

**Minnesota Department of Natural Resources  
Division of Fisheries and Wildlife**

**Completion Report**

**Evaluation of Centrarchid Populations throughout Leech Lake  
2015**

**by**


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**Walker Area Fisheries Office**

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2015**

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## INTRODUCTION

Leech Lake is renowned among anglers as an exceptional multi-species fishery. Although summer creel surveys continue to indicate the majority of anglers target walleye ( $\bar{x} = 64\%$ ; Stevens and Ward 2015), the proportion of anglers targeting Centrarchids has an increasing trend (Table 1). The four summer creel surveys conducted throughout the 1990s indicated 3% of anglers targeted Centrarchids, while that percentage has increased to 7% over the past seven surveys. On average, summer creel surveys since the early 2000s have indicated anglers caught 41,086 bluegill, 12,333 largemouth bass, and 12,369 black crappie, while they harvested 17,987, 2,029, and 8,712, respectively. Leech Lake also has supported as many as seven large (>50 boats) bass tournaments annually during the past decade. Thus, given the increasing attention from anglers as well as the likelihood Leech Lake will be impacted by ecosystem changes (invasive species introductions, warming climate, etc.), bluegill, largemouth bass, and black crappie were targeted for a comprehensive assessment during spring.

Standardized large lake sampling gears such as gill nets are intended to target walleye, northern pike, yellow perch, and cisco. This gear does not adequately sample Centrarchids and alternate sampling techniques are being evaluated. Based on criteria stated within the Fisheries Management Plan for Leech Lake 2016-2020, spring assessments will be conducted every three years, with sampling methodology, location, and timing becoming standardized by 2018. The intent of this sampling is to monitor for potential changes in size structure and catch rates. The initial lakewide Centrarchid survey was completed in 2012, and this report compiles the 2012 and 2015 electrofishing assessments and serves as a benchmark for future stock assessments of this subset of the Leech Lake fish community.

## STUDY AREA

Leech Lake has approximately 112,000 surface acres and 201 miles of shoreline. The maximum depth of the lake is near 150 feet; however, nearly 52 percent or 57,994 acres of the lake is  $\leq 15$  feet deep (littoral acres, Figure 1). Leech Lake varies considerably from a morphological perspective and contains bays with eutrophic, mesotrophic, and oligotrophic characteristics. Steamboat, Boy, and Headquarters display eutrophic characteristics, whereas Portage, Sucker, and Shingobee have mesotrophic characteristics, while Walker, Kabekona, and Agency, have properties more congruent with oligotrophic lakes. The main portion of the lake, like most large Minnesota walleye lakes, is mesotrophic. Approximately 53 percent of the shoreline was classified as either having dense aquatic vegetation, moderate aquatic vegetation, or phragmites and cattails, nearly all of which is used as habitat by Centrarchids (Wilcox 1979).

The diversity of the Leech Lake shoreline and substrate, as well as its extensive littoral zone, provides excellent spawning and nursery habitats for a number of fish species, including bluegill *Lepomis macrochirus*, largemouth bass *Micropterus salmoides*, and black crappie *Pomoxis nigromaculatus*.

## METHODS

In attempts to refine sampling methodology, location, and timing, sampling procedures varied between the spring 2012 and 2015 assessments. In 2012, spring nighttime electrofishing was used to target Centrarchids from late-May through early-June. Sampling was conducted using a two-person crew in a Coffelt pulsed-DC electrofishing boat (VVP 2E; single array anode). Forty-nine stations were sampled lakewide, with four to six stations per major bay (Figure 2). Transects were approximately 3-5 feet deep on shorelines with both submergent and emergent aquatic macrophytes. Transects consisted of 20 minutes of continuous on-time from the starting point. Sampling typically started at 2200 hours and concluded at 0400 hours. All target species sampled were measured and recorded (TL, mm) in the boat. Subsampling for otolith removal and sex identification consisted of five fish from each 10 mm length group up to 300 mm, and 10 fish from each 25 mm length group for all fish over 300 mm, per target species, per major bay. Subsampled fish were placed on ice and returned to the office. Once length groups were filled in the field, all other target species sampled were measured and released.

Fish returned to the office were separated by station, and processed within six hours. Fish were identified to species, measured (TL, mm), and weighed (g). Sex and maturity data were also determined, and otoliths were removed from all individuals for aging. The size structure of target species sampled was quantified using length frequency indices calculating proportional stock density (PSD-Q) and relative stock density (RSD-P; Gabelhouse 1984). Condition was assessed for each species and sex by calculating the relative weight ( $W_r$ ; Anderson and Neumann, 1996).

There were several differences between data collection methodology, location, and timing in 2012 and 2015. In 2015, sampling occurred from mid to late-May, 51 stations were sampled (Figure 3), transects consisted of 10 minutes of continuous on-time from the starting point (with almost all starting points remaining the same between surveys), and sampling was conducted using a two-person crew in a Midwest Lake Electrofishing Systems (MLES) electrofishing boat with pulsed-DC (MLM – Infinity Unit; double array anode).

## RESULTS

### *Sampling*

Fish were sampled from May 28 through June 15, 2012, while fish were sampled from May 19 through May 26, 2015. Water temperatures ranged between 60 and 74° F in 2012, compared to 52 and 58° F in 2015. The total number of on-time minutes electrofished was 980 (16 hours, 33 minutes) in 2012, compared to 501 minutes (8 hours, 21 minutes).

### *Bluegill*

A total of 412 and 393 bluegills were sampled in the five major bays in 2012 and 2015, respectively (Table 2). Overall catch rates were 31 and 46 fish/hour in 2012 and 2015, respectively (Table 2). Catch rates for fish  $\geq 6$  inches were 16/hour in 2012 and 19/hour in 2015,

while catch rates for fish  $\geq 8$  inches were 8/hour in 2012 and 3/hour in 2015 (Table 3, Figure 4). Length distributions ranged from 1.5-10.1 inches in 2012 and ranged from 2.9-9.4 inches in 2015 (Figure 5). The size structure of bluegill sampled in Leech Lake in both 2012 and 2015 was comparable or better than that of many other Walker area lakes considered to have quality populations (Table 6). Age distributions ranged from 1-12 in 2012 and 3-13 in 2015 (Table 7, Figure 6). Length and age at 50% maturity for male bluegills were 4.3 inches and 2.9 years in 2012, and 4.9 inches and 4.0 years in 2015 (Table 8). The condition ( $W_r$ ) of male, female, and all fish sampled collectively was good in both 2012 and 2015, with mean values between 109 and 115 (Table 9).

