

**SOUTH DAKOTA STATEWIDE FISHERIES SURVEY**  
**Wilmarth Lake, Aurora County**  
**2102-F-21-R-47**  
**2014**



**Figure 1.** Wilmarth Lake, Aurora County

**Legal Description:** T105N-R65W-Sec 35, 36

**Location from nearest town:** 10 miles north, 4 miles west of Plankinton, SD

**Surface Area:** 103 acres

**Meandered (Y/N):** no

**OHWM elevation:** none set

**Outlet elevation:** no data

**Max. depth at outlet elevation:** 26 feet

**Observed water level:** full

**Contour map available (Y/N):** yes

**Watershed area:** 34,812 acres

**Shoreline length:** 3.2 miles

**Date set:** NA

**Date set:** NA

**Mean depth at outlet elevation:** 11 feet

**Lake volume:** 1,027 acre feet

**Date mapped:** 1969

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

## Introduction

### General

Wilmarth Lake was created by the construction of a dam across Firesteel Creek by the Works Progress Administration (WPA) in 1936. The lake was named for Fred Wilmarth who had lived on a farm near the lake since 1906. Wilmarth gets its water from the East and West Forks of Firesteel Creek and their associated watersheds. Outflows exit into Firesteel Creek and continue downstream through Lake Mitchell into the James River.

### Ownership of Lake and Adjacent Lakeshore Properties

Except for the extreme west end and a portion of the north shore, Wilmarth Lake is owned and managed by the South Dakota Department of Game, Fish and Parks.

### Fishing Access

The Wilmarth Lake Access Area on the northwest end of the lake contains a boat ramp, roll-in boat dock and public toilet. Several vehicle trails provide shore-fishing access along the north side of the lake.

### Water Quality and Aquatic Vegetation

The water in Wilmarth Lake was very clear during the survey. The lake was heavily vegetated with sago pondweed and clasping leaf pondweed (Table 1).

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

<b>Year</b>	<b>Water Temp °C (°F)</b>	<b>Secchi Depth cm (in)</b>	<b>Observations/Comments (algae, aquatic vegetation, water quality, etc.)</b>
2014	22 (72)	-- (--)	Sago and clasping leaf pondweed. Very clear water
2013	22 (72)	-- (--)	Sago and clasping leaf pondweed.
2011	19 (66)	231 (91)	Heavy with cattail, coontail, milfoil, and sago pondweed
2009	17 (63)	100 (39)	Dense sago pondweed and milfoil around shoreline
2007	18 (65)	51 (20)	Stained brown water, dense vegetation
2005	19 (66)	150 (59)	Moderate density pondweed

### **Fish Community**

Wilmarth Lake is a typical bass panfish impoundment with several species of panfish (Table 2) and northern pike as a secondary predator.

**Table 2.** Fish species commonly found in Wilmarth Lake, Aurora County.

<b><i>Game Species</i></b>	<b><i>Other Species</i></b>
Largemouth Bass	Black Bullhead
Bluegill	Yellow Perch
Northern Pike	Black Crappie
	Hybrid Sunfish

### **Fish Management**

Maintaining a quality largemouth bass fishery in Wilmarth Lake has been a challenge because good natural reproduction is sporadic and stocking has been unsuccessful (Table 4). Potential reasons include unsuitable spawning habitat (steep, silted, heavily vegetated shorelines) and predation by abundant northern pike. Additionally, bluegills and crappies have often not attained a size acceptable to anglers due to slow growth and high adult mortality.

**Table 3.** Fish kill history for Wilmarth Lake, Aurora County.

<b><i>Year</i></b>	<b><i>Severity</i></b>	<b><i>Comments</i></b>
2000	Severe	BLB, BLG-August fish kill. 5,000 fish dead (est.). 90% BLB.

**Table 4.** Stocking history for Wilmarth Lake, Aurora County, 2005-2014.

<b><i>Year</i></b>	<b><i>Number</i></b>	<b><i>Species</i></b>	<b><i>Size</i></b>
2012	1,030	Largemouth Bass	Juvenile

### **Methods**

Wilmarth Lake was sampled on May 26, 2014 with two hours of nighttime electrofishing to sample the entire fish population.

