Greenleaf Lake Management Plan

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10/28/2011

BACKGROUND

Greenleaf Lake is a 920 acre reservoir located three miles south of Braggs, in Muskogee County in eastern Oklahoma. The reservoir impounds Greenleaf Creek approximately 1.5 miles above its confluence with the Arkansas River. The reservoir was impounded in 1939 by the United States Army as a water supply lake for Camp Gruber. Since, Greenleaf Lake has been leased to the State of Oklahoma, and its classified purpose is recreation. Table 1 contains a list of physical and chemical characteristics of Greenleaf Lake.

HABITAT

Shoreline habitat in Greenleaf Lake is primarily comprised of aquatic vegetation, rock, and woody debris. Water willow and coontail comprise the bulk of the aquatic vegetation; however, many other species are present. Additional habitat includes man-made structures such as brush piles, spider blocks, and boat docks. The north end of the lake offers some standing timber, but most of it has rotted since impoundment. The ODWC has established and maintained 13 brush piles on Greenleaf Lake. These brush piles are refurbished with cedar trees and/or spider blocks when needed. Locations of brush piles are shown in Figure 1, and can be found on the Department's Interactive Digital Wildlife Atlas at http://www.wildlifedepartment.com/wmas2.htm.

WATER QUALITY

Greenleaf Lake is classified as a eutrophic reservoir with a high level of primary productivity and nutrient conditions. Water quality data collected through the OWRB as part of their Beneficial Use Monitoring Program (BUMP) classifies Greenleaf Lake as supporting the outlined Fish and Wildlife Propagation (FWP) beneficial uses for turbidity, pH and metals. However, Greenleaf Lake is classified as not supporting the FWP for dissolved oxygen levels. If D.O. values are less than 2.0 ppm for greater than 70% of the water column, the FWP beneficial use is deemed not supported. The complete BUMP report for Fort Greenleaf Lake can be seen in Figure 2. A brief overview of several water quality parameters from the 2005-2006 sampling period is included below.

Thermal and Chemical Stratification

During the 2005-2006 sampling period Greenleaf Lake was stratified during the summer months, with up to 71% of the water column having less than 2 mg/L dissolved oxygen in September.

Productivity

Carlson's trophic state index (TSI chlorophyll-a), was calculated to measure the lake's productivity. The average TSI was 52, classifying the lake as eutrophic, indicative of variable oxygen concentrations, and nutrient rich conditions. Based on previous data collection efforts, the lake is currently listed in the Oklahoma Water Quality Standards as a phosphorous limited watershed.

Conductivity
Specific conductivity ranged from 143.6 µS/cm to 297 µS/cm, indicating low to moderate concentrations of ionized salts in Greenleaf Lake.

pH
The pH values ranged from 6.81 to 8.31 representing a neutral to slightly alkaline system. These values support the beneficial use based on pH.

FISHERY

The major sport fish in Greenleaf Lake include largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), white bass (*Morone chrysops*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), channel catfish (*Ictalurus punctatus*), and flathead catfish (*Pylodictis olivaris*). The primary forage species include bluegill (*Lepomis macrochirus*), threadfin shad (*Dorosoma petenense*), and gizzard shad (*Dorosoma cepedianum*). The fish stocking history for Greenleaf Lake is included in Table 2.

Black Bass

Greenleaf Lake contains two species of black bass; largemouth bass and spotted bass. A 14 inch minimum length limit for black bass was set on Greenleaf Lake in 1987. The 14 inch minimum length limit still applies to largemouth bass, but size and creel limits on spotted bass were removed in 2010.

Largemouth Bass
The largemouth bass is the dominant black bass species in Greenleaf Lake. Largemouth bass catch rates and catch rates of largemouth bass greater than 14 inches have gradually increased since the early 1980's. This is likely due to the 14 inch minimum length limit that was implemented in 1987 as well as changes in society's view of harvesting largemouth bass. The region switched from using a variable voltage pulsator electrofisher to a generator powered pulsator electrofisher in 1988, resulting in increased efficiency and higher catch rates after that point (Table 3). Supplemental stocking of threadfin shad was implemented on a yearly basis starting in 2009 to provide more forage for largemouth bass as well as other sport fish. Growth rates of both bass and crappie have increased since the implementation (Table 6 and Figure 3). In the early 2000's Greenleaf Lake underwent testing for Largemouth Bass Virus (LMBV). Although much of the population tested positive for LMBV, no related fish kills ensued. Catch rates and size structure of largemouth bass are included in Table 3 and Figures 3 and 5.

Spotted Bass
Spotted bass make up a small portion of the black bass population at Greenleaf Lake. Catch rates of spotted bass have gradually decreased since the late 1990's. This is most likely due to a growing largemouth bass population, or a change in water quality. Catch rates and size structure of the spotted bass population are included in Table 4 and Figures 4 and 6.

Temperate Bass

White Bass
White Bass are seldom encountered at Greenleaf Lake. Inflows from Greenleaf Creek are rarely substantial enough to support a breeding population.

Crappie

Greenleaf Lake contains both white crappie and black crappie. Historically, Greenleaf Lake has suffered from a stunted crappie population. For the past thirty years, regional biologists have encouraged anglers to harvest small crappie to thin out the numbers, thus providing more resources for those that are left. Trap net data from the past five years has shown that the population is no longer stunted, and quite small. In turn, growth rates have increased, while catch rates have decreased. Supplemental stocking of threadfin shad was implemented on a yearly basis starting in 2009 to provide more forage for sport fish. Crappie catch rates, growth rates, and size structure from fall trap netting are presented in Tables 5 and 6 and Figures 8 - 10.

Catfish

Channel Catfish
Channel and/or blue catfish have a combined limit of six per day, and only one blue catfish over 30 inches. Channel catfish are an important sport fish to bank and boat anglers, ranking third in angler preference surveys. Although channel catfish have been stocked numerous times into Greenleaf Lake over the past 50 years (Table 2), catch rates have historically been low. Data from the 1984 gillnetting survey showed an abnormally high channel catfish catch rate, but this was probably due to a large number of channel catfish being stocked directly prior to the survey. Catch rates and size structure of the Greenleaf Lake channel catfish fishery are included in Table 7 and Figure 7. Channel catfish have not been sampled at Greenleaf in the past few years due to a study being done by Oklahoma State University. The lake was stocked with approximately 26,000 channel catfish in two consecutive years. Recruitment and growth are being determined.

Flathead Catfish
Flathead catfish are seldom encountered in Greenleaf Lake.

Shad

Gizzard Shad
Gizzard Shad provide forage for most game species. The species is often used by anglers as bait for other fish species. Catch rates and size structure of the Greenleaf Lake gizzard shad fishery are included in Table 8.

Threadfin Shad
Threadfin Shad are quite temperature sensitive, with die-offs reported at temperatures below 45°F. They have been introduced as forage fish in Greenleaf Lake many times since 1967 (Table 2). Threadfin shad rarely survive through the winter months in Greenleaf Lake. Supplemental stockings of threadfin shad have been made yearly since 2009. Adults are considerably smaller

than gizzard shad adults, rarely exceeding 6 inches in length. The species is often used by anglers as bait for other fish species. Catch rates and size structure of the Greenleaf Lake threadfin shad fishery are included in Table 9.

