KONAWA LAKE

5 YEAR

LAKE MANAGEMENT PLAN

OKLAHOMA DEPTMENT OF WILDLIFE CONSERVATION

FISHERIES DIVISION

CENTRAL REGION

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Background

Konawa Lake impounds Jumper Creek 2 miles east of the city Konawa in Seminole County, Oklahoma (Figure l). It covers 1350 surface acres. Construction began in 1968 and was completed in 1970. The lake is owned by Oklahoma Gas and Electric Company. This lake serves as the cooling water source for a gas-fired power generation station; therefore water temperatures are higher year-round than in most other lakes in the state. The station has three natural gas powered steam-turbine generators and a gas turbine generator producing approximately 1,534 megawatts at peak output capacity. The station circulates 1,000,000 gallons of lake water per minute through its' cooling condensers when the three main generators are on-line.

Konawa Lake has a mean depth of 17 feet and a maximum depth of 49.8 feet, a shoreline development ratio of 3.5, and a secchi disc visibility of around 37.4 inches in the main pool in August. Turbidity is from plankton. The lake has a shoreline length of 20 miles and a storage capacity of 23,000 acre-feet. It has large stretches of shoreline covered by cattails while most of the remainder is eroded clay banks. Ten fish attractor sites consisting of artificial habitat structures made from polyethylene pipe called "spider blocks" have been installed by the Oklahoma Department of Wildlife Conservation (ODWC) recently. Normal pool elevation is 924 feet MSL (above Mean Sea Level). Lake levels are maintained by pumping water from the nearby South Canadian River into settling ponds on the south side of the lake which are then allowed to gravity flow into the lake. Fish habitat consists primarily of aquatic vegetation. The dam is located at latitude N 34^0 57' 42" and longitude W 96^0 42' 6".

The trophic state of the reservoir measured by the Oklahoma Water Resources Board (OWRB) using Carlson's Trophic State Index (TSI, chlorophyll-a) averaged 53 in 2005 indicating high levels of primary productivity and nutrients. The OWRB also found the lake to be weakly stratified thermally during the late spring and summer months but was still considered supporting the Fish and Wildlife Propagation (FWP) use for dissolved oxygen (DO) levels. Salinity and specific conductivity levels (0.66-0.74 parts per thousand and 1234-1428 microsiemens per cubic centimeter, respectively) were both above the normal ranges found in Oklahoma lakes. With pH levels ranging from 7.29-8.7 the lake was found to be neutral to slightly alkaline. The OWRB also found the lake's water clarity to be good to excellent compared to other Oklahoma reservoirs.

Wind direction is primarily from the south to southeast with an average annual speed of 7.1 mph. Maximum gusts recorded in Seminole county were 55.8 mph and maximum sustained winds were recorded at 35.5 mph. The winds and a fairly exposed shoreline contribute to the eroded clay banks found around the lake.

A major change in the lake began in the late 1980's when power generation at the plant during the winter was reduced, leading to lower winter water temperatures which had a major impact on the threadfin shad (*Dorosoma petenense*) and tilapia (*Oreochromis aureus*) populations. The reduced survival of these prey species has had considerable impact on the predator fish populations. Tilapia have not been collected in several years.

History of fishery

Major sport fish species present in Konawa Lake include largemouth bass (*Micropterus salmoides*), white bass (*Morone chrysops*), striped bass x white bass hybrids (*M. saxatilis x M. chrysops*) and channel catfish (*Ictalurus punctatus*).

For many years, the largemouth bass fishery in the lake has been characterized by high abundance of all size-classes (Table 2). Konawa Lake regularly ranks at or near the top for spring electrofishing catch rate among lakes over 1,000 acres surveyed by the ODWC. In the last 10 years, catch per hour (C/f) has declined from 228.9 in 2001 to 131.6 in 2006 but has been more stable the last few years (Table 2, Figure 2).

Florida strain largemouth bass have been stocked in the lake since 1973 (Table 1). The most recent electrophoresis results (2006) indicated 74% of the bass sampled during spring electrofishing were pure Florida strain largemouth bass. It appears that the population has become totally integrated as no pure northern strain bass have been collected in recent samples.

Konawa Lake has been managed as a trophy bass fishery since January 1, 1994. At that time a 14-inch minimum length limit was changed to a 16-22 inch slot length limit and 6 bass per day creel limit of which only one bass could be over 22 inches. This regulation was modified on January 1, 2003 to 6 bass per day with no length limit except only one can be 22 inches or longer due to stockpiling of bass 12 to 16 inches long and variable catch rates of trophy-size bass.

Largemouth Bass Virus (LMBV) was found in the lake in 2001 and unconfirmed reports of bass dying were received from the public. There was a marked drop in the catch rate of trophy bass following the disease outbreak. It has taken several years for it to recover to pre-LMBV levels (Table 2).

White bass catch rates in gill netting at Konawa Lake have varied in recent years (Table 3). Catch per net set has ranged from a low of 4.3 (2002) to a high of 17.8 (2006) over the last ten years. The catch per net set for quality-size white bass (>12 inches) has also been variable during the same time period but overall has been above the minimum desired level (Table 3, Figure 3).

Striped bass x white bass hybrids were first stocked in the lake in 1979 and were stocked annually from 1988 through 2007 (Table 1). Over the last ten years, catch per net set has varied from 2.4 in 2004 to 13.2 in 2000 and was 12.0 in the 2008 gillnet survey (Table 4). The catch per net set for hybrids greater than 20 inches in length has remained at or above the minimum acceptable catch rate for a quality fishery (0.48/net set; Table 4). Growth is good the first two years of life, and then slows down when hybrids reach the size where they're competing with the stockpiled largemouth bass population. Growth improves again when they exceed the 17 to 20 inch size range (Table 5). A creel limit of 20 striped bass, striped bass x white bass hybrids, and/or white bass per day of which only 5 may be >20 inches in length is in effect to prevent over-harvest. The hybrid fishery is good overall and the catch rate for trophy-size hybrids has been steadily improving since 2004 (Figure 4).