## Results and Discussion

### Net Catch Results

Black bullheads were dominant in the electrofishing catch (Table 5). Nearly all bullheads were stock length and larger, and a high percentage were quality length 23 cm (9 in, Table 6). Northern pike, largemouth bass and three species of panfish were also caught (Table 5).

**Table 5.** Total catch from two hours of nighttime electrofishing in Wilmarth Lake, Aurora County, May 26, 2014.

<i>Species</i>	<i>#</i>	<i>%</i>	<i>CPUE<sup>1</sup></i>	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
Black Bullhead	1,113	84.4	556.5	+35.2	144.7	69	4	--
Yellow Perch	113	8.6	56.5	+5.1	17.8	--	--	--
Bluegill	60	4.6	30.0	+6.3	74.5	74	4	120
Largemouth Bass	14	1.1	7.0	+0.8	27.9	93	71	120
Northern Pike	10	0.8	5.0	+0.9	4.3	20	0	86
Black Crappie	8	0.6	4.0	+0.6	8.4	--	--	--

\*10 years (2005-2014)

**Table 6.** CPUE by length category for selected species sampled with electrofishing in Wilmarth Lake, Aurora County, May 26, 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	5.5	551.0	171.5	357.0	22.5	556.5	+35.2
Yellow Perch	54.0	2.5	1.0	1.5	--	56.5	+5.1
Bluegill	1.5	28.5	7.5	20.0	1.0	30.0	+6.3
Largemouth Bass	--	7.0	0.5	1.5	5.0	7.0	+0.8
Northern Pike	--	5.0	4.0	1.0	--	5.0	+0.9
Black Crappie	1.0	3.0	3.0	--	--	4.0	+0.6

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

**Table 7.** Electrofishing CPUE for selected fish species sampled in Wilmarth Lake, Aurora County, 2005-2014.

<i>Species</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	54.9		55.8		43.2		13.5		144.5	556.5
Black Crappie	0.6		16.1		1.2		22.0		6.5	4.0
Bluegill	18.9		109.8		114.6		112.0		61.5	30.0
Green Sunfish	4.5		1.2		0.6		--		--	--
Hybrid Sunfish	--		2.4		--		--		--	--
Largemouth Bass	84.0		52.8		12.0		9.0		2.5	7.0
Northern Pike	0.6		9.0		3.0		7.5		0.5	5.0
Yellow Perch	9.9		1.2		--		--		3.5	56.5

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

## Largemouth Bass

### Management Objective

- Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20 for stock length ( $\geq 20$  cm, 8 in) and longer fish and a RSD-P of 20-40.

### Management Strategy

- Stock hatchery-reared large fingerlings in the spring as needed to achieve the management objective.

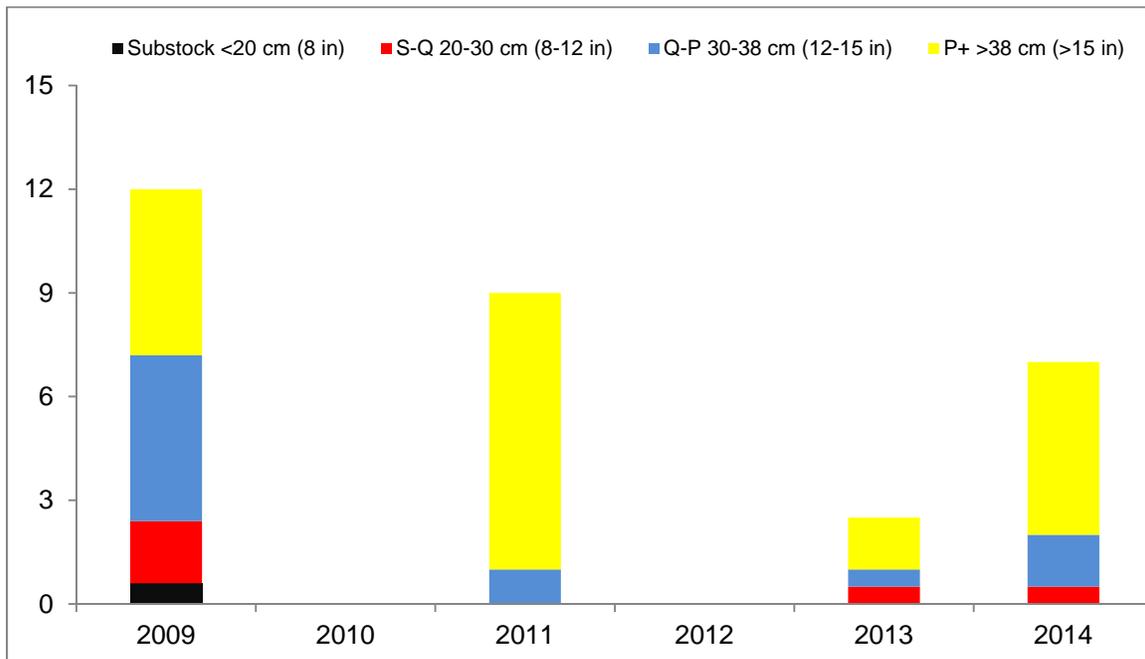
Largemouth bass CPUE was up from 2013 and comprised mostly of larger fish (Table 8, Figures 2 and 3). Some fish from the 2012 juvenile bass stocking may have been present in the catch (Figure 3).