Fish Consumption Advisories
Fish consumption advisories are issued by the Oklahoma Department of Environmental Quality (ODEQ). Currently, Greenleaf Lake has no fish consumption advisories. The most recent statewide fact sheet concerning fish consumption can be viewed at: http://www.deq.state.ok.us/factsheets/land/fishmerc.pdf.

Threats to the Fishery

Aquatic Nuisance Species (ANS)
Zebra Mussels
Zebra mussels have never been documented in Greenleaf Lake. However, its close proximity to the Arkansas River Navigation System poses a threat of future infestation. Fishermen often fish both water bodies in the same day. Proper cleaning methods of boats and equipment should be used to avoid the transfer of zebra mussels into Greenleaf Lake.

Asian Carp
Asian carp have never been documented in Greenleaf Lake. However, as with zebra mussels, precautions must be taken to avoid future infestation.

Invasive Aquatic Vegetation
Greenleaf Lake has a very stable water level and high nutrient load, making it highly supportive of aquatic plant life. As of now, aquatic vegetation present in Greenleaf Lake is made up of native species. With the close proximity of the Arkansas River Navigation System to the lake, the threat of invasive plant species transfer will always exist.

The ODWC follows strict Hazard Analysis and Critical Control Point (HACCP) procedures to avoid transporting invasive species to uninfected water bodies. For more information, visit www.wildlifedepartment.com/nuisancespecies.htm.

Siltation
Siltation poses a major threat to Greenleaf Lake. The upper end of the lake has become so silted in that navigation is greatly hindered. The United States Army National Guard and Camp Gruber have proposed plans to dredge the lake in past years. When and if this will ever happen is unknown. The cost associated with dredging the lake may be greater than the reward to Camp Gruber.

Management Objectives

- Maintain total largemouth bass catch rates at or above 100/hour with catch rates of largemouth bass >14 inches at or above 40/hour and relative weights that exceed 90% for all size groups.
- Increase the catch rate of crappie greater than ten (10) inches.
- Maintain sufficient levels of forage species.
- Protect and enhance aquatic habitat.
- Monitor sport fish and forage species populations through SSP trend data.
- Increase bank angler access and success.
- Work with Greenleaf State Park and other appropriate entities to enhance boating and/or fishing access.
- Conduct public outreach and solicit feedback regarding fisheries management issues.
- Coordinate and assist with the documentation and monitoring of aquatic nuisance species.

Strategies

I. Largemouth bass
   a. Maintain the 14 inch minimum length limit.
   b. Continue to encourage anglers to take precautions to limit further introductions of ANS.
   c. Continue stocking threadfin shad yearly to increase the forage base, following all appropriate HACCP procedures.

II. Crappie
   a. Discontinue encouraging the harvest of small crappie, as the population is no longer stunted.
   b. Continue stocking threadfin shad yearly to increase the forage base.

III. Forage species
   a. Continue stocking threadfin shad yearly to increase the forage base.

IV. Aquatic habitat will be protected and enhanced in the following ways:
   a. Oppose habitat degradation and shoreline development that is not conducive to the health of the ecosystem and does not require adequate mitigation. ODWC will propose adequate and reasonable mitigation measures when necessary.
   b. Maintain existing seventeen (13) fish attractors utilizing natural and artificial materials. These fish attractors will be maintained with cedar trees and spider blocks.

V. SSP trend data on the major sport fish and forage species will be collected and monitored. Sampling for the major sport fish and forage species will be as follows:
   a. Largemouth Bass - Conduct Standardized Sampling Protocol (SSP) spring electrofishing for largemouth bass every three years to determine catch rates by size groups and relative weights. Age and growth data will be collected when necessary. Largemouth bass will be tested for LMBV if it is believed to be the cause of a fish kill.

b. Spotted Bass – Conduct SSP spring electrofishing for spotted bass every three years to determine catch rates by size groups and relative weights. Age and growth data will be collected when necessary.
c. Crappie – Conduct SSP fall trap netting for crappie every three to five (3-5) years to determine catch rates by size groups and relative weights. Age and growth data will be collected during sample years.
d. Channel Catfish – Conduct SSP fall gill netting for channel catfish every three (3) years to determine catch rates by size groups and relative weights.
e. Gizzard Shad – Conduct SSP fall gill netting for gizzard shad every three (3) years to determine catch rates by size groups.

VI. Bank angler access and fishing success could be increased in the following ways:
a. Selective aquatic vegetation removal by State Park personnel.
b. Addition of bank accessible brush pile and/or spider block fish attractors.

VII. Perform outreach to educate the public about the threats, prevention, and spread of ANS. Investigate and report all sightings of ANS to the ODWC ANS biologist, other resource agencies, and the media when appropriate.

TABLES

Table 1. Physical and Chemical Characteristics of Greenleaf Lake.

Operating Agencies	U.S. Army and the State of Oklahoma
Impoundment Date	1939
Surface Area	920 acres
Shoreline	14 miles
Capacity	14,720 acre-feet
Mean Depth	16.4 feet
Maximum Depth	45.3 feet
Secchi Disk	44 inches
Conductivity	143.6 to 297 µS/cm
pH	6.81 to 8.31
Carlson's Trophic State Index (chlorophyll a)	52; Eutrophic

Table 2. Stocking Record for Greenleaf Lake.

Species	N	Size (inches)
Largemouth Bass		
1942	10,000	Unknown
1945	11,400	Unknown
1945	50,000	Fry
1947	900	Unknown
1948	500	Unknown
1958	1500	Unknown
1967	2525	Unknown
Sunfish Sp.		
1941	37,000	Unknown
1945	12,000	Unknown
1947	100	Unknown
1948	5,000	Unknown
1951	10,450	Unknown
1952	5,000	Unknown
1956	250	Unknown
1958	4,500	Unknown
Walleye		
1953	100,000	Fry
1984	50,000	Fry
Northern Pike		
1966	500,000	Fry
1976	24,735	Unknown
Hybrid Striped Bass		
1980	100,000	Fry
White Bass		
1941	6,000	Unknown
1948	105	Unknown
1951	62	Unknown
Crappie Sp.		
1941	500	Unknown
1947	50	Unknown

Threadfin Shad		
1967	1,500	Unknown
1975	10,500	Brooders
1976	2,750	Brooders
1995	200	Brooders
1998	2,000	Brooders
2005	2,450	Brooders
2007	1,200	Brooders
2009	1,000	Brooders
2010	1,000	Brooders
2011	1,500	Brooders
2012	1,500	Brooders
Channel Catfish		
1941	3,000	Unknown
1942	15,000	Unknown
1945	15,000	Unknown
1947	10,000	Unknown
1952	2,000	Unknown
1956	17,000	Unknown
1958	1,500	Unknown
1967	30,021	8” – 10”
1970	163,240	Unknown
1976	10,000	6”
1977	18,400	9”
1978	46,000	3”
1981	23,001	4”
1982	92,000	4.5”
1983	66,020	5”- 6”
1984	100,310	3”
1988	96,330	4”
1989	100,000	3”
1997	26,481	6.5”
2010	20,513	7”

Table 3. Total Number (No.), Catch Rates (C/f), and Relative Weights (W_r) by Size Groups of Largemouth Bass Collected by Spring Electrofishing from Greenleaf Lake. Numbers in Parentheses Represent Acceptable C/f Values for a Quality Fishery. Acceptable W_r Values are $\geq$90.