Channel catfish catch rates in gill netting at Konawa Lake continue to be high for all size classes (Table 6, Figure 5). The catch per net set for quality-size individuals (>16 inches) in 2008 gill netting (8.16/ net set) was more than six times the minimum acceptable rate for a quality fishery (>1.2/net set; Table 5).

Flathead catfish (*Pylodictis olivaris*) are present in the lake at very low population levels. Very few have been collected in gill netting (Table 7, Figure 6).

Crappie (*Pomoxis* spp.) had virtually disappeared from this lake in past years, probably due to elevated water temperatures. However, a few have been collected in recent surveys perhaps because of lower water temperatures due to a decrease in power generation (Table 8, Figure 7).

The abundance of threadfin shad in the lake has decreased since the 1980's due to lower winter water temperatures from reduced wintertime power generation. This has impacted all the predatory fish species in the lake. During the 1970's and 1980's the threadfin were so abundant that the ODWC used Konawa Lake as a source for threadfin shad brooders to stock in other waters of the state. Due to the reduction in threadfin shad abundance and the fact that LMBV was found in the lake, Konawa Lake is no longer used for this purpose. It is not known if LMBV can be carried by threadfin shad or can be transported in hauling water, but the risks outweighed the benefits and the transport of Konawa threadfin shad to other reservoirs was discontinued.

Threats to fishery

- Aquatic Nuisance Species (ANS) – Zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostiformis bugensis*) can be transported on boats and trailers moving from infested waters. Konawa is a popular winter time fishery due to warmer water temperatures from power generation and an abundant bass population. Anglers from around the state traveling to the lake pose a significant risk of transporting these organisms unless precautions are taken.

  Silver carp (*Hypophthalmichthys molitrix*), bighead carp (*Aristichthys nobilis*) and grass carp (*Ctenopharyngodon idella*) also represent potential problems as water levels in the lake are maintained by water pumped in from the nearby South Canadian river. Grass carp have been found in Eufaula Lake, approximately 83 miles downstream. Tilapia were a problem in the lake during the 1980's but have not been collected during subsequent sampling.

  Golden algae (*Prymnesium parvum*) is another threat that has caused large fish kills in Lake Texoma and several reservoirs in Texas. It has been found in the South Canadian river downstream of Lake Meredith in the Texas panhandle. Konawa Lake's water conditions are very similar to lakes that have had outbreaks.

  Eurasian water milfoil (*Myriophyllum spicatum*) is found in the lake but has not become a nuisance, being outcompeted in most areas by native species. However, hydrilla (*Hydrilla verticillata*) has been found in nearby Arbuckle Lake, and is considered a very

real threat to Konawa Lake through boat and/or trailer introduction from anglers who fish weekly jackpot tournaments at both lakes.

- Economics – The high productivity of Konawa Lake is due in large part to the use of its water to cool the Seminole Power Plant. Economic factors that might cause a shutdown or scaling back of electric generation at this facility, like high wintertime natural gas costs, will have serious impacts on the fishery, particularly as it affects the threadfin shad which are the main food base for the lake's predator fish populations.

Management Objectives

Sampling goals by species

- Largemouth bass – Maintain the catch rate for largemouth bass at or above 130/hr with a catch rate of bass >21 inches exceeding 3/hr.
- Conduct spring electrofishing surveys at least bi-annually to monitor progress. Collect age and growth data and evaluate Florida largemouth bass stocking success by collecting fish periodically for genetic analysis.
- White bass - Continue periodic monitoring of the white bass population with gillnetting surveys and collect age and growth data.
- Striped bass x white bass hybrids – Maintain a reduced total catch rate of 2.0/gillnet set and conduct netting surveys every 2-3 years to monitor stocking success and to collect age and growth information. Adjust stocking frequency and/or rate if necessary to maintain satisfactory predator growth rates.
- Channel catfish - Maintain a catch rate of 4.8/net set of gill netting and conduct gillnetting surveys every 3-5 years to monitor population status.

Strategies to achieve sampling goals

1. Stockings

- Continue alternate or every third year stockings of Florida-strain largemouth bass to maintain a high percentage of pure Florida largemouth bass in the bass population.
- Reduce stockings of striped bass x white bass hybrids to every three to four years to reduce competitive interactions with largemouth bass and improve growth rates for both hybrids and largemouth.

2. Surveys

- Monitor the largemouth bass population with bi-annual electrofishing surveys collecting samples for genetic evaluation and age and growth data.
- Monitor the striped bass x white bass hybrid population with periodic gill netting and collect age and growth information.
- Conduct shad gill netting to evaluate the forage base in the lake and its effects on the predator fish populations.

3. Habitat improvement

- Continue constructing fish attractor sites on the lake using spider blocks.
- Consult with OG&E, the lake's owner, about the possibility of conducting an aquatic vegetation management project to improve forage availability and predator species' growth rates.

4. Regulations

- Maintain the current creel limit of 6 bass/day with only one over 22 inches in length. If necessary, make adjustments to these regulations to improve the size structure of the population to achieve desired catch rates for different size-classes of bass.
- Maintain the current creel limit of 20 striped bass, striped bass x white bass hybrids and white bass combined per day of which only 5 can be >20 inches in length and, if necessary, make adjustments to the regulation to better manage the population.

Table 1. Species, number and size of fish stocked in Konawa Lake, 1988 - 2007.