**Table 8.** CPUE, PSD, RSD-P, and mean  $W_r$  for all largemouth bass sampled with electrofishing in Wilmarth Lake, Aurora County, 2005-2014. Stocked years are shaded.

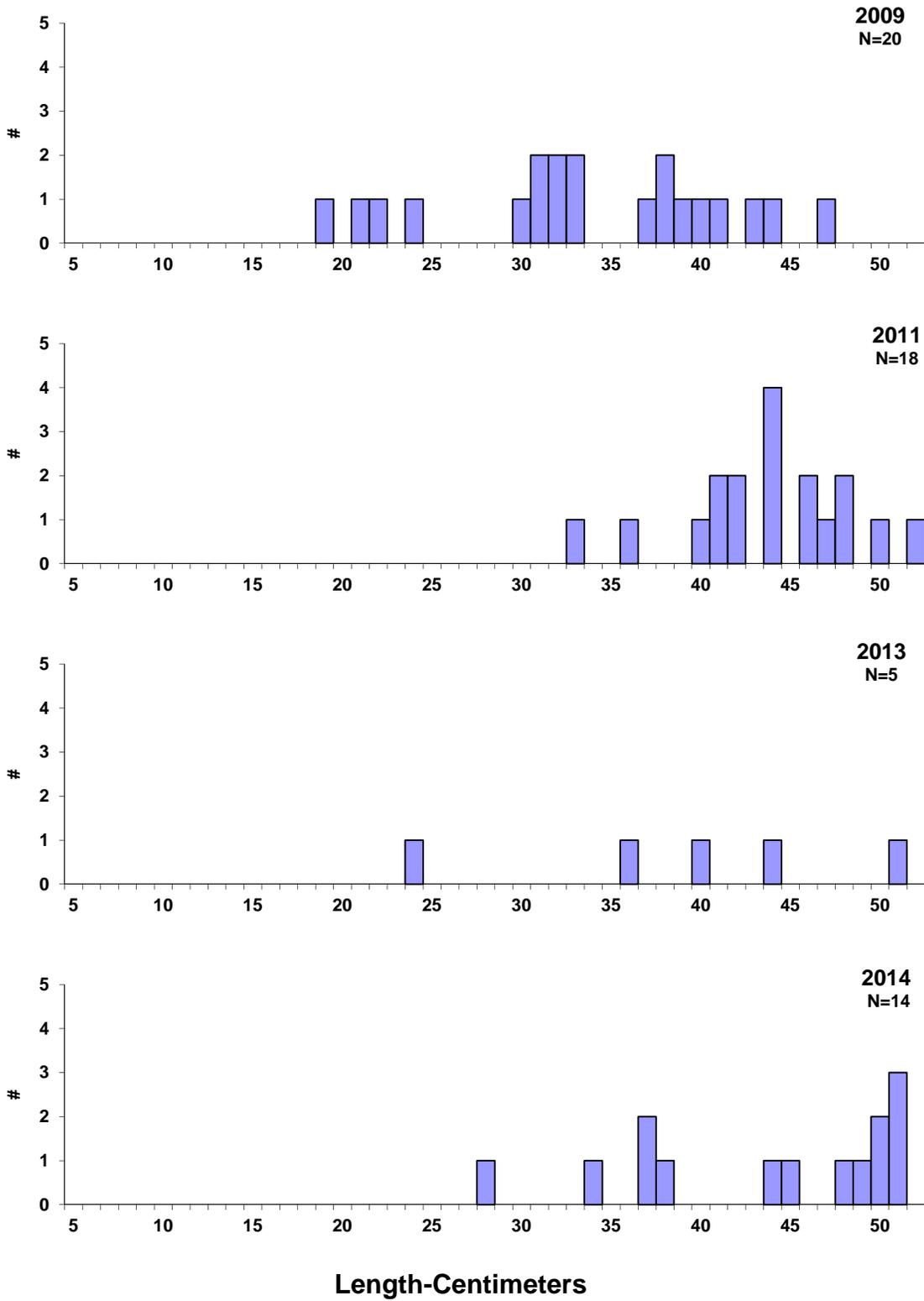
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>CPUE</b>	28.0	52.8			12.0		9.0		2.5	7.0
<b>PSD</b>	98	70			84		100		--	93
<b>RSD-P</b>	12	60			42		89		--	71
<b>Mean <math>W_r</math></b>	111	116			116		123		--	120