### *Largemouth Bass*

A total of 201 and 130 largemouth bass were sampled in the five major bays in 2012 and 2015, respectively (Table 2). Overall catch rates were 15 fish/hour in both 2012 and 2015 (Table 2). Catch rates for fish  $\geq 12$  inches were 7/hour in 2012 and 13/hour in 2015, while catch rates for fish  $\geq 15$  inches were 5/hour in 2012 and 6/hour in 2015 (Table 4, Figure 4). The catch rates of largemouth bass sampled in Leech Lake in both 2012 and 2015 were lower than many other Walker area lakes considered to have abundant populations (Table 10). Length distributions ranged from 2.6-19.4 inches in 2012 and ranged from 4.1-18.4 inches in 2015 (Figure 7). The size structure of largemouth bass sampled in Leech Lake in both 2012 and 2015 was comparable or better than that of many other Walker area lakes considered to have quality populations (Table 6). Age distributions ranged from 1-16 in 2012 and 1-15 in 2015 (Table 7, Figure 8). Length and age at 50% maturity for female largemouth bass were 11.2 inches and 3.5 years in 2012, and 11.0 inches and 3.1 years in 2015 (Table 8). The condition ( $W_r$ ) of male, female, and all fish sampled collectively was good in both 2012 and 2015, with mean values between 110 and 113 (Table 9).

### *Black Crappie*

A total of 52 and 74 black crappie were sampled in the five major bays in 2012 and 2015, respectively (Table 2). Overall catch rates were 4 and 9 fish/hour in 2012 and 2015, respectively (Table 2). Catch rates for fish  $\geq 8$  inches were 4/hour in 2012 and 7/hour in 2015, while catch rates for fish  $\geq 10$  inches were 4/hour in 2012 and 5/hour in 2015 (Table 5, Figure 4). The catch rates of black crappie sampled in Leech Lake in both 2012 and 2015 were lower than many other Walker area lakes considered to have good populations (Table 10). Length distributions ranged from 2.7-14.3 inches in 2012 and ranged from 2.8-14.2 inches in 2015 (Figure 9). The size structure of black crappie sampled in Leech Lake in both 2012 and 2015 was comparable to many other Walker area lakes considered to have quality populations (Table 6). Age distributions ranged from 1-12 in 2012 and 2-12 in 2015 (Table 7, Figure 10). Length and age at 50% maturity for female black crappie were 7.8 inches and 2.5 years in 2012, and 6.8 inches and 1.9 years in 2015 (Table 8). The condition ( $W_r$ ) of male, female, and all fish sampled collectively was average in both 2012 and 2015, with mean values between 97 and 100 (Table 9).

## DISCUSSION

Size structure of bluegill, largemouth bass and black crappie populations in Leech Lake was similar or better than many Walker area lakes (Table 6); however, catch rates for largemouth bass and black crappie were typically lower (Table 10). Bluegills are typically sampled with trap nets instead of electrofishing so catch rates could not be compared to area lakes and comparisons with size structure across lakes should be made cautiously because electrofishing selects for larger individuals. Despite special regulations occurring on most area lakes in which comparisons were made, Leech Lake currently possesses quality Centrarchid populations.

The age structure for both bluegill and largemouth bass indicate consistent recruitment occurs, with almost all age-classes represented for ages one through ten and one through sixteen, respectively. The age structure for black crappie also indicated fairly consistent recruitment occurs with most age-classes represented, although the sample sizes were low given the effort expended. Recruitment of all three species is benefitted by 52 percent of the lake being  $\leq 15$  feet deep, by 53 percent of the shoreline having either emergent or submergent aquatic vegetation, and by the considerable amount of protection afforded with publically owned shoreline prohibiting development.

Some of the first physical signs of increased mortality on a population include decreased age and size at sexual maturity. For most species females have a higher likelihood of being harvested as they typically obtain greater lengths, and is true for both largemouth bass and black crappie. However, sexual dimorphism is reversed for bluegill which results in males having a higher likelihood of being harvested for their size (Beard et al. 1997, Drake et al. 1997), and their nest guarding behavior (Becker 1983). During both 2012 and 2015, male bluegill length and age at 50% maturity ranged between 4.3-4.9 inches and 2.9-4.0 years. This compares to 6.9 inches and 6.6 years on some Minnesota lakes (Drake et al. 1997) and 6.1 inches and 5.8 years and on other Minnesota Lakes (Jacobson 2005). When these data were compared to other studies in Minnesota, it would suggest exploitation rates could be higher on Leech Lake than the other lakes referenced, but the effect of gear selectivity on these statistics is unknown. Comparisons for length and age at 50% maturity for largemouth bass and black crappie to other Minnesota populations are similar (McInerny 2014).

The condition indices ( $W_r$ ) of bluegill and largemouth bass sampled were good (109-115), while condition for black crappie was average (97-100). Throughout most of the year condition reflects the amount of visceral fat reserves a fish has; however, during the spawning period it more commonly reflects gonad weight, and this is exaggerated in females. Because male and female condition indices for all three species were between average and good, there are no apparent concerns with food availability or feeding conditions. Condition values below 85 can be associated with limited food availability, and poor feeding conditions (Anderson and Neumann 1996).

## RECOMMENDATIONS

The 2012 and 2015 electrofishing assessments were the first attempts to target bluegill, largemouth bass, and black crappie on Leech Lake during the spawning period. A substantial amount of effort was exerted to sample approximately 50 stations each year. Sampling was



highly dependent on weather and wind conditions, which were quite variable on such a large lake. As a result, it took a time span of 19 nights to accomplish 10 nights of work in 2012 and eight nights to accomplish five nights of work in 2015. A goal for the field work portion of this assessment in both years was to sample more stations than were planned for future surveys so the most representative stations could be selected. Based on criteria stated within the Fisheries Management Plan for Leech Lake 2016-2020, spawning assessments will be conducted every three years, with sampling methodology, location, and timing becoming standardized by 2018. Prior to 2018, exploratory searches in rocky areas throughout the lake will continue to be conducted with night electrofishing to locate and establish three additional smallmouth bass electrofishing stations. No stations targeting this type of habitat were selected in 2012 or 2015, and only one incidental smallmouth bass was sampled overall. Although traps nets are a more standard gear type to be used to sample bluegill and black crappie for spawner assessments, electrofishing was used to maximize efficiency. Trap netting will be evaluated to sample black crappie and bluegill populations prior to 2018, as black crappie were ineffectively sampled with electrofishing gear in both years and trap nets are the traditional gear used to sample bluegill, thus making comparisons across lakes more valid. A subset of current electrofishing stations is recommended for largemouth bass starting in 2018.

A substantial proportion of Centrarchids sampled throughout this electrofishing assessment were sacrificed for age and sex determination. However, the number sacrificed was less than 4% of what anglers annually harvest for these three species (Table 1). Future surveys will only include a subset of the stations sampled within this survey so fewer fish will be sampled and sacrificed to monitor growth, maturity, and recruitment.

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## **TABLES**

Table 1. The estimated total catch and harvest statistics by number for Centrarchids from the summer creel season, Leech Lake, MN, 1991-2014. The species sought by boat parties is also included.