DATE	SPECIES	NUMBER	SIZE
1988	Striped bass hybrid	16,540	fingerlings
	Intergrade Florida LMB	27,186	fingerlings
1989	Certified Florida LMB	30,000	fingerlings
	Striped bass hybrid	13,000	fingerlings
1990	Striped bass hybrid	14,000	fingerlings
	Certified Florida LMB	32,105	fingerlings
1991	Striped bass hybrid	13,590	fingerlings
	Certified Florida LMB	7,000	fingerlings
1992	Striped bass hybrid	13,600	fingerlings
1993	Striped bass hybrid	13,500	fingerlings
1994	Certified Florida LMB	3,080	fingerlings
	Striped bass hybrid	13,750	fingerlings
1995	Certified Florida LMB	27,000	fingerlings
	Striped bass hybrid	13,500	fingerlings
1996	Certified Florida LMB	27,000	fingerlings
	Striped bass hybrid	16,000	fingerlings
1997	Certified Florida LMB	26,860	fingerlings
	Striped bass hybrid	13,500	fingerlings
1998	Florida LMB	28,416	fingerlings
	Striped bass hybrid	13,650	fingerlings
1999	Florida LMB	27,600	fingerlings
	Striped bass hybrid	14,400	fingerlings
2000	Florida LMB	27,400	fingerlings
	Striped bass hybrid	15,000	fingerlings
2001	Florida LMB	27,405	fingerlings
	Striped bass hybrid	13,805	fingerlings
2002	Striped bass hybrid	15,000	fingerlings
2003	Florida LMB	27,040	fingerlings
	Striped bass hybrid	15,625	fingerlings
2004	Striped bass hybrid	14,400	fingerlings
2005	Florida LMB	26,560	fingerlings
	Striped bass hybrid	14,620	fingerlings
	Blue catfish	6,336	fingerlings
2007	Striped bass hybrid	13,950	fingerlings

Table 2. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **largemouth bass** collected by spring electrofishing from Konawa Lake (VVP 1980-1988; GPP 1989-2009). Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Total (40)		<8 inches (15-45)		8-12 inches (15-30)		12 inches (15)		14 inches (10)		21 inches (2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1981	128	42.7	10.7	84	14.7	84	17.3	91	6.7	--		
1985	176	54.2	3.4	83	24.6	88	26.2	88	16.3	--		
1987	357	89.3	5.7	93	31.2	92	52.2	87	19.2	89	3.0	95
1988	316	90.3	3.4	93	14.9	87	72.0	85	24.9	84	0.6	76
1989	555	170.8	20.3	105	36.6	96	113.8	93	56.3	93	2.8	99
1990	545	218.0	19.2	77	48.0	90	150.8	87	55.2	86	2.4	97
1991	447	162.5	41.1	89	28.4	89	93.1	85	33.5	85	1.5	103
1992	417	208.5	37.5	83	72.0	87	99.0	86	33.5	84	0.0	--
1993	424	242.3	62.9	92	49.7	90	129.7	88	49.7	87	1.7	96
1994	449	224.5	30.5	96	26.5	90	167.5	85	82.5	84	4.5	89
1995	684	210.5	35.4	89	51.1	86	124.0	83	46.5	81	0.6	94
1996	317	211.3	20.7	80	35.3	83	155.3	85	78.0	84	5.3	95
1997	511	185.8	13.8	81	19.6	88	152.4	85	93.5	84	2.9	88
1998	414	207.0	37.0	84	35.0	85	135.0	83	81.0	81	2.0	92
1999	447	198.7	60.0	79	38.2	83	100.4	84	53.8	84	1.3	82
2000	376	188.0	41.0	87	22.0	92	125.0	84	83.5	83	5.0	85
2001	515	228.9	64.4	90	65.3	88	99.1	86	45.8	84	0.9	91
2002	471	209.3	49.8	84	54.2	90	105.3	85	41.8	84	0.9	83
2003	905	201.1	34.9	91	26.0	89	140.7	86	54.7	83	0.2	85
2004	763	169.6	32.4	91	43.8	93	94.4	89	43.3	88	0.2	90
2005	640	150.6	37.4	93	23.3	94	90.4	88	33.4	86	0.2	108
2006	592	131.6	15.8	93	29.8	95	86.9	95	48.4	94	0.2	96
2007	834	185.3	29.5	94	32.4	96	123.3	88	69.1	86	2.2	89
2008	441	155.5	34.9	--	57.5	--	64.1	--	27.2	--	0.0	--
2009	701	155.8	8.9	95	17.1	96	129.8	92	69.8	89	2.0	61

Table 3. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **white bass** collected by gill netting from Konawa Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Total (4.8)		<8 inches (1.2)		8-12 inches (1.3-7.2)		12 inches (2.4)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	50	5.28	.00	--	1.2		4.08	
1979	68	12.96	.00	--	2.64		10.32	
1981	29	5.52	.00	--	1.44		4.08	
1982	29	5.52	.00	--	.00	--	5.52	96
1984	22	4.32	.00	--	0.72	111	3.36	108
1985	73	13.44	0.48	98	11.28	97	2.16	97
1986	45	9.12	.00	--	1.92	96	6.96	99
1987	43	8.4	.00	--	0.96	106	7.44	99
1988	10	2.16	.00	--	.00	--	2.16	113
1989	12	2.4	.00	--	0.24	117	2.16	101
1990	17	3.36	.00	--	2.16	103	1.2	91
1991	20	4.08	.00	--	1.44	104	2.64	101
1992	11	2.16	.00	--	1.68	105	0.72	101
1993	23	4.56	.00	--	0.72	113	4.08	101
1994	63	12.72	.00	--	0.72	89	12.0	88
1995	56	13.92	5.52	84	3.6	78	5.04	84
1996	19	4.32	0.24	88	.00	--	4.08	91
1998	49	11.04	1.44	71	5.04	78	4.8	82
2000	31	7.2	.00	--	0.24	98	6.96	97
2002	21	4.32	.00	--	2.16	88	1.92	88
2004	55	6.24	0.96	73	3.6	88	1.68	83
2006	145	17.76	0.24	89	4.32	89	13.2	88
2008	54	6.0	.00	--	2.16	100	3.84	99