Total ($\geq$40)		<8 in. (15-45)			8–12 in. (15-30)		$\geq$12 in. ($\geq$15)		$\geq$14 in. ($\geq$10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1982	119	26.4	8.0	96	11.11	90	7.33	98	5.6	100
1983	104	13.0	4.75	93	6.0	88	2.25	94	1.0	97
1984	162	14.7	6.6	92	4.6	87	3.5	89	1.4	94
1986	115	38.3	19.3	91	14.7	85	4.3	82	1.3	93
1988	148	65.8	14.2	87	27.1	85	24.4	88	11.1	89
1989	121	60.5	13.0	87	33	82	14.5	89	8.0	90
1990	128	73.1	24.6	88	20.0	87	28.6	90	12.6	92
1992	186	82.7	21.8	88	19.1	86	41.8	90	26.7	90
1994	105	84.0	20.8	96	35.2	87	28	88	11.2	86
1996	108	86.4	14.4	76	18.4	86	53.6	89	30.4	92
1998	95	63.3	12.0	90	20.7	94	30.7	93	21.3	93
1999	111	111	16.0	90	35.0	86	60.0	88	39.0	87
2003	338	112.7	38.7	93	43.3	90	30.7	94	23.0	93
2007	245	81.7	9.3	94	15.0	93	57.3	92	36.3	93
2011	308	154	17.0	86	42.0	87	94.0	91	47.5	91

Table 4. Total Number (No.), Catch Rates (C/f), and Relative Weights (W_r) by Size Groups of Spotted Bass Collected by Spring Electrofishing from Greenleaf Lake. Numbers in Parentheses Represent Acceptable C/f Values for a Quality Fishery. Acceptable W_r Values are ≥90.

Total (≥40)		<8 in. (15-45)			8–12 in. (15-30)		≥12 in. (≥15)		≥14 in. (≥10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1994	16	13	1.6	---	5.6	77	5.6	73	0.8	75
1996	7	5.6	---	---	2.4	81	3.2	73	2.4	71
1998	22	12.8	1.33	76	4.7	80	8.7	82	---	---
1999	13	13	---	---	4	95	9	90	4	91
2003	30	10	2.0	95	2.0	96	6.0	93	2.7	94
2007	20	6.7	0.33	99	1.0	109	5.3	87	2.7	85
2011	9	4.5	0.5	82	2.0	91	1.0	97	---	---

Table 5. Total Number (No.), Fish Per Net Night (C/f), and Relative Weights (Wr) by Size Groups of All Crappie Collected by Trap Netting from Greenleaf Lake. Numbers in Parentheses Represent Acceptable C/f Values for a Quality Fishery.

Total (≥25)		<5 in. (≥5)			≥5 in. (10-40)		≥8 in. (≥10)		≥10 in. (≥4)	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr	C/f	Wr
1986	88	1.35	0.28	98	1.1	92	0.46	88	0.02	78
1990	281	0.90	0.14	95	0.77	89	0.18	90	0.05	92
1991	426	1.27	0.13	93	1.14	90	0.19	93	0.06	97
1992	89	0.31	0	---	0.31	83	0.035	84	0	---
1993	436	0.84	0.17	97	0.67	91	0.11	90	0.03	94
1994	392	1.2	0.09	97	1.1	87	0.31	88	0.08	94
1998	389	0.54	0	---	0.54	95	0.44	96	0.19	96
1999	143	0.18	0.04	99	0.14	92	0.11	91	0.05	93
2009	26	0.05	0	---	0.05	88	0.04	89	0.02	88
2010	28	0.08	0.03	79	0.05	83	0.04	81	0.024	82

Table 6. Mean length at Age of Crappie Collected by Trap Netting from Greenleaf Lake. Numbers in Parentheses Represent Values for Acceptable Growth Rates.

	Age 1	Age 2	Age 3	Age 4
Year	(≥ 6.3 in.)	(≥ 7.9 in.)	(≥ 8.9 in.)	(≥ 9.8 in.)
1986	6.61	7.71	8.58	8.26
1990	6.37	7.91	10.62	8.89
1991	6.29	7.75	9.64	9.05
1992	6.22	7.20	7.40	10.94
1993	5.51	7.48	7.59	11.41
1994	5.78	7.20	8.70	8.54
1998	7.56	9.05	9.69	9.37
1999	7.59	9.29	10.62	10.15
2009	7.7	10.1	10.8	12.1
2010	6.7	9.8	10.6	13.3

Table 7. Total Number (No.), Fish Per Net Night (C/f), and Relative Weights (Wr) by Size Groups of Channel Catfish Collected by Gill Netting from Greenleaf Lake.

	Total		< 12 in.		8 – 16 in.		≥ 12 in.		≥ 16 in.	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr	C/f	Wr
1982	28	.17	.024	99	.024	92	.143	97	.131	98
1983	60	.531	.34	96	.43	95	.19	93	.098	97
1984	168	1.22	.572	96	1.1	92	.65	87	.12	88
1986	20	.103	.005	106	.058	89	.099	91	.047	95
1988	31	.21	.061	107	.033	87	.149	80	.054	75
1989	66	.365	.232	88	--	--	.133	84	.099	84
1992	11	.10	--	--	--	--	.10	87	.091	87
1999	32	.274	.009	86	.137	88	.265	91	.137	94
2000	18	.15	.008	84	.042	77	.142	79	.108	81
2001	13	.090	--	--	.021	89	.090	93	.069	94
2007	17	.126	.006	84	.013	86	.119	96	.113	96

Table 8. Total Number (No.), Fish Per Net Night (C/f) by Size Groups of Gizzard Shad Collected by Gill Netting from Greenleaf Lake.

	Total		< 8 in.	≥ 8 in.
Year	No.	C/f	C/f	C/f
1983	41	.366	.250	.116
1984	83	.68	.42	.181
1986	87	.455	.225	.230
1988	125	.845	.642	.203
1989	85	.47	.348	.122
1992	101	.918	.582	.336
1999	156	1.33	.504	.829
2000	187	1.56	.608	.950
2001	--	--	--	--
2007	75	.561	.052	.510

Table 9. Total Number (No.), Fish Per Net Night (C/f) by Size Groups of Threadfin Shad Collected by Gill Netting from Greenleaf Lake.

