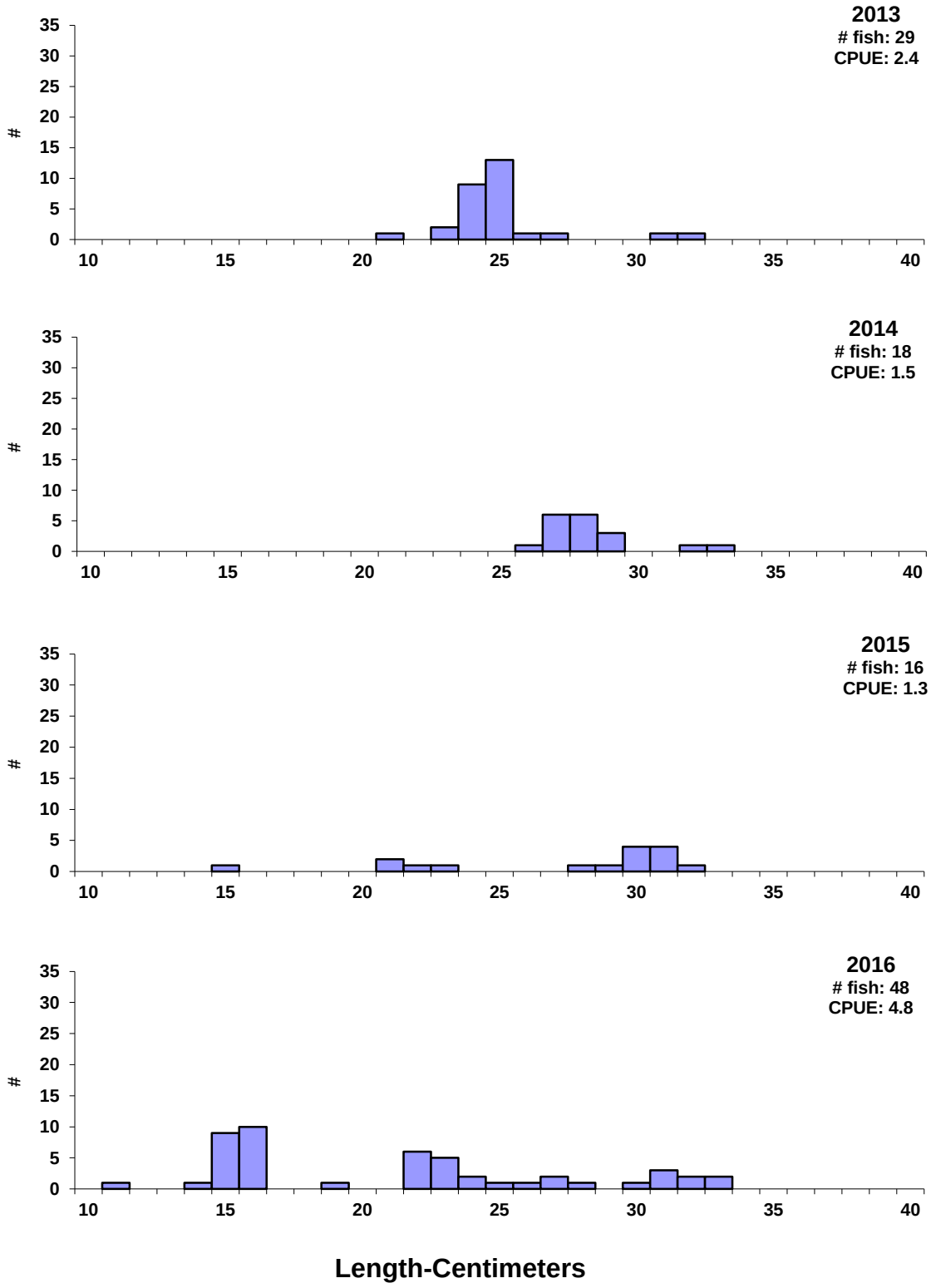

Figure 9. Length frequency histograms for black crappies sampled with trap nets in Brant Lake, Lake County, 2013-2016.