Table 4. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **striped bass x white bass hybrids** collected by gill netting from Konawa Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Total (2.4)		<12 inches (0.72)		12-20 inches (1.2)		20 inches (0.48)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1979	4	0.72	.00	--	0.72		.00	--
1981	7	1.44	.00	--	0.48		0.96	
1982	0	.00	.00	--	.00	--	.00	--
1984	29	5.52	2.88	93	2.64	92	.00	--
1985	45	8.64	4.08	87	4.56	91	.00	--
1986	56	11.28	1.2	89	8.88	91	1.2	86
1987	14	2.64	.00	--	2.64	92	0.24	85
1988	15	3.36	1.44	102	0.48	102	1.68	98
1989	5	0.96	0.24	106	0.72	98	.00	--
1990	12	2.4	1.68	97	0.72	91	.00	--
1991	11	2.16	.00	--	2.16	95	.00	--
1992	31	6.0	3.12	98	2.64	97	0.48	95
1993	29	5.76	0.48	97	4.32	95	0.72	87
1994	14	2.88	0.24	86	1.68	92	0.96	75
1995	12	3.12	1.92	76	0.96	80	.00	--
1996	16	3.6	0.48	101	2.88	90	0.48	91
1998	55	12.48	0.96	75	10.56	78	0.96	91
2000	57	13.2	6.72	97	5.76	90	0.72	78
2002	39	7.92	1.2	105	5.76	83	0.72	75
2004	20	2.4	0.72	76	1.2	79	0.48	75
2006	62	7.44	0.24	92	6.48	86	0.96	81
2008	108	12.0	3.36	97	7.2	95	1.44	85

Table 5. Mean length (inches) at age of **striped bass hybrids** collected by gill netting from Konawa Lake.

Year	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5
2002	9.5	13.9	17.0	18.9	20.5	24.0

Table 6. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **channel catfish** collected by gill netting from Konawa Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Total (4.8)		<12 inches (2.4)		12 inches (2.4)		16 inches (1.2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1979	92	17.76	7.92		9.84		5.76	
1981	61	11.52	4.8		4.8		1.2	
1982	83	15.84	8.4	89	7.44	87	2.4	104
1984	102	19.68	11.04	92	8.64	81	1.92	94
1985	75	14.4	12.72	95	1.68	98	0.48	116
1986	77	15.6	13.68	74	1.92	90	0.24	135
1987	42	8.16	7.68	87	0.48	87	0.24	104
1988	203	45.84	22.8	86	23.04	87	2.88	100
1989	76	14.88	7.92	83	6.72	88	1.68	95
1990	68	13.44	7.44	81	6.0	84	2.16	93
1991	81	16.32	13.2	81	3.12	90	1.68	101
1992	67	13.2	6.96	83	6.24	85	2.4	92
1993	48	9.6	4.56	82	5.04	84	1.68	93
1994	55	11.04	4.32	78	6.72	82	3.36	87
1995	56	13.92	3.36	79	10.8	80	1.68	86
1996	81	18.72	5.04	81	13.68	83	5.04	88
1998	78	17.76	6.48	71	11.04	79	5.04	86
2000	78	18.0	9.84	82	8.16	81	3.36	86
2002	130	25.92	13.44	79	12.72	82	8.16	85
2004	154	17.04	6.0	77	11.04	81	4.08	86
2006	114	13.68	0.24	83	13.44	84	5.28	90
2008	199	22.08	9.6	82	12.24	83	8.16	84

Table 7. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **flathead catfish** collected by gill netting from Konawa Lake . Acceptable W_r values are 90.

	Total		<12 inches		12 20 inches		20 24 inches		24 28 inches		28 inches	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1978	3	.01										
1981	1	.01										
1982	2	.02										
1984	2	.02	.01	--	.01	99	.01	99	.00	--	.00	--
1985	1	.01	.00	--	.01	107	.01	107	.00	--	.00	--
1986	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
1987	1	.01	.00	--	.01	94	.01	94	.00	--	.00	--
1988	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
1989	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
1990	3	.03	.00	--	.02	88	.02	85	.01	89	.00	--
1991	1	.01	.00	--	.01	86	.01	86	.01	86	.00	--
1992	2	.02	.00	--	.02	94	.02	94	.01	87	.00	--
1993	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
1994	3	.02	.00	--	.02	115	.02	115	.02	115	.02	114
1995	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
1996	5	.05	.00	--	.05	88	.05	88	.03	83	.02	83
1998	1	.01	.00	--	.01	89	.01	89	.01	89	.00	--
2000	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
2002	4	.03	.00	--	.03	86	.03	86	.02	82	.01	88
2004	4	.02	.00	--	.02	81	.02	81	.02	81	.01	83
2006	0	.00	.00	--	.00	--	.00	--	.00	--	.00	--
2008	3	.01	.00	--	.01	99	.01	92	.00	--	.00	--