	Year											Mean
	1991 <sup>1</sup>	1992 <sup>2</sup>	1998 <sup>3</sup>	1999 <sup>4</sup>	2004 <sup>5</sup>	2005 <sup>6</sup>	2008 <sup>7</sup>	2009 <sup>8</sup>	2010 <sup>9</sup>	2011 <sup>10</sup>	2014 <sup>11</sup>	
	<i>Number of Fish Caught</i>											
Bluegill	44,400	31,637	31,816	17,899	37,190	72,886	62,945	43,832	52,825	49,465	7,056	41,086
Black Crappie	13,029	8,936	5,204	4,508	4,302	11,016	12,017	35,180	6,179	15,614	20,069	12,369
Largemouth Bass	7,676	5,360	6,770	11,749	27,096	12,493	9,796	13,066	17,294	9,769	14,592	12,333
Smallmouth Bass	0	0	0	376	519	0	68	267	100	51	1,132	228
	<i>Number of Fish Harvested</i>											
Bluegill	22,978	16,728	14,599	11,220	12,789	22,322	30,992	21,136	21,620	19,664	3,810	17,987
Black Crappie	12,011	8,217	3,209	4,012	3,299	5,676	8,793	20,444	5,527	10,085	14,562	8,712
Largemouth Bass	1,024	1,466	2,649	2,349	4,085	3,105	2,412	1,243	2,611	851	527	2,029
Smallmouth Bass	0	0	0	0	0	0	0	36	15	0	149	18
	<i>Percentage of Time Targeted</i>											
Bluegill	1.1%	1.4%	0.5%	0.6%	4.2%	3.4%	0.4%	1.6%	2.3%	3.4%	1.3%	1.8%
Black Crappie	1.5%	1.4%	0.9%	0.7%	1.4%	2.1%	1.5%	2.6%	1.6%	1.6%	1.8%	1.6%
Largemouth Bass	1.0%	1.2%	1.5%	1.6%	4.0%	4.4%	2.1%	1.9%	3.2%	2.3%	2.3%	2.3%
Smallmouth Bass	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Centrarchid Total	3.6%	4.0%	2.9%	2.9%	9.8%	10.0%	4.0%	6.1%	7.1%	7.3%	5.4%	5.8%

<sup>1</sup> Haukos, N. A. 1992. 1991 summer creel survey and 1991-1992 winter creel survey for Leech Lake. MNDNR, Section of Fisheries, Completion Report, Study 2, Job 239.

<sup>2</sup> Haukos, N. A. 1993. 1992 summer creel survey and 1992 winter cisco survey for Leech Lake. MNDNR, Section of Fisheries, Completion Report, Study 2, Job 239.

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Table 2. Summary of overall bluegill, largemouth bass, and black crappie catch rates by major bay, Leech Lake in 2012 and 2015.

Year Sampled: 2012

Bay	Hours electrofished	Number sampled			Catch rate (number/hour)		
		Bluegill	Largemouth Bass	Black Crappie	Bluegill	Largemouth Bass	Black Crappie
Boy/Headquarters	3.7	157	100	12	43	27	3
Portage	2.0	13	26	21	7	13	11
Shingobee/Agency Narrows	3.3	146	15	7	44	5	2
Steamboat/Walker Narrows	2.7	70	18	2	26	43	1
Sucker	1.7	26	42	10	16	25	6
All Sites	13.3	412	201	52	31	15	4

Year Sampled: 2015

Bay	Hours electrofished	Number sampled			Catch rate (number/hour)		
		Bluegill	Largemouth Bass	Black Crappie	Bluegill	Largemouth Bass	Black Crappie
Boy/Headquarters	1.8	85	22	22	46	12	12
Portage	1.7	2	9	7	1	5	4
Shingobee/Agency Narrows	1.7	123	27	14	74	16	8
Steamboat/Walker Narrows	1.7	53	11	7	32	7	4
Sucker	1.7	130	61	24	78	37	14
All Sites	8.5	393	130	74	46	15	9

Table 3. Summary of bluegill catch rates by size by major bay, Leech Lake in 2012 and 2015.

Year Sampled: 2012

Bay	Hours e-fished	Bluegill NUMBER			Bluegill CPE (fish/hour)			Bluegill	
		≥3"	≥6"	≥8"	≥3"	≥6"	≥8"	RSD-Q (≥6")	RSD-P (≥8")
Boy/Headquarters	3.7	145	67	39	40	18	11	46	27
Portage	2.0	13	13	13	7	7	7	100	100
Shingobee/Agency Narrows	3.3	143	74	13	43	22	4	52	9
Steamboat/Walker Narrows	2.7	68	55	35	26	21	13	81	51
Sucker	1.7	26	19	10	16	11	6	73	38
Overall	16.3	395	228	110	26	16	8	58	28

Year Sampled: 2015

Bay	Hours e-fished	Bluegill NUMBER			Bluegill CPE (fish/hour)			Bluegill	
		≥3"	≥6"	≥8"	≥3"	≥6"	≥8"	RSD-Q (≥6")	RSD-P (≥8")
Boy/Headquarters	1.8	85	17	4	46	9	2	20	5
Portage	1.7	2	2	0	1	1	0	100	0
Shingobee/Agency Narrows	1.7	122	46	13	73	28	8	38	11
Steamboat/Walker Narrows	1.7	53	43	9	32	26	5	81	17
Sucker	1.7	130	50	1	78	30	1	38	1
Overall	16.3	392	158	27	46	19	3	40	7

Table 4. Summary of largemouth bass catch rates by size by major bay, Leech Lake in 2012 and 2015.

Year Sampled: 2012

Bay	Hours e-fished	Largemouth Bass NUMBER			Largemouth Bass CPE (fish/hour)			Largemouth Bass	
		≥8"	≥12"	≥15"	≥8"	≥12"	≥15"	RSD-Q (≥12")	RSD-P (≥15")
Boy/Headquarters	3.7	57	47	37	16	13	10	82	65
Portage	2.0	15	15	14	8	8	7	100	93
Shingobee/Agency Narrows	3.3	11	9	6	3	3	2	82	55
Steamboat/Walker Narrows	2.7	12	9	6	5	3	2	75	50
Sucker	1.7	33	18	10	20	11	6	55	30
Overall	16.3	128	98	73	10	7	5	77	57

Year Sampled: 2015

Bay	Hours e-fished	Largemouth Bass NUMBER			Largemouth Bass CPE (fish/hour)			Largemouth Bass	
		≥8"	≥12"	≥15"	≥8"	≥12"	≥15"	RSD-Q (≥12")	RSD-P (≥15")
Boy/Headquarters	1.8	21	21	12	11	11	7	100	57
Portage	1.7	9	9	9	5	5	5	100	100
Shingobee/Agency Narrows	1.7	27	26	15	16	16	9	96	56
Steamboat/Walker Narrows	1.7	10	8	3	6	5	2	80	30
Sucker	1.7	60	45	9	36	27	5	75	15
Overall	16.3	127	109	48	15	13	6	86	38



Table 5. Summary of black crappie catch rates by size by major bay, Leech Lake in 2012 and 2015.