**Table 9.** Largemouth bass stocked into Wilmarth Lake, Aurora County, 2005-2014.

Year	Number	Size
2012	1,030	Juvenile



**Figure 2.** CPUE by length category for largemouth bass sampled by electrofishing in Wilmarth Lake, Aurora County, 2009-2014.



**Figure 3.** Length frequency histograms for largemouth bass sampled by electrofishing in Wilmarth Lake, Aurora County, 2009, 2011, 2013, and 2014.

## **Bluegill**

### **Management Objective**

- Maintain a bluegill fishery with an electrofishing CPUE of 25-50 and a RSD-18 of at least 20.

### **Management Strategies**

- Monitor the population by nighttime electrofishing annually.
- Attempt to maintain largemouth bass as an effective predator upon bluegills in order to crop the population to promote good growth.

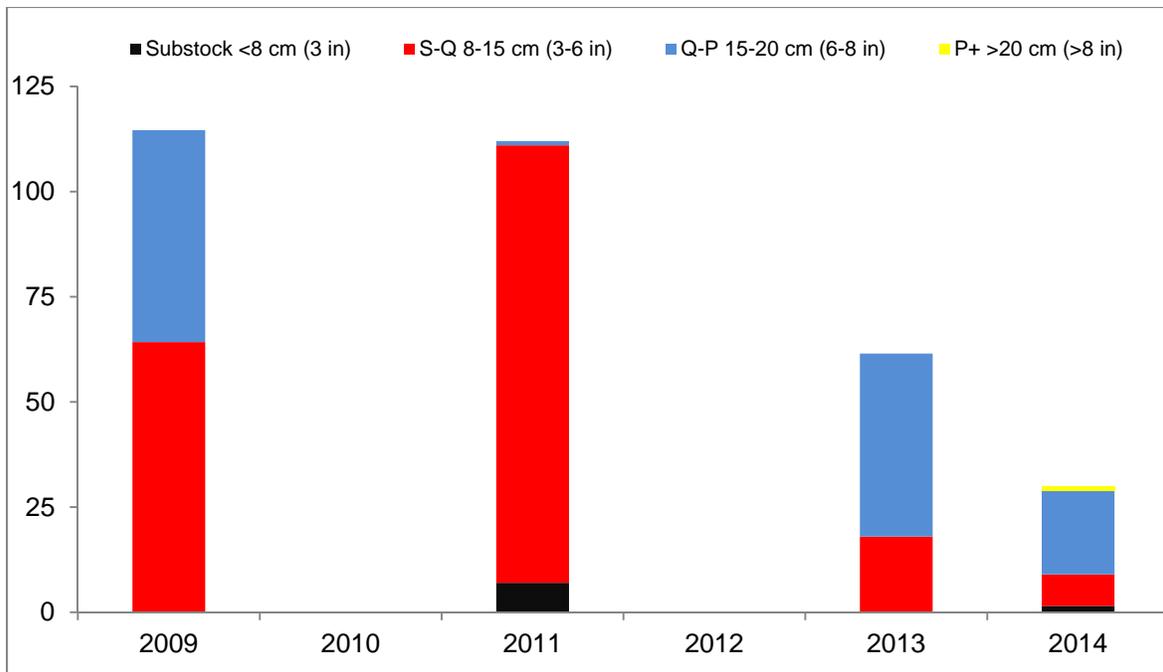
Bluegill CPUE and RSD-18 both met the GFP objective for the first time in 10 years (Table 10). It is apparent that bluegill growth is density dependent and slows at population densities corresponding to an electrofishing CPUE of over 100. A decline in the abundance of black crappies (Table 12) may also be helping to promote better growth in bluegills. The population should currently provide a fishery with 30% of stock-length fish now at 18-20 cm (7-8 in) long.