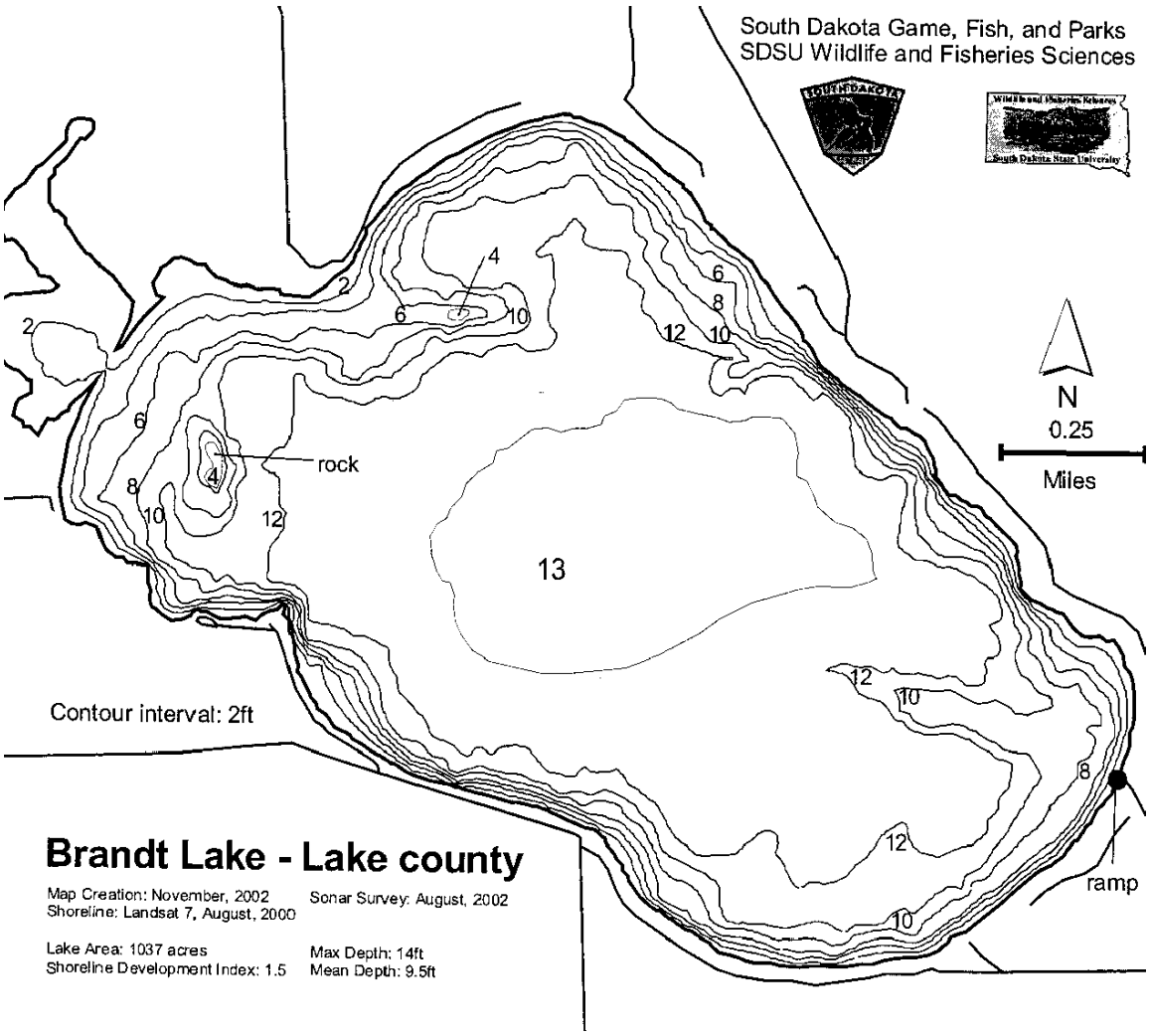

Figure 10. Contour map of Brant Lake, Lake County.

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.