Year Sampled: 2012

Bay	Hours e-fished	Black Crappie NUMBER			Black Crappie CPE (fish/hour)			Black Crappie	
		≥5"	≥8"	≥10"	≥5"	≥8"	≥10"	RSD-Q (≥8")	RSD-P (≥10")
Boy/Headquarters	3.7	12	6	6	3	2	2	50	50
Portage	2.0	20	20	20	10	10	10	100	100
Shingobee/Agency Narrows	3.3	6	1	1	2	0	0	17	17
Steamboat/Walker Narrows	2.7	2	1	0	1	0	0	50	0
Sucker	1.7	10	10	10	6	6	6	100	100
Overall	16.3	50	38	37	4	4	4	76	74

Year Sampled: 2015

Bay	Hours e-fished	Black Crappie NUMBER			Black Crappie CPE (fish/hour)			Black Crappie	
		≥5"	≥8"	≥10"	≥5"	≥8"	≥10"	RSD-Q (≥8")	RSD-P (≥10")
Boy/Headquarters	1.8	20	15	11	11	8	6	75	55
Portage	1.7	7	7	6	4	4	4	100	86
Shingobee/Agency Narrows	1.7	12	9	6	7	5	4	75	50
Steamboat/Walker Narrows	1.7	7	7	6	4	4	4	100	86
Sucker	1.7	24	23	17	14	14	10	96	71
Overall	16.3	70	61	46	8	7	5	87	66

Table 6. The percentage of bluegill, largemouth bass, and black crappie sampled that were stock size (PSD) and preferred size (RSD-P) sampled in Leech Lake in 2012 and 2015. Values for other area lakes and year surveyed are also represented.

	Leech 2012	Leech 2015	Lind* 2008	Lind* 2009	May 2001	May 2006	Ox Yoke* 2001	Ox Yoke* 2006	Sanborn* 2001	Sanborn* 2006	Widow 2001	Widow 2006
Bluegills												
PSD-Q (≥6")	58	40	99	96	32	65	78	88	87	68	28	75
RSD-P (≥8")	28	7	33	42	2	5	0	4	17	7	3	5

	Leech 2012	Leech 2015	Blackwater* 2011	Hovde* 2011	Mule* 2011	Thirteen* 2010	Moccasin* 2010	Stony* 2010	Portage* 2010
Largemouth Bass									
PSD-Q (≥12")	77	86	91	88	77	49	83	66	71
RSD-P (≥15")	57	38	32	4	21	17	38	34	34

	Leech 2012	Leech 2015	Blackwater 2006	Blackwater 2009	Mocassin 2005	Mocassin 2010	Stony 2004	Stony 2005
Black Crappie								
PSD-Q (≥8")	76	87	77	80	100	100	93	90
RSD-P (≥10")	74	66	31	40	20	68	93	70

\* indicates lake has special regulations for this species

Table 7. Mean length (inches) at age for bluegill, largemouth bass, and black crappie sampled in Leech Lake in 2012 and 2015.

Year Sampled: 2012

Bluegill	Age															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Unknown Immature</i>	2.6	3.2														
<i>Male Immature</i>		3.8	4.4													
<i>Male Mature</i>			4.9	6.1	6.9	7.8	8.3	8.6	9.0	9.0						
<i>Female Immature</i>	3.3	3.9	4.5													
<i>Female Mature</i>			5.1	6.5	7.0	7.4	8.2	9.1	9.5	9.4						
<hr/>																
<b>Largemouth Bass</b>																
<i>Unknown Immature</i>	4.2															
<i>Male Immature</i>	5.1	8.5														
<i>Male Mature</i>		10.0	10.9	13.8	14.5	14.8	15.3	15.6	15.7	16.0	16.4	17.3	17.6		17.9	18.5
<i>Female Immature</i>	5.0	8.2	9.6													
<i>Female Mature</i>				13.2	14.2	14.8	15.5	15.8	16.3	16.6	17.1	17.6	18.1	18.3	19.0	19.4
<hr/>																
<b>Black Crappie</b>																
<i>Unknown Immature</i>	3.0															
<i>Male Immature</i>		4.4														
<i>Male Mature</i>		6.2		11.5	11.8	12.2	12.4			13.1	13.4	13.8				
<i>Female Immature</i>		5.8														
<i>Female Mature</i>			9.1			10.9	12.1	12.8		13.1		13.8	14.3			

Year Sampled: 2015

Bluegill	Age															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Unknown Immature</i>																
<i>Male Immature</i>				4.8												
<i>Male Mature</i>				5.0	6.9	7.8		9.1	9.0	9.1		9.3				
<i>Female Immature</i>			3.0	4.3												
<i>Female Mature</i>				5.3	6.6	7.6		9.2	8.8	9.2		9.4				
<hr/>																
<b>Largemouth Bass</b>																
<i>Unknown Immature</i>	4.1															
<i>Male Immature</i>		7.5														
<i>Male Mature</i>			11.0	12.9	14.4				15.8	17.3			17.0	18.0		
<i>Female Immature</i>		7.5	10.2													
<i>Female Mature</i>			11.6	13.1	14.8		16.9	16.2	17.2	17.1		17.1		18.3		
<hr/>																
<b>Black Crappie</b>																
<i>Unknown Immature</i>																
<i>Male Immature</i>																
<i>Male Mature</i>			8.2	10.6	11.8	12.1	12.2	12.9	13.6							
<i>Female Immature</i>		5.6	7.5	8.1												
<i>Female Mature</i>		6.4	8.3	10.4	11.5				13.3	13.5						

Table 8. Comparisons of length and age at 50% maturity of bluegill, largemouth bass, and black crappie sampled in Leech Lake in 2012 and 2015.

	2012		2015	
	Length at 50% maturity	Age at 50% maturity	Length at 50% maturity	Age at 50% maturity
Bluegill (male)	4.3	2.9	4.9	4.0
Largemouth Bass (female)	11.2	3.5	11.0	3.1
Black Crappie (female)	7.8	2.5	6.8	1.9

Table 9. The relative weight (Wr) for bluegill, largemouth bass, and black crappie sampled in Leech Lake in 2012 and 2015.

Year Sampled: 2012

Species	Male	Female	Overall
Bluegill	111	113	112
Largemouth Bass	111	110	110
Black Crappie	97	97	97

Year Sampled: 2015

Species	Male	Female	Overall
Bluegill	115	109	110
Largemouth Bass	113	113	113
Black Crappie	98	100	100

Table 10. Catch rate (number/hour) comparisons for largemouth bass and black crappie sampled in Leech Lake in 2012 and 2015 compared to other recent surveys on other Walker area lakes.

Largemouth Bass

Lake/year	Leech 2012	Leech 2015	Blackwater* 2011	Hovde* 2011	Mule* 2011	Thirteen* 2010	Moccasin* 2010	Stony* 2010	Portage* 2010
Catch rate	15	15	72	51	85	93	141	69	69

Black Crappie

Lake/year	Leech 2012	Leech 2015	Blackwater 2006	Blackwater 2009	Moccasin 2005	Moccasin 2010	Stony 2004	Stony 2005
Catch rate	4	9	11	2	11	17	13	10

\* indicates lake has special regulations for this species

## **FIGURES**

# Leech Lake - Littoral Zone



**Legend**

 Leech Lake Littoral Area

Littoral Area is estimated and considered water depth less than or equal to 15 feet



0 1.25 2.5 5 Miles



Map created by: Carl Pedersen 04/18/2013



Figure 1. Map of the littoral area ( $\leq 15$  feet) of Leech Lake.