**Table 10.** CPUE, PSD, RSD-P, and mean  $W_r$  for all bluegill sampled with electrofishing in Wilmarth Lake, Aurora County, 2005-2014. Stocked years are shaded.

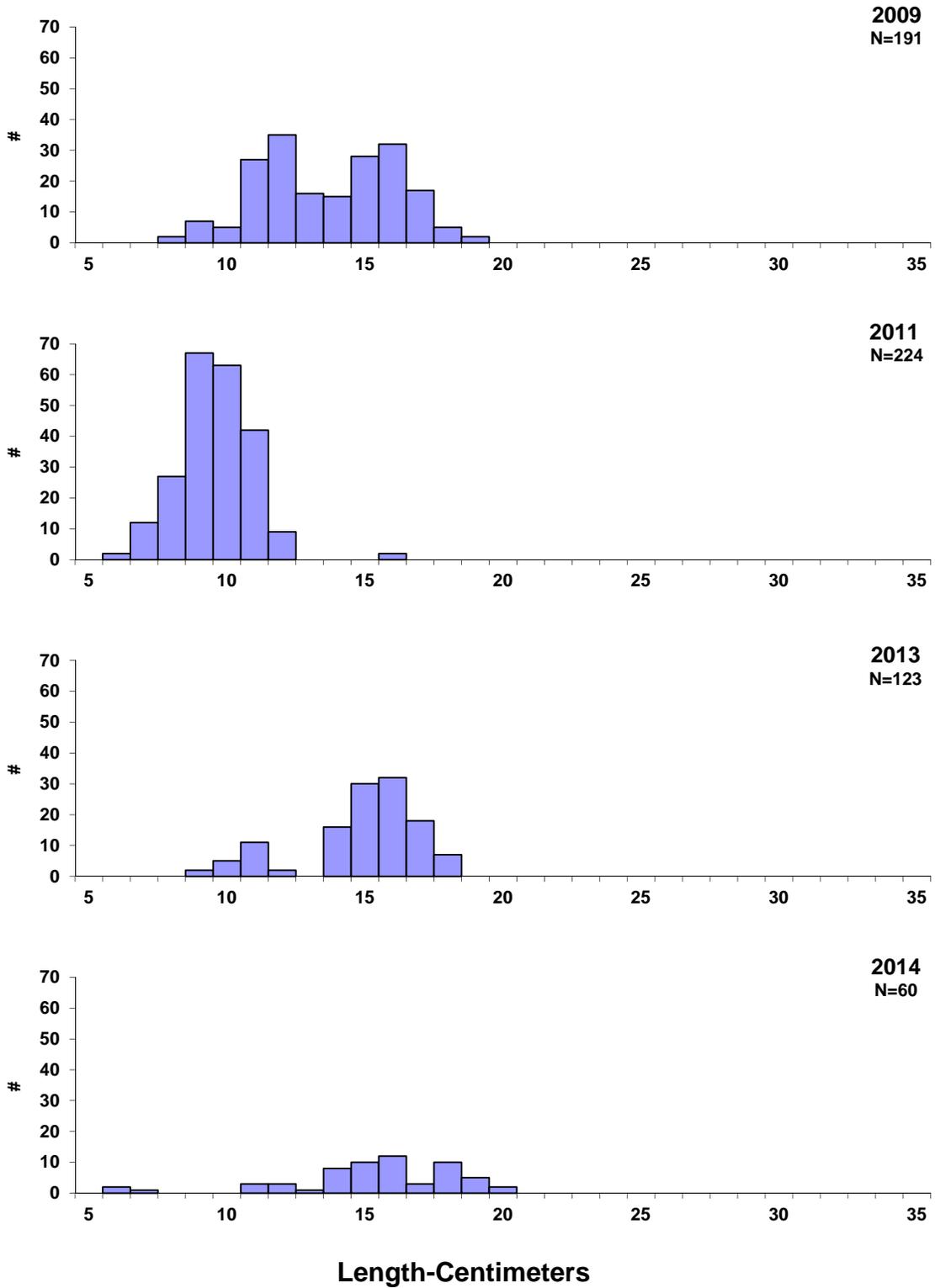
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>CPUE</b>	19.0		109.8		114.6		112.0		61.5	30.0
<b>PSD</b>	28		31		44		1		71	74
<b>RSD-18</b>	6		4		0		0		6	30
<b>RSD-P</b>	3		1		0		0		0	4
<b>Mean <math>W_r</math></b>	123		139		114		--		106	120