Table 8. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **crappie** collected by gill netting from Konawa Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Total (4.8)		<8 inches (1.2-7.2)		≥8inches (1.92)		≥10 inches (0.96)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	3	0.24						
1979	1	0.24						
1981	0	0.00						
1982	0	0.00						
1984	0	0.00						
1985	0	0.00						
1986	0	0.00						
1987	0	0.00						
1988	0	0.00						
1989	1	0.24	0.00	--	0.24	119	0.24	119
1990	0	0.00						
1991	2	0.48	.00	--	0.48	111	0.48	111
1992	2	0.48	0.24	126	0.24	119	0.00	--
1993	4	0.72	0.00	--	0.72	110	0.72	110
1994	1	0.24	0.00	--	0.24	106	0.24	106
1995	2	0.48	0.00	--	0.48	97	0.24	95
1996	4	0.96	0.00	--	0.96	114	0.72	115
1998	0	0.00						
2000	1	0.24	0.00	--	0.24	115	0.24	115
2002	0	0.00						
2004	1	0.24	0.00	--	0.24	102	0.00	--
2006	1	0.24	0.00	--	0.24	101	0.24	101
2008	3	0.24	0.00	--	0.24	111	0.24	111

Table 9. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **gizzard shad** collected by spring electrofishing (VVP 1980-1988; GPP 1989-2008), gill netting, and seining from Konawa Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are 90.

	Spring Electrofishing				Gill Netting		Seining			
	Total (40)		<8 inches (20)		Total (4.8)		<8 inches (2.4)		Age 0 -	
Year	No.	C/f	C/f	W_r	No.	C/f	C/f	W_r	No.	C/f
1985	16	7.1	2.2	107	23	4.32	1.44	107	0	.00
1986					49	9.84	7.92	94	1	.09
1987	19	4.7	2.7	107	84	16.32	5.76	--	0	.00
1988	16	4.6	2.0	115	25	5.76	1.2	82	0	.00
1989	64	19.7	.6	107	51	9.84	0.48	89	0	.00
1990	9	4.0	2.2	--	45	8.88	0.48	101	0	.00
1991	37	13.5	5.5	84	61	12.24	0.48	85	0	.00
1992	108	61.7	8.0	84	35	6.96	.00	--		
1993	44	29.3	16.0	85	50	10.08	3.84	--		
1994	6	4.8	0.0	--	42	8.4	0.24	90		
1995	47	15.7	0.0	--	78	19.44	5.52	95		
1996	0	0.0	0.0	--	61	14.16	1.92	99		
1997	6	4.0	0.0	--						
1998	4	2.0	0.0	--	77	17.52	2.88	86		
1999	15	6.7	0.0	--						
2000	16	12.8	0.0	--	78	18.0	2.64	82		
2001	127	63.5	0.0	--						
2002	123	164.0	0.0	--	32	6.48	0.24	--		
2004					53	6.0	.00	--		
2006					250	30.24	12.96	--		
2008					100	11.04	0.72	--		

Table 10. Total number (No.) and catch rates (C/f) of **threadfin shad and silversides** collected by spring electrofishing (VVP 1980-1988; GPP 1989-2008), gill netting, and seining from Konawa Lake.

	Total[1]		Threadfin shad Total[2]		Total[3]		Silversides Total[3]	
Year	No.	C/f	No.	C/f	No.	C/f	No.	C/f
1985	196	87.1	0	.00	1	.09	1518	130.9
1986			0	.00	0	.00	3029	261.1
1987	200	50.0	4	0.72	0	.00	8034	692.6
1988	50	14.3	0	.00	0	.00	2841	244.9
1989	685	210.8	0	.00	6	.52	7028	605.9
1990	200	88.9	5	0.96	0	.00	3394	292.6
1991	60	21.8	7	1.44	0	.00	7020	605.2
1992	5	2.9	8	1.68				
1993	91	60.7	9	1.92				
1994	119	95.2	0	.00				
1995	206	68.7	104	25.92				
1996	91	72.8	3	0.72				
1997	1077	718.0						
1998	50	25.0	118	26.64				
1999	19	8.4						
2000	137	109.6						
2001	165	82.5						
2002	162	216.0	2	0.48				
2004			50	5.04				
2006			543	65.28				
2008			16	1.92				