	Total		< 5 in.	≥ 5 in.
Year	No.	C/f	C/f	C/f
1983	--	--	--	--
1984	--	--	--	--
1986	--	--	--	--
1988	--	--	--	--
1989	--	--	--	--
1992	--	--	--	--
1999	83	.709	0	.709
2000	133	1.11	.658	.45
2001	--	--	--	--
2007	26	.201	.037	.164

FIGURES

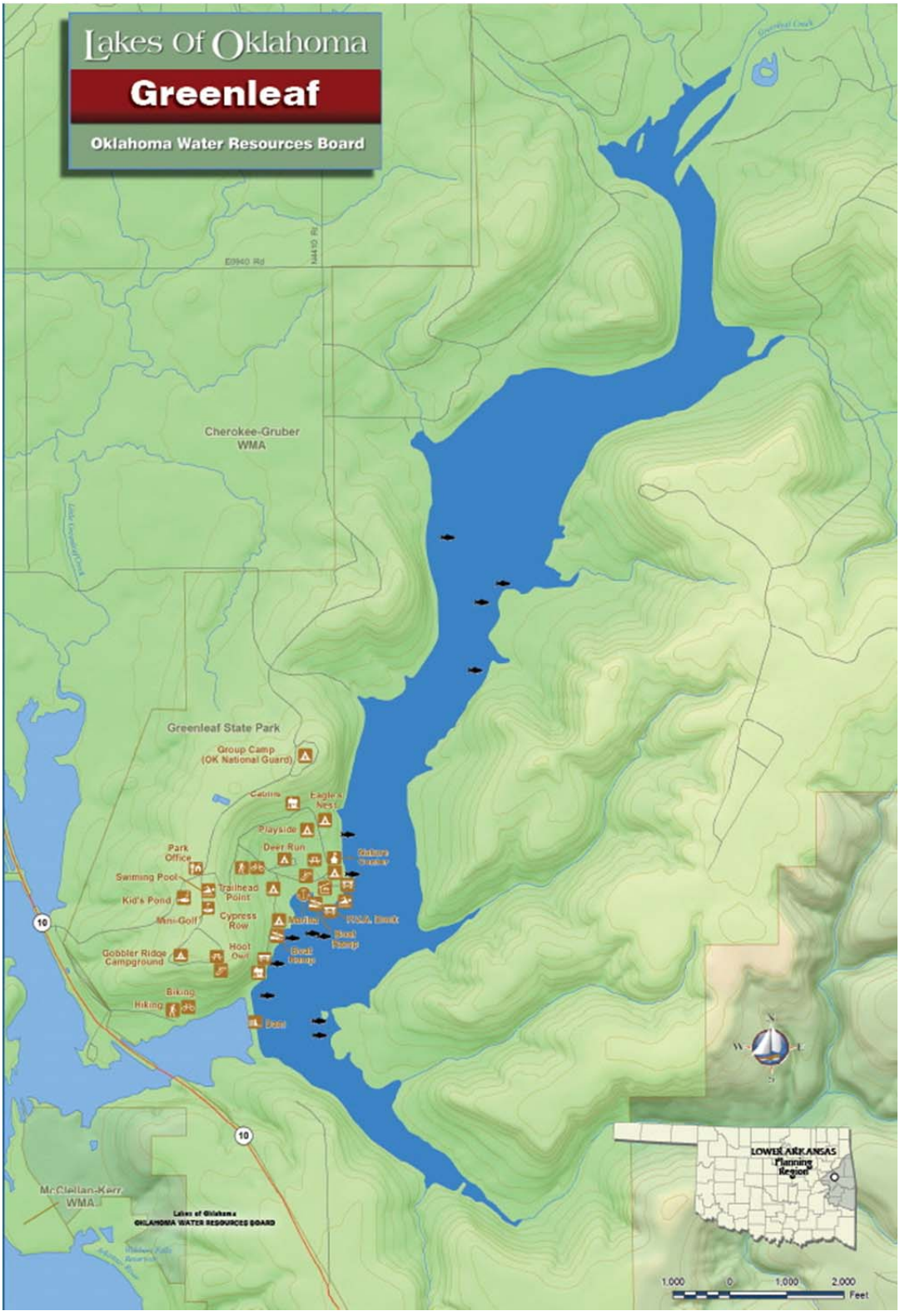
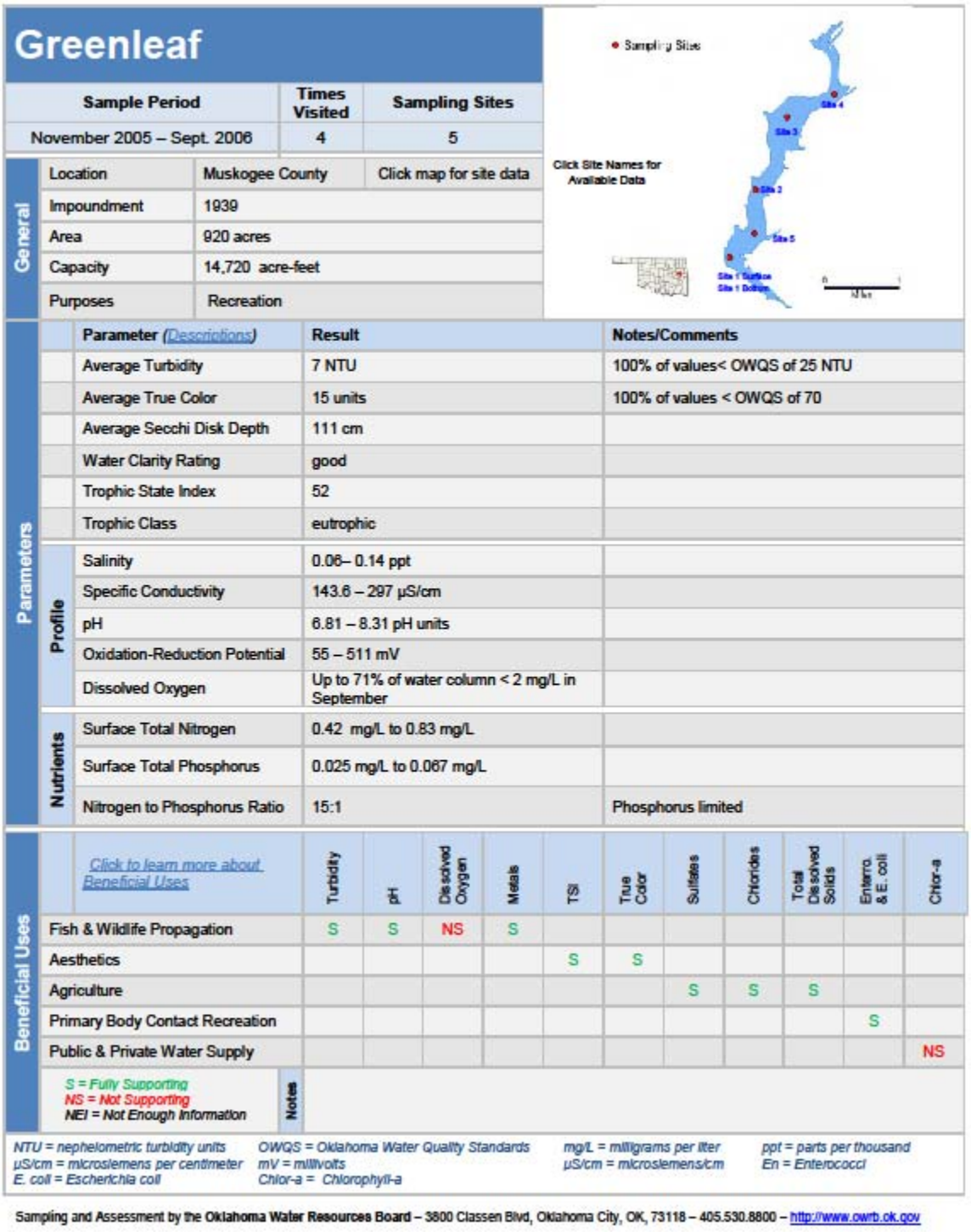