**Table 11.** Weighted mean length at capture (mm) for bluegill sampled with electrofishing in Wilmarth Lake, Aurora 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 (60)	78 (1)	120 (7)	146 (3)	162 (34)	191 (9)	189 (6)	--	--	--	--
2013 (123)	--	112 (20)	162 (67)	164 (30)	158 (6)	--	--	--	--	--
2011 (210)	--	101 (205)	140 (5)	--	--	--	--	--	--	--
2009 (193)	--	121 (103)	161 (72)	167 (16)	190 (2)	--	--	--	--	--
2007 (184)	91 (9)	145 (161)	142 (5)	190 (9)	--	--	--	--	--	--
2005 (35)	85 (1)	136 (30)	167 (3)	160 (1)	--	--	--	--	--	--



**Figure 4.** CPUE by length category for bluegill sampled with electrofishing in Wilmarth Lake, Aurora, County, 2009-2014.



**Figure 5.** Length frequency histograms for bluegill sampled by electrofishing in Wilmarth Lake, Aurora County, 2009, 2011, 2013, and 2014.

## **Black Crappie**

### **Management Objective**

- Maintain a black crappie fishery with an electrofishing CPUE of 25-50 and a RSD-23 of at least 20.

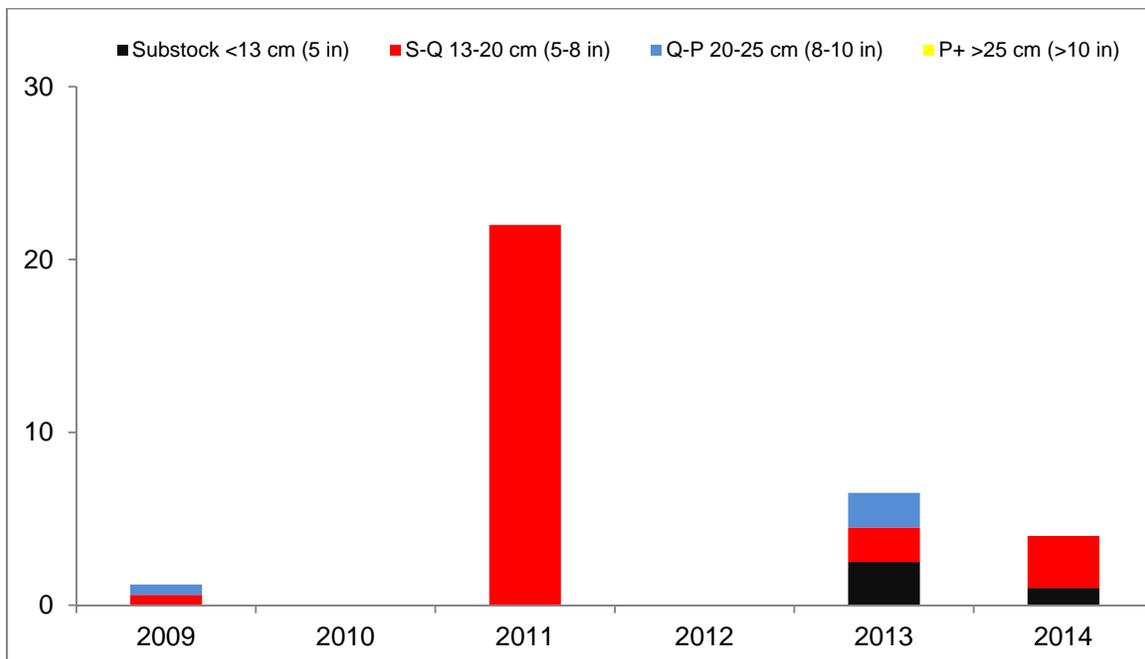
### **Management Strategies**

- Monitor the population by nighttime electrofishing annually.
- Attempt to maintain largemouth bass as an effective predator upon bluegills in order to crop the population to promote good growth.

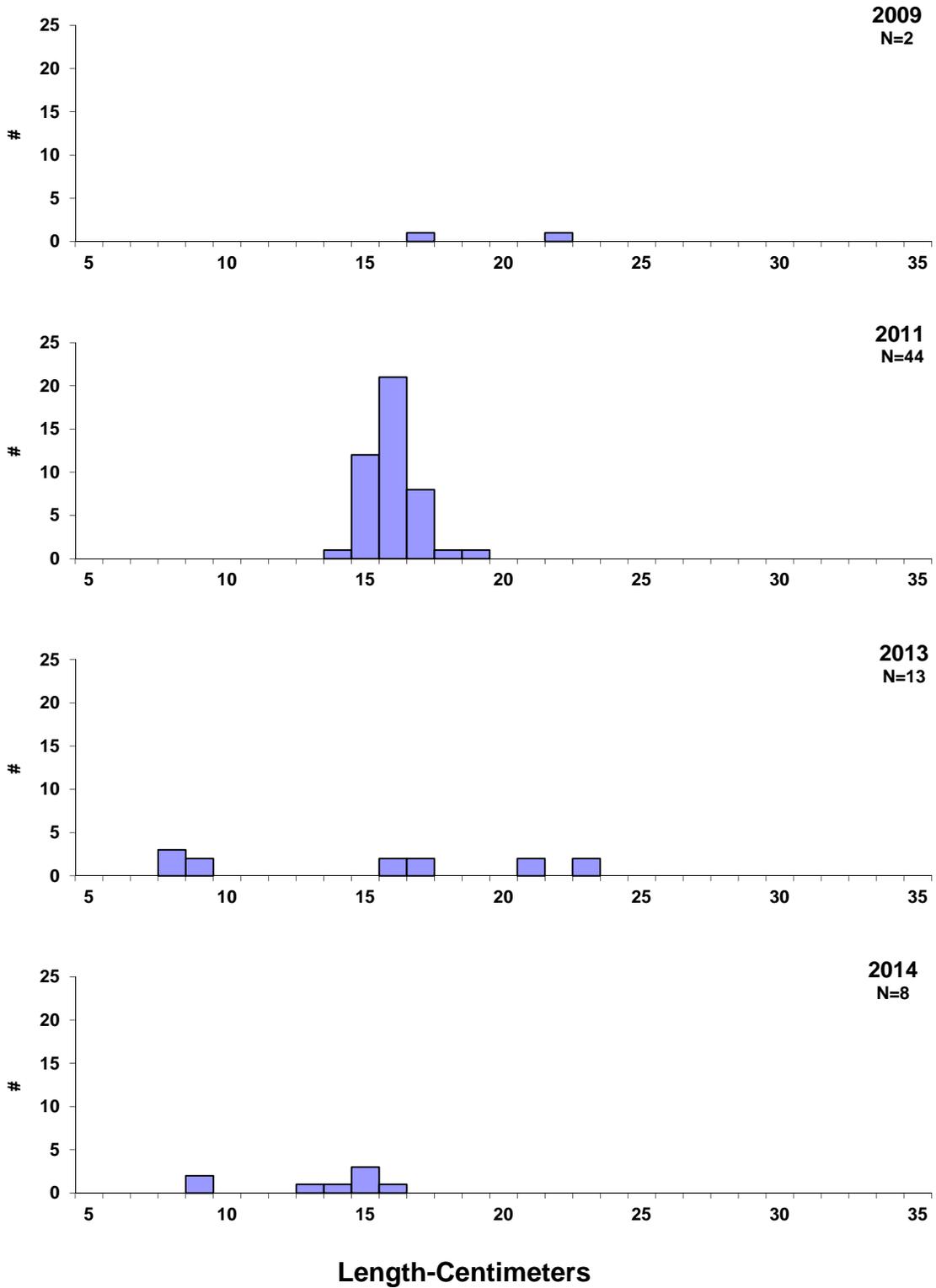
Black crappie abundance has been low since 2011 (Table 12). The fluctuating CPUE reflects a very cyclical population with highly sporadic recruitment. Moreover, no larger crappies were sampled by electrofishing in 2013 or 2014 (Figures 6 and 7).