[1] Spring electrofishing
[2] Gill netting
[3] Seining

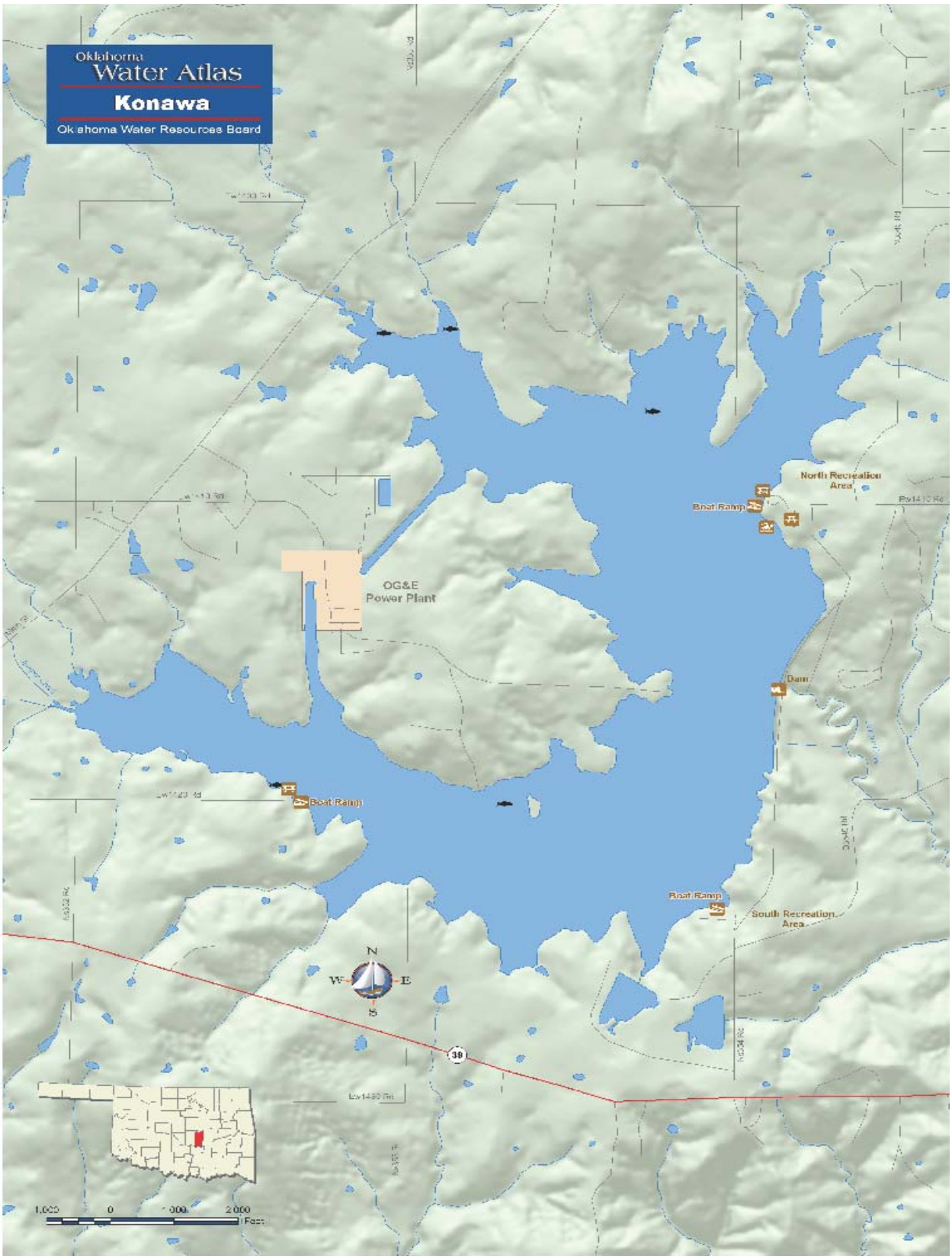

Figure 1. Konawa Lake

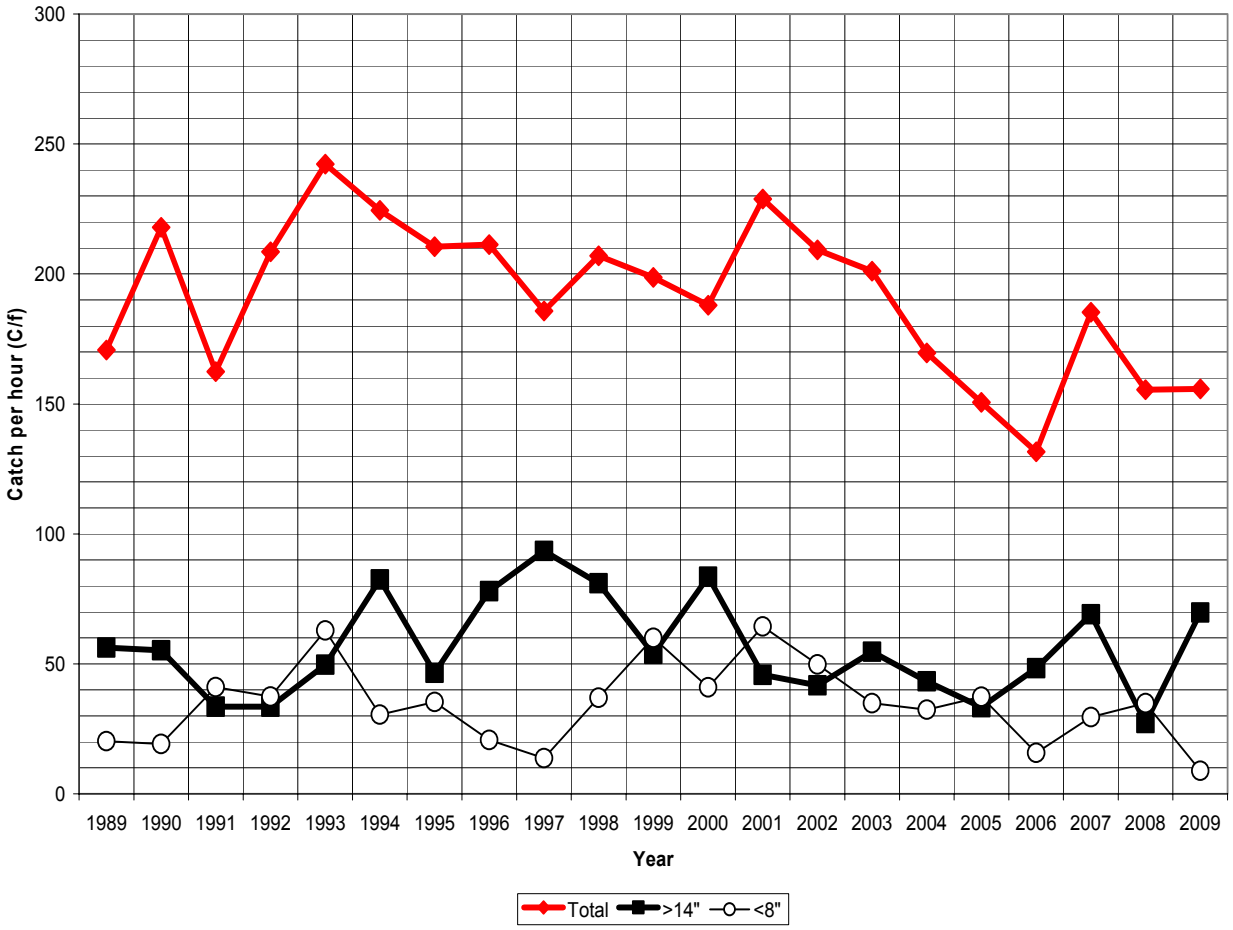

Figure 2. Largemouth bass catch per hour (C/f) by electrofishing in Konawa Lake 1989 – 2009.