Figure 1. Map of Greenleaf Lake and Vicinity with Fish Attractors Marked.



Greenleaf

Sample Period	Times Visited	Sampling Sites
November 2005 – Sept. 2006	4	5

General

Location	Muskogee County	Click map for site data
Impoundment	1939	
Area	920 acres	
Capacity	14,720 acre-feet	
Purposes	Recreation	

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
	Average Turbidity	7 NTU	100% of values< OWQS of 25 NTU
	Average True Color	15 units	100% of values < OWQS of 70
	Average Secchi Disk Depth	111 cm	
	Water Clarity Rating	good	
	Trophic State Index	52	
	Trophic Class	eutrophic	
Profile	Salinity	0.06– 0.14 ppt	
Profile	Specific Conductivity	143.6 – 297 µS/cm	
Profile	pH	6.81 – 8.31 pH units	
Profile	Oxidation-Reduction Potential	55 – 511 mV	
Profile	Dissolved Oxygen	Up to 71% of water column < 2 mg/L in September	
Nutrients	Surface Total Nitrogen	0.42 mg/L to 0.83 mg/L	
Nutrients	Surface Total Phosphorus	0.025 mg/L to 0.067 mg/L	
Nutrients	Nitrogen to Phosphorus Ratio	15:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S							
Aesthetics					S	S					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											NS

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

Sampling and Assessment by the **Oklahoma Water Resources Board** – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

Figure 2. The Latest Beneficial Use Monitoring Program Report for Greenleaf Lake.

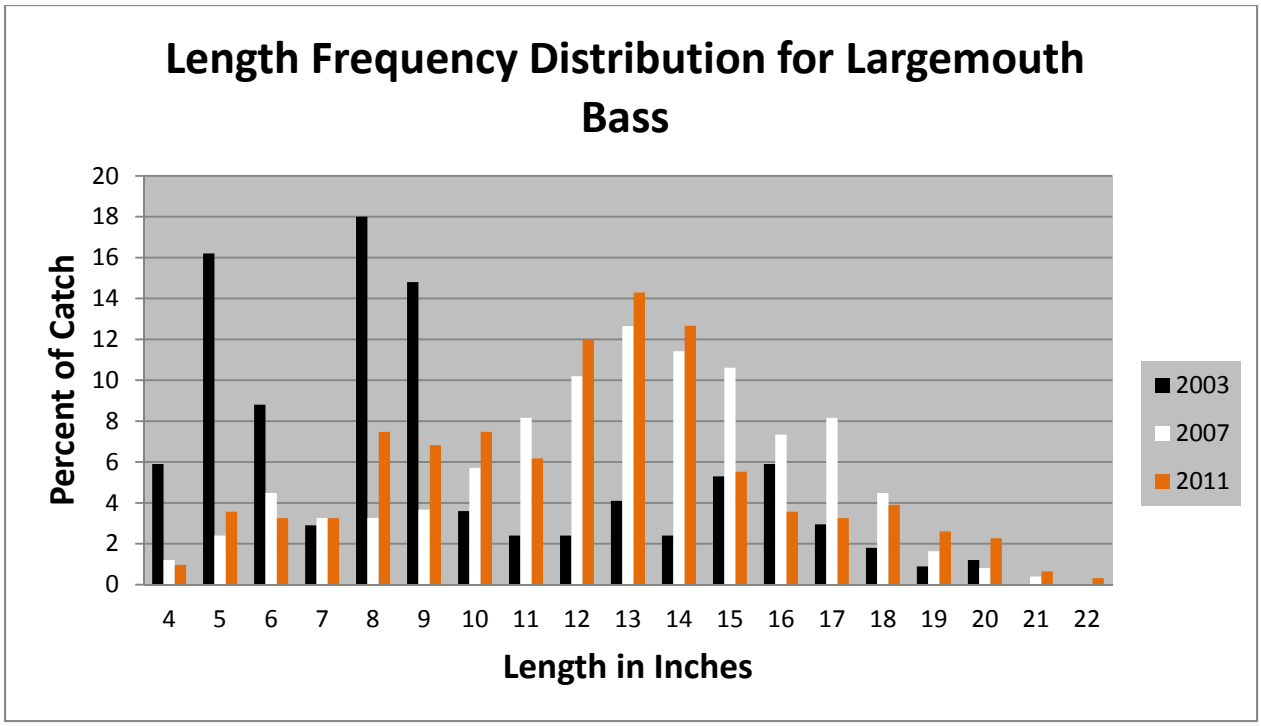


Figure 3. 2003-2011 Spring Electrofishing at Greenleaf Lake. Length Frequency Distribution for Largemouth Bass.