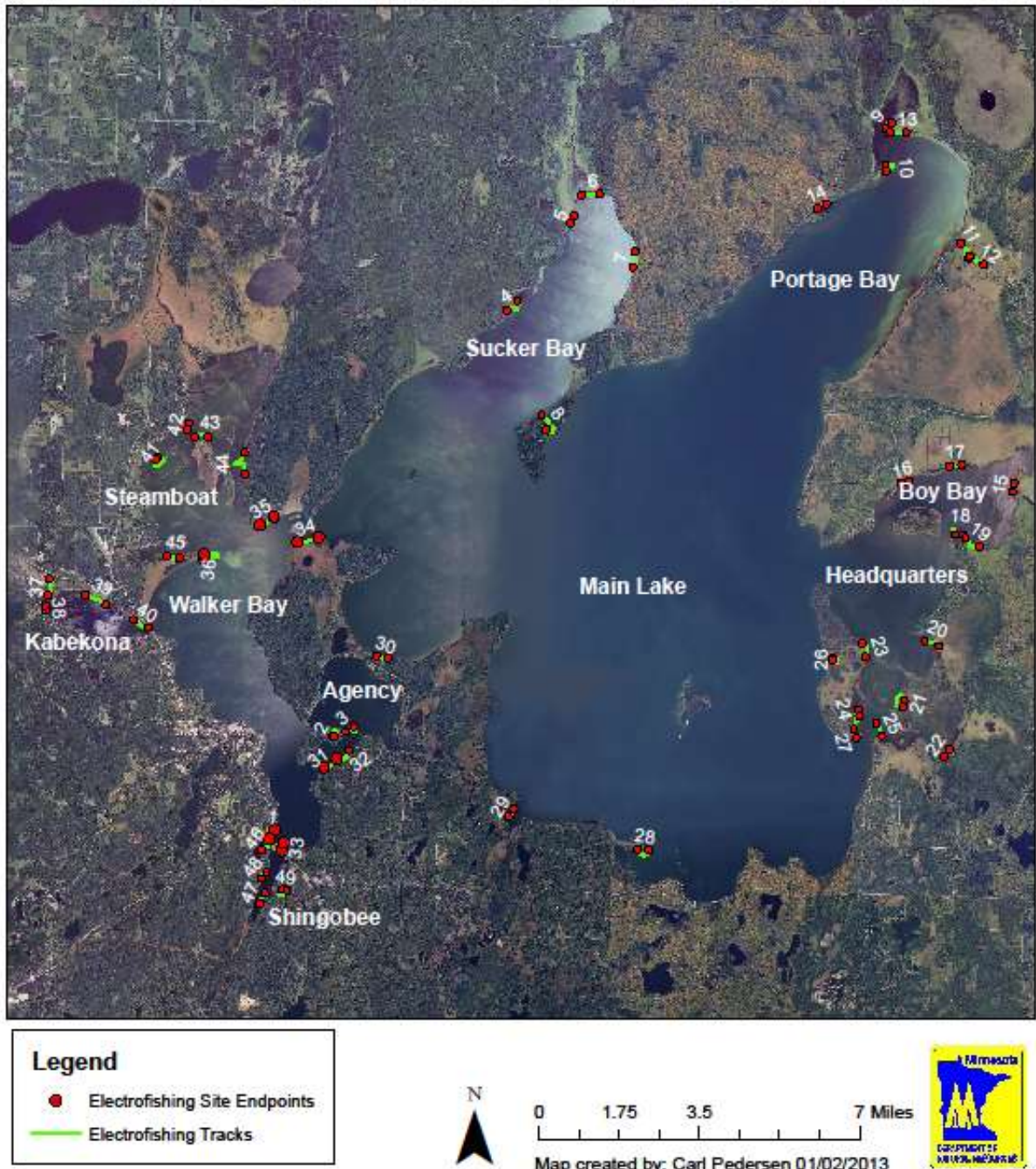


Figure 2. Map of the electrofishing stations for Leech Lake, 2012.