**Table 12.** CPUE, PSD, RSD-P, and mean *Wr* for all black crappie sampled with electrofishing in Wilmarth Lake, Aurora County, 2005-2014. Stocked years are shaded.

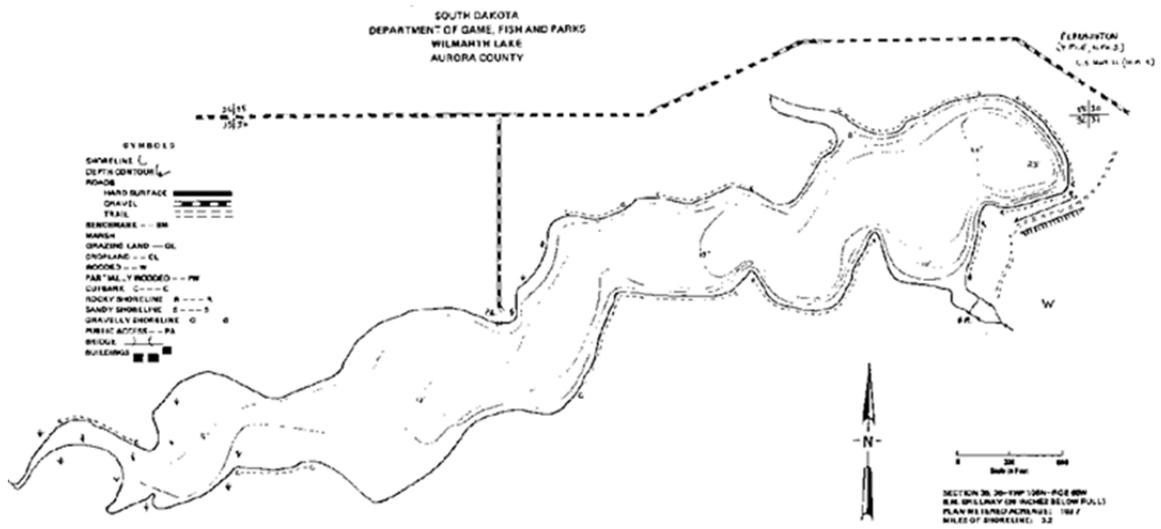
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>CPUE</b>	0.3	44.4			1.2		22.0		6.5	4.0
<b>PSD</b>	--		38		--		0		--	--
<b>RSD-23</b>	--		0		--		0		--	--
<b>RSD-P</b>	--		0		--		0		--	--
<b>Mean <i>Wr</i></b>	--		109		--		90		--	--



**Figure 6.** CPUE by length category for black crappie, sampled with electrofishing in Wilmarth Lake, Aurora County, 2009-2014.



**Figure 7.** Length frequency histograms for black crappie sampled by electrofishing in Wilmarth Lake, Aurora County, 2009, 2011, 2013, and 2014.



**Figure 8.** Contour map of Wilmarth Lake, Aurora 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 (Inches in parenthesis).

<b>Species</b>	<b>Stock</b>	<b>Quality</b>	<b>Preferred</b>	<b>Memorable</b>	<b>Trophy</b>
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.