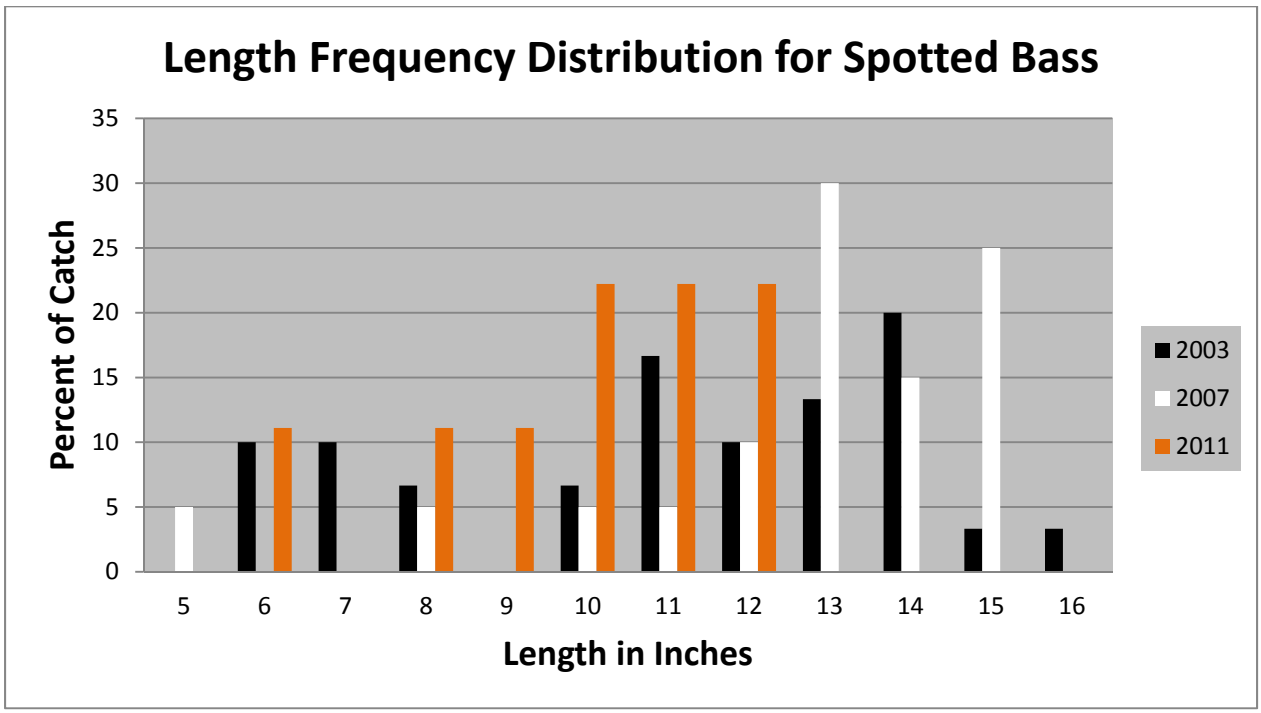


Figure 4. 2003-2011 Spring Electrofishing at Greenleaf Lake. Length Frequency Distribution for Spotted Bass.

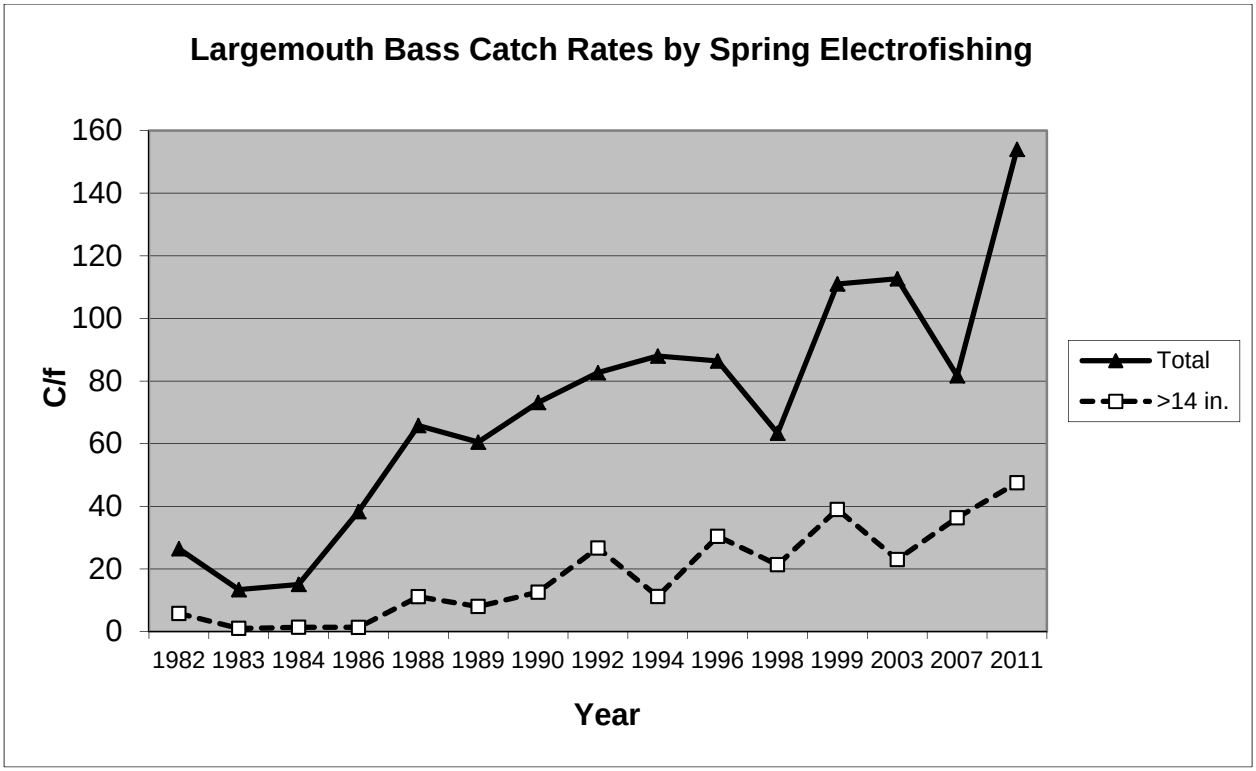


Figure 5. 1982-2011 Largemouth Bass Catch Rates by Spring Electrofishing at Greenleaf Lake. (*Note: 14" minimum black bass length limit went into effect in 1987.)