# Leech Lake Electrofishing Sites for Largemouth Bass, Bluegill, and Black Crappie - 2015

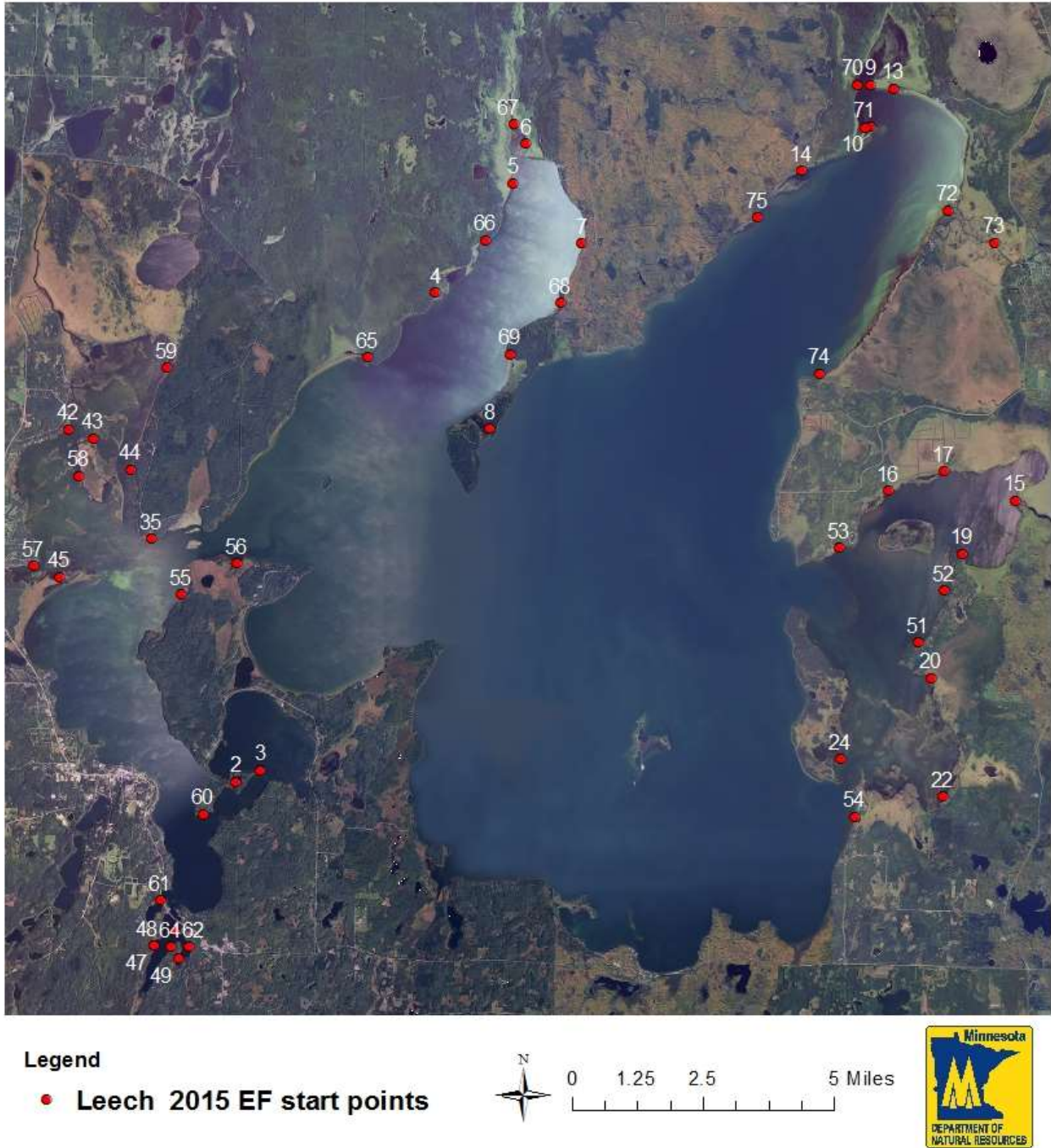


Figure 3. Map of the electrofishing stations for Leech Lake, 2015.



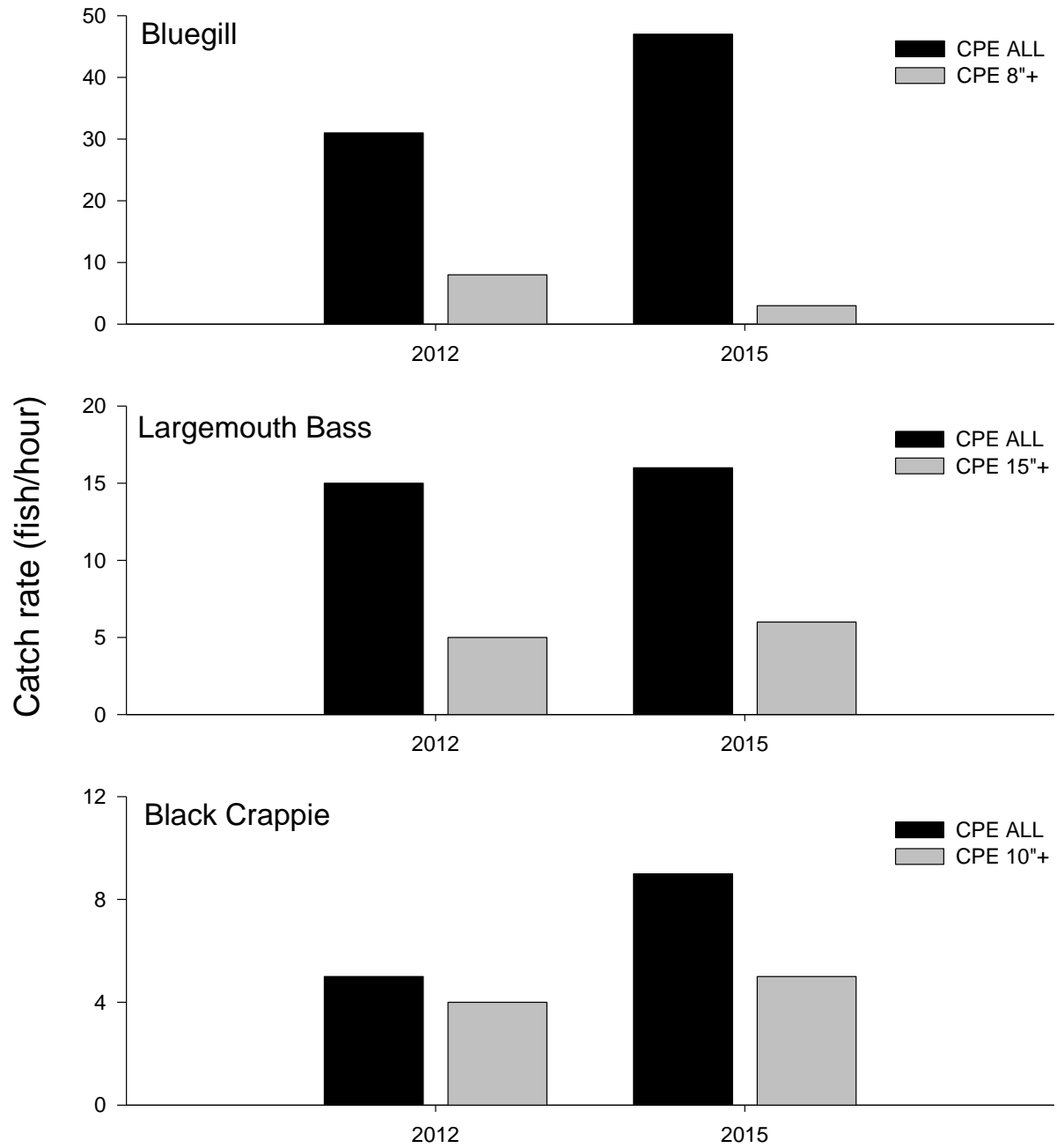


Figure 4. Catch rates (fish/hour) for bluegill, largemouth bass, and black crappie sampled in Leech Lake in 2012 and 2015.

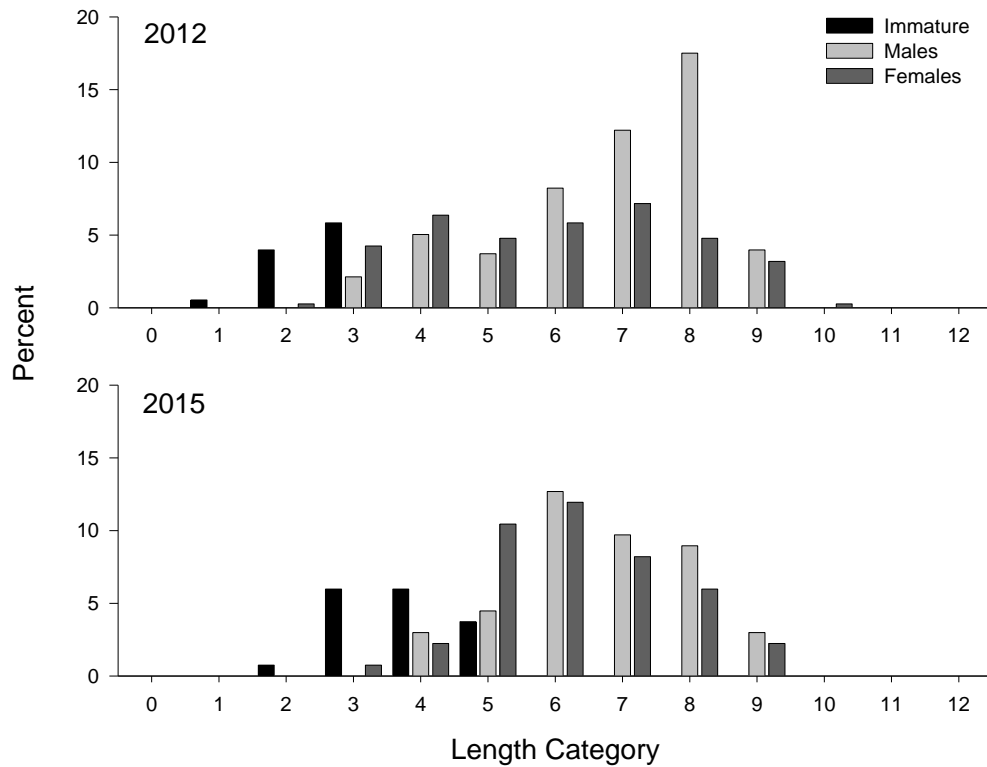


Figure 5. Length-frequency of bluegill sampled in Leech Lake in 2012 and 2015.