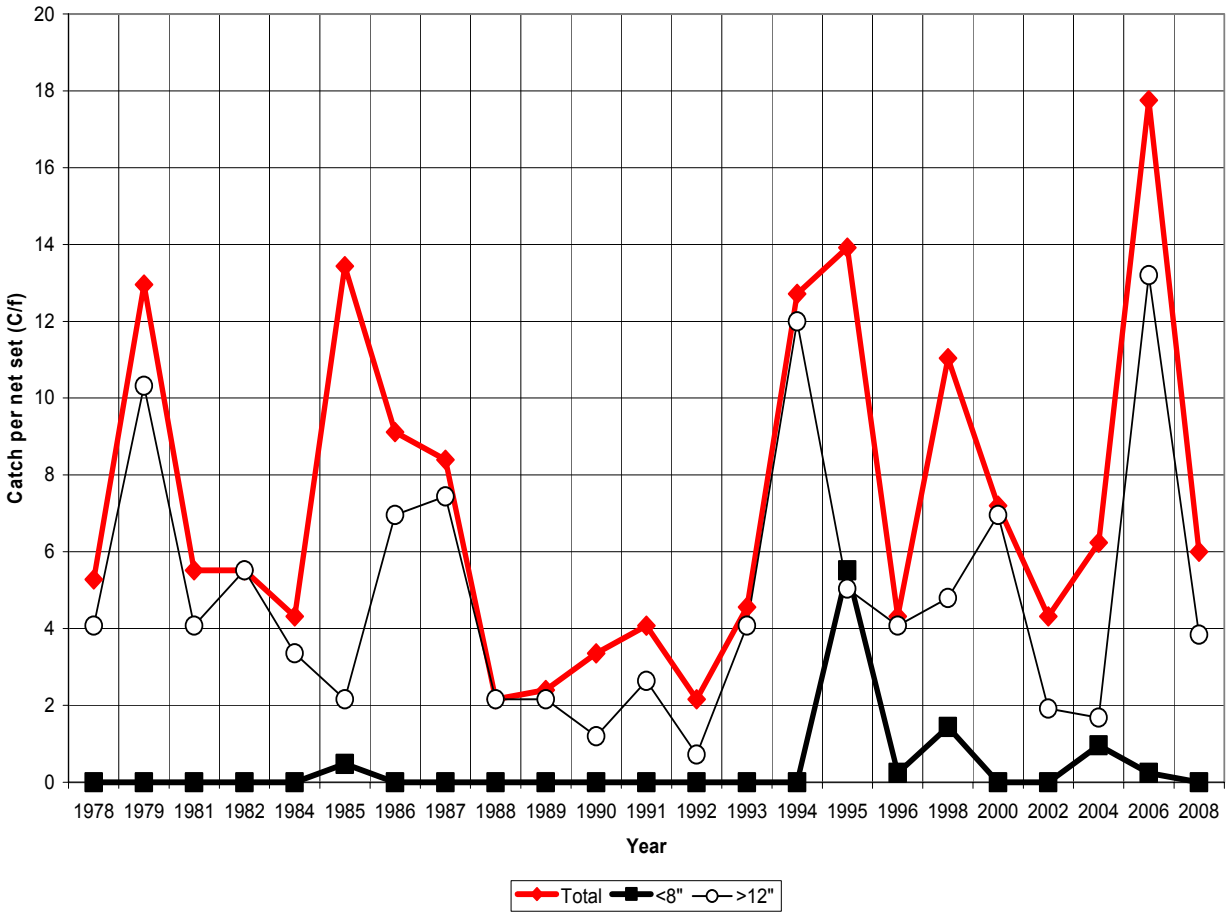

Figure 3. White bass catch per net set (C/f) in Konawa Lake 1978 – 2008.