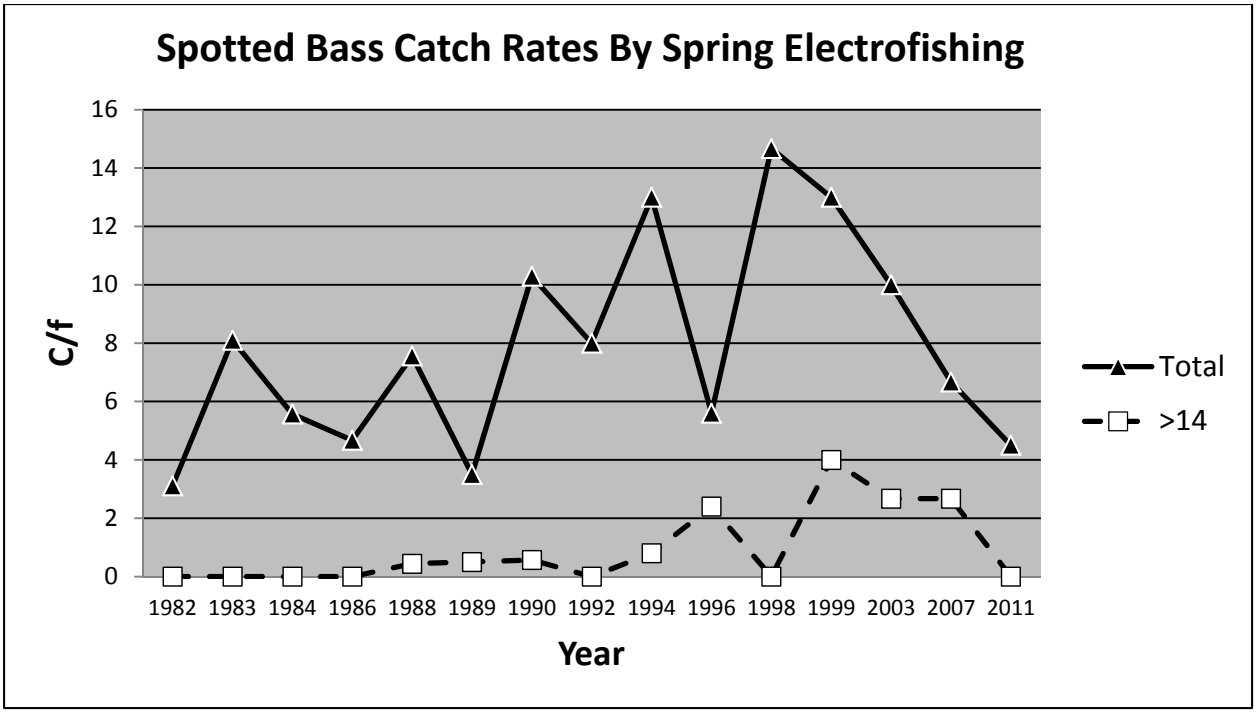


Figure 6. 1982-2011 Spotted Bass Catch Rates by Spring Electrofishing at Greenleaf Lake. (*Note: 14" minimum black bass length limit went into effect in 1987.)

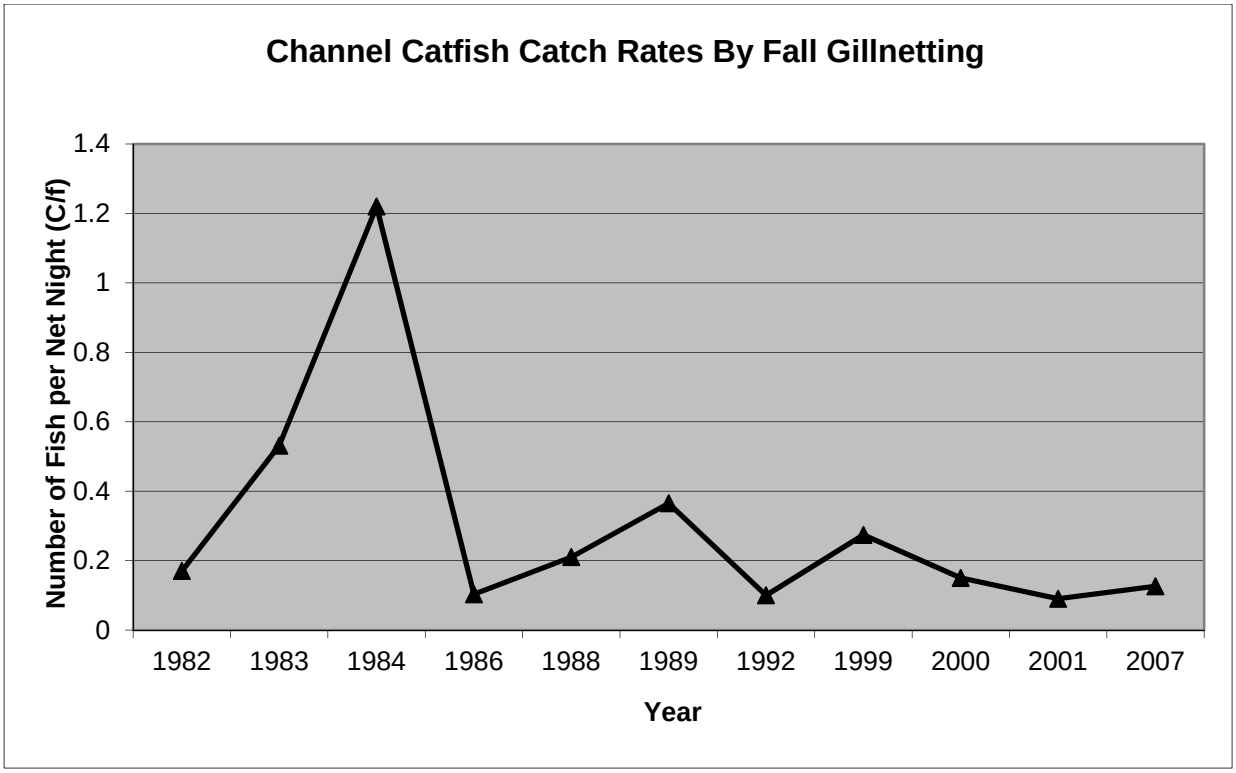


Figure 7. 1982-2007 Fall Gill Netting at Greenleaf Lake. Fish per net night for Channel Catfish.

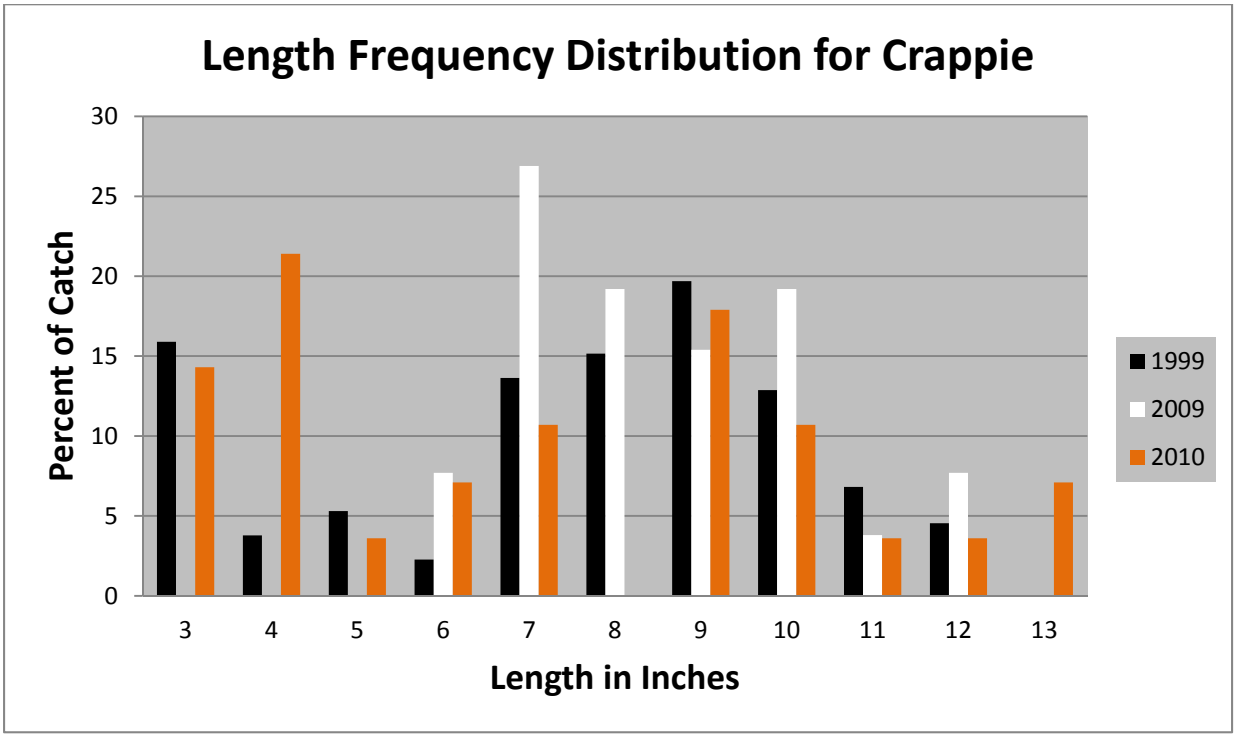


Figure 8. 2002-2006 Fall Trap Netting at Greenleaf Lake. Length Frequency Distribution for All Crappie Combined