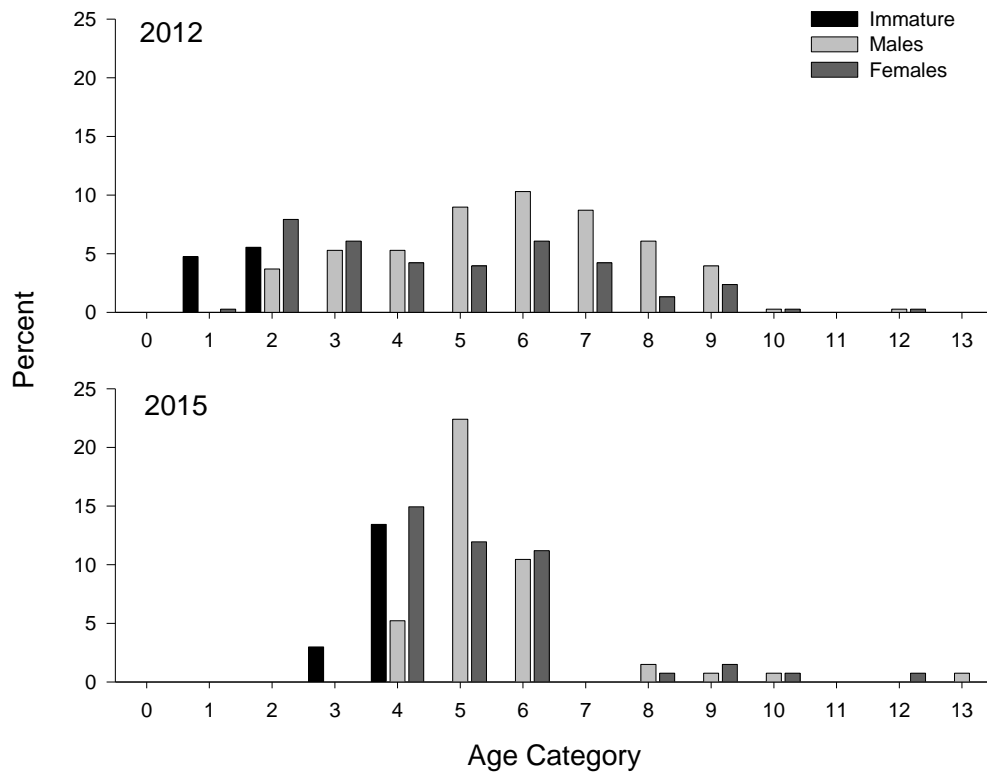


Figure 6. Age-frequency of bluegill sampled in Leech Lake in 2012 and 2015.

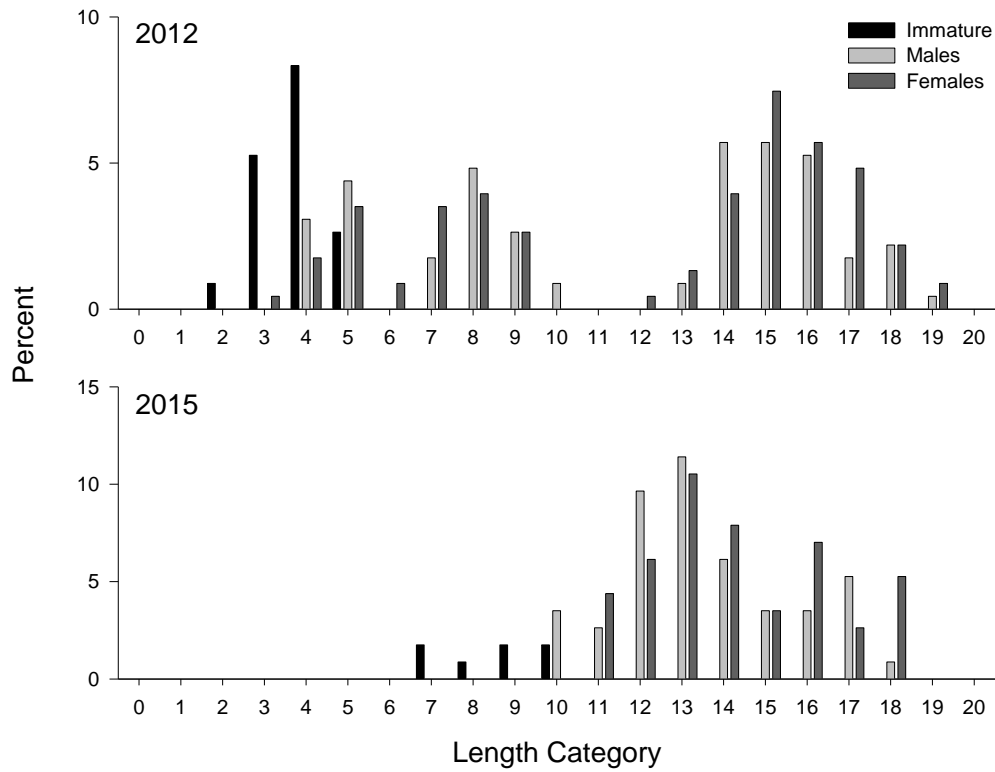


Figure 7. Length-frequency of largemouth bass sampled in Leech Lake in 2012 and 2015.