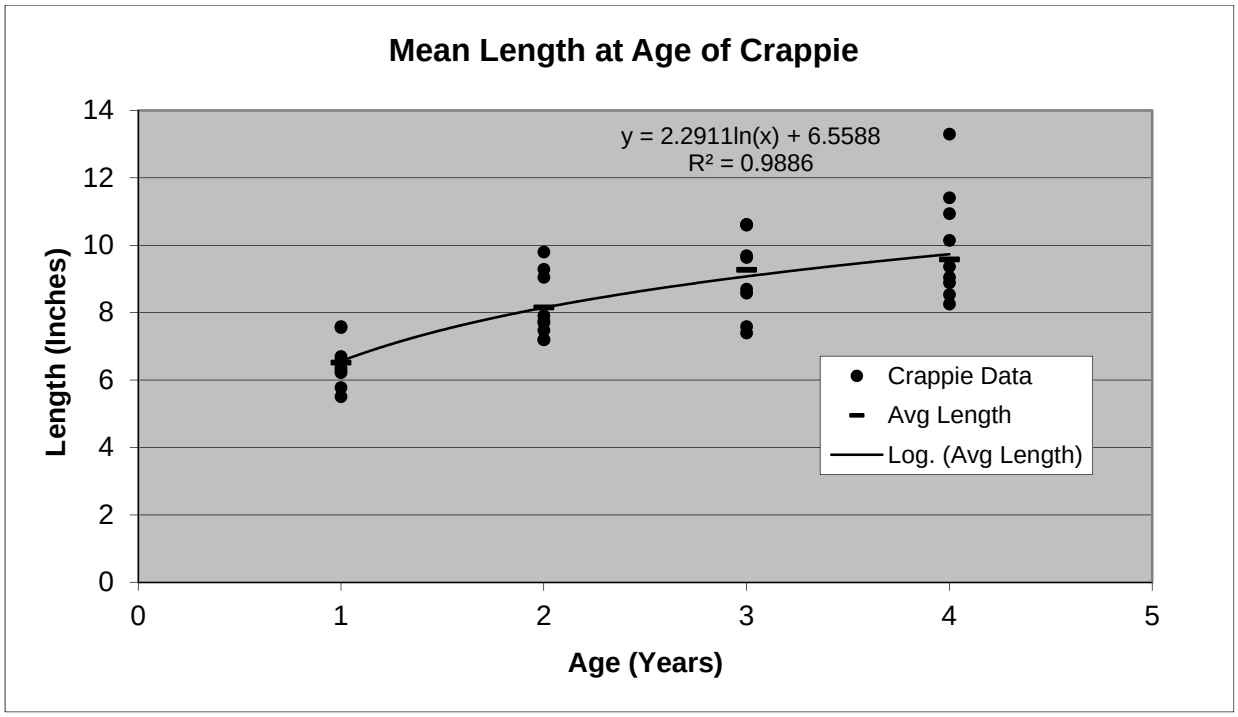


Figure 9. 1986-2010 Trap Netting at Greenleaf Lake. Mean Length at Age, All Crappie Combined.

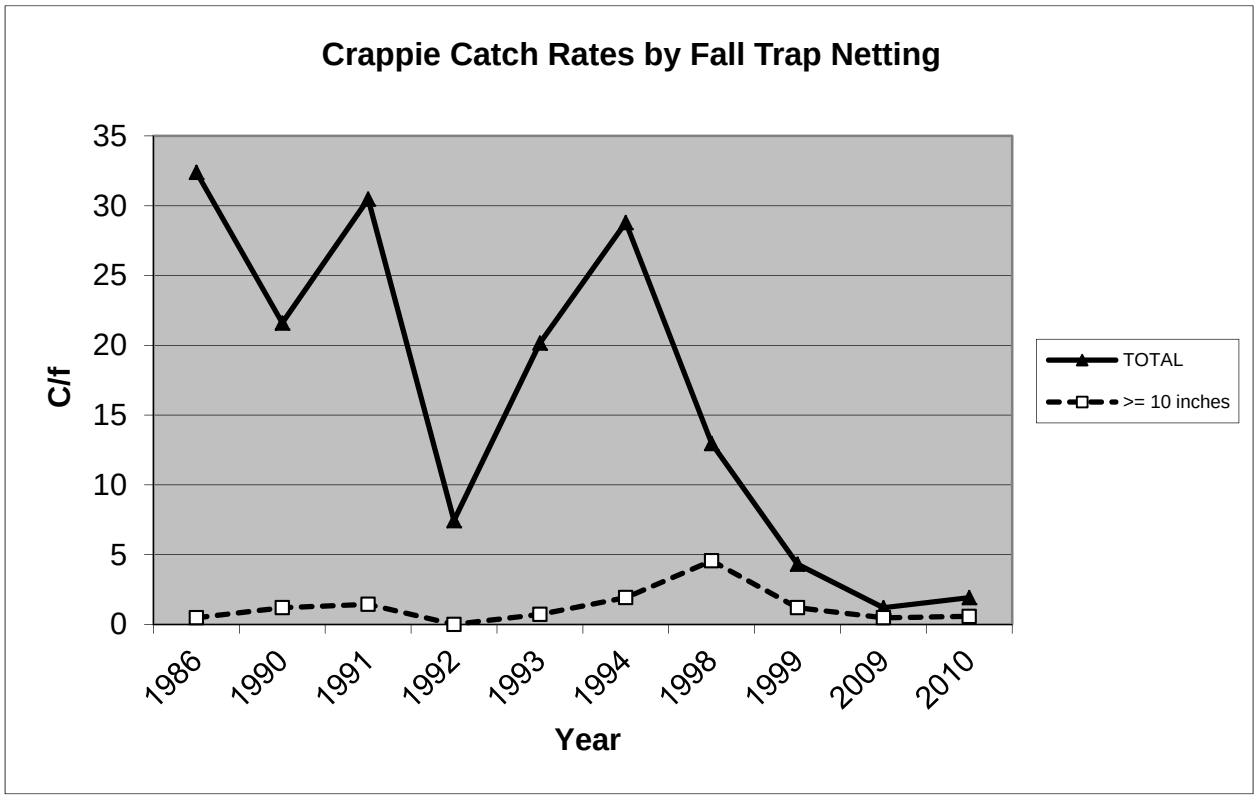


Figure 10. 1986-2010 Crappie Catch Rates by Fall Trap Netting at Greenleaf Lake.