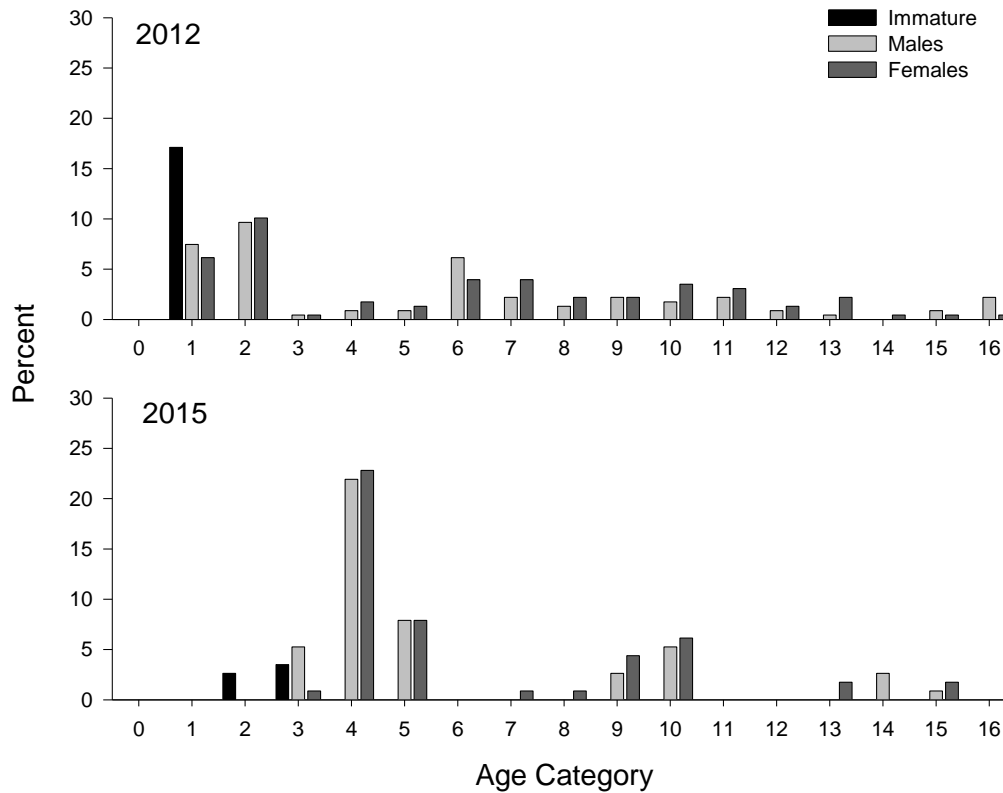


Figure 8. Age-frequency of largemouth bass sampled in Leech Lake in 2012 and 2015.

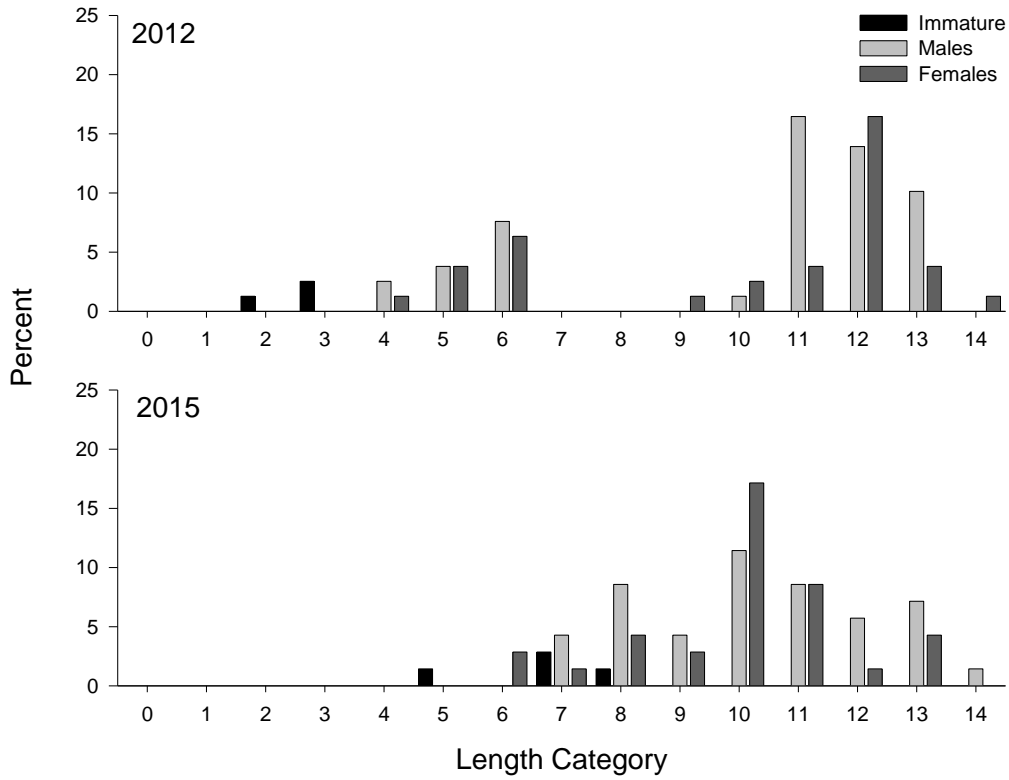


Figure 9. Length-frequency of black crappie sampled in Leech Lake in 2012 and 2015.

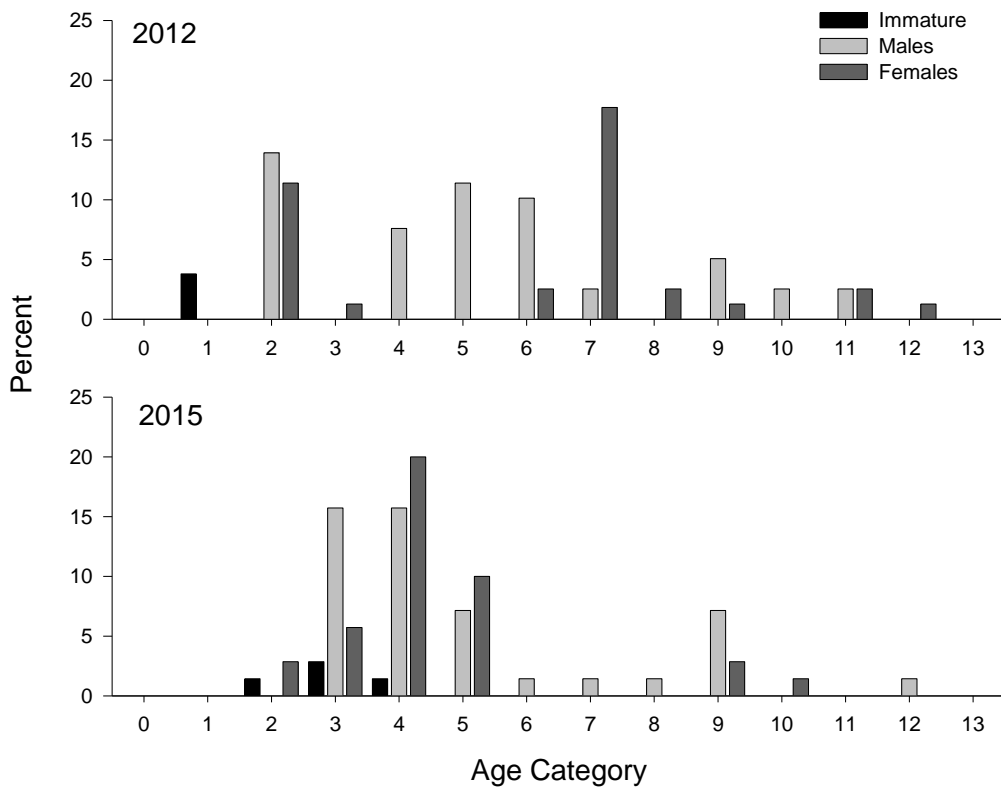


Figure 10. Age-frequency of black crappie sampled in Leech Lake in 2012 and 2015.