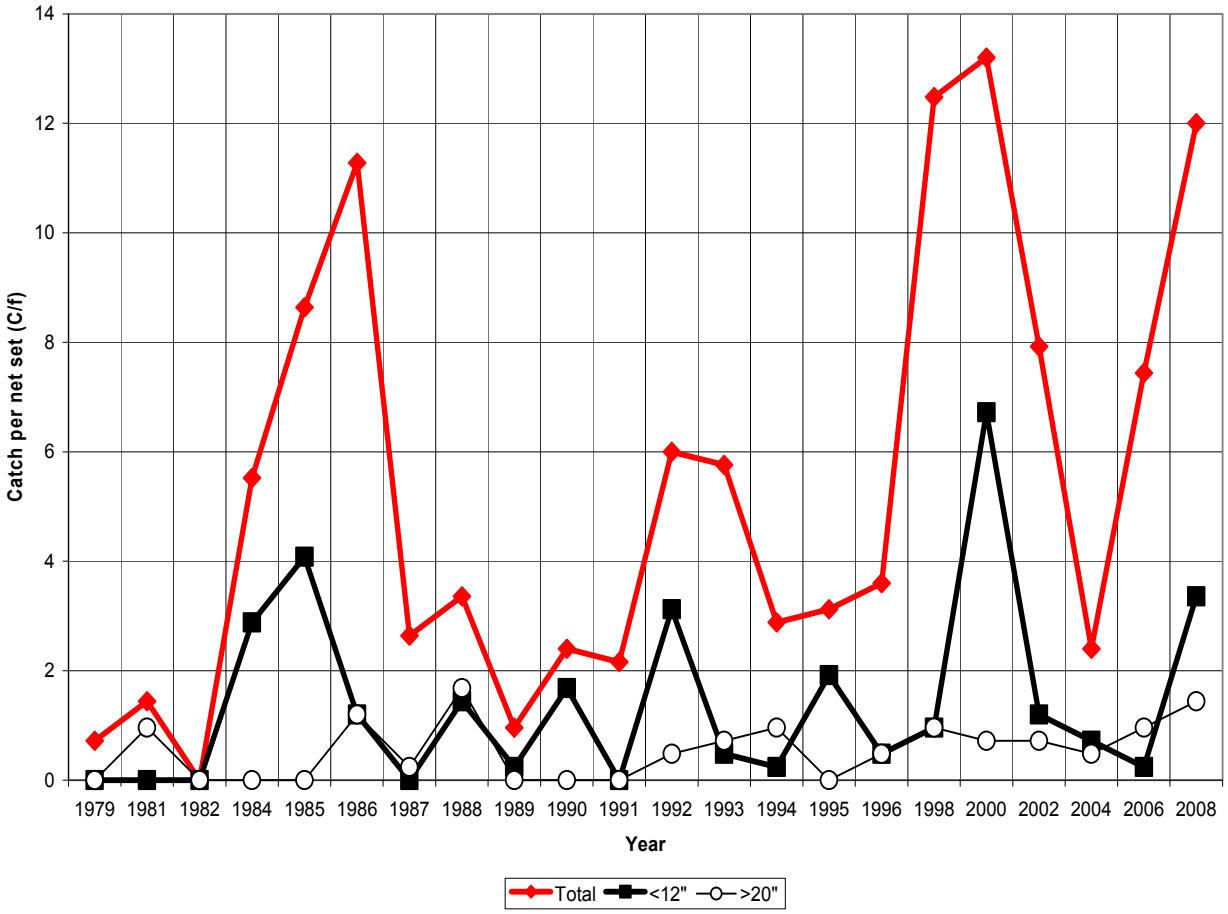

Figure 4. Striped bass x white bass hybrid catch per net set (C/f) in Konawa Lake 1979 – 2008.

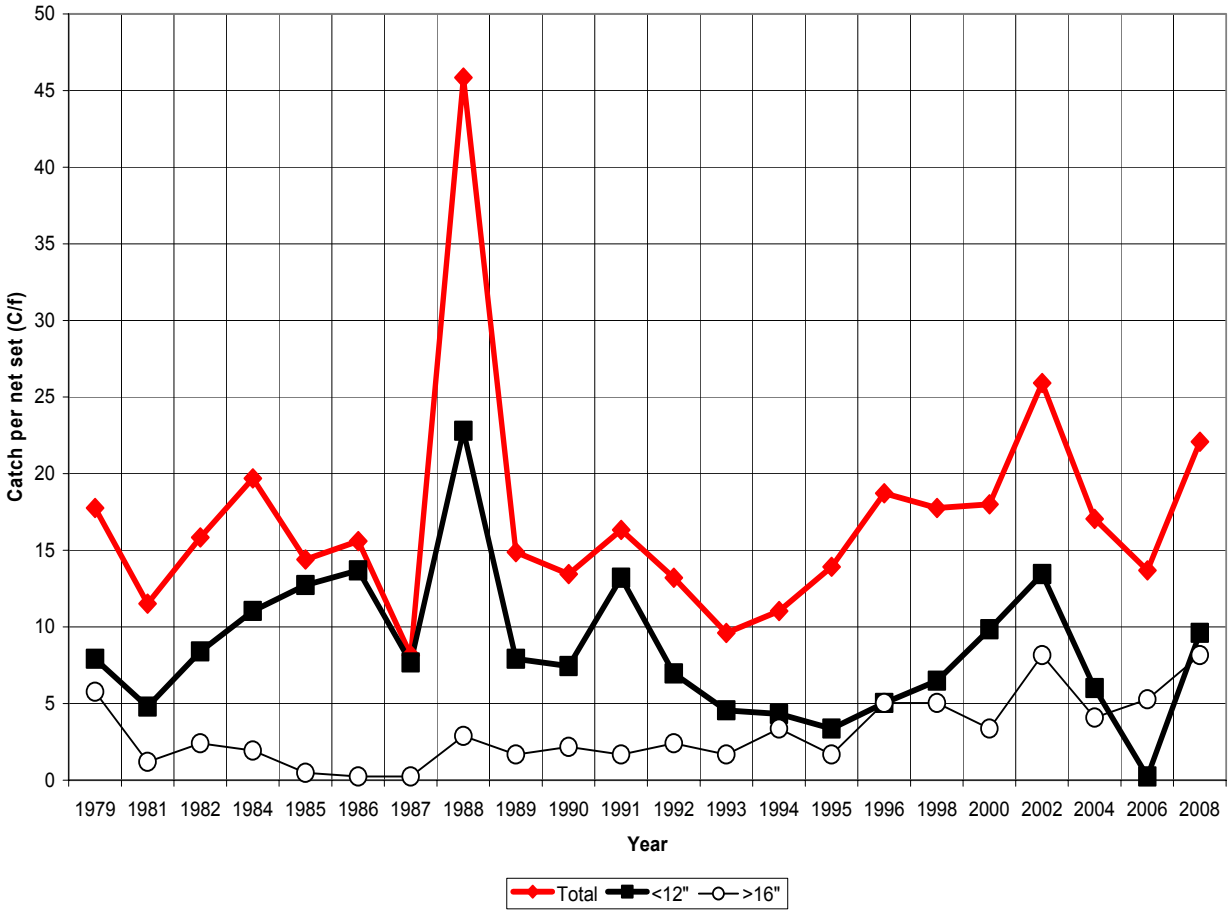

Figure 5. Channel catfish catch per net set (C/f) in Konawa Lake 1979 – 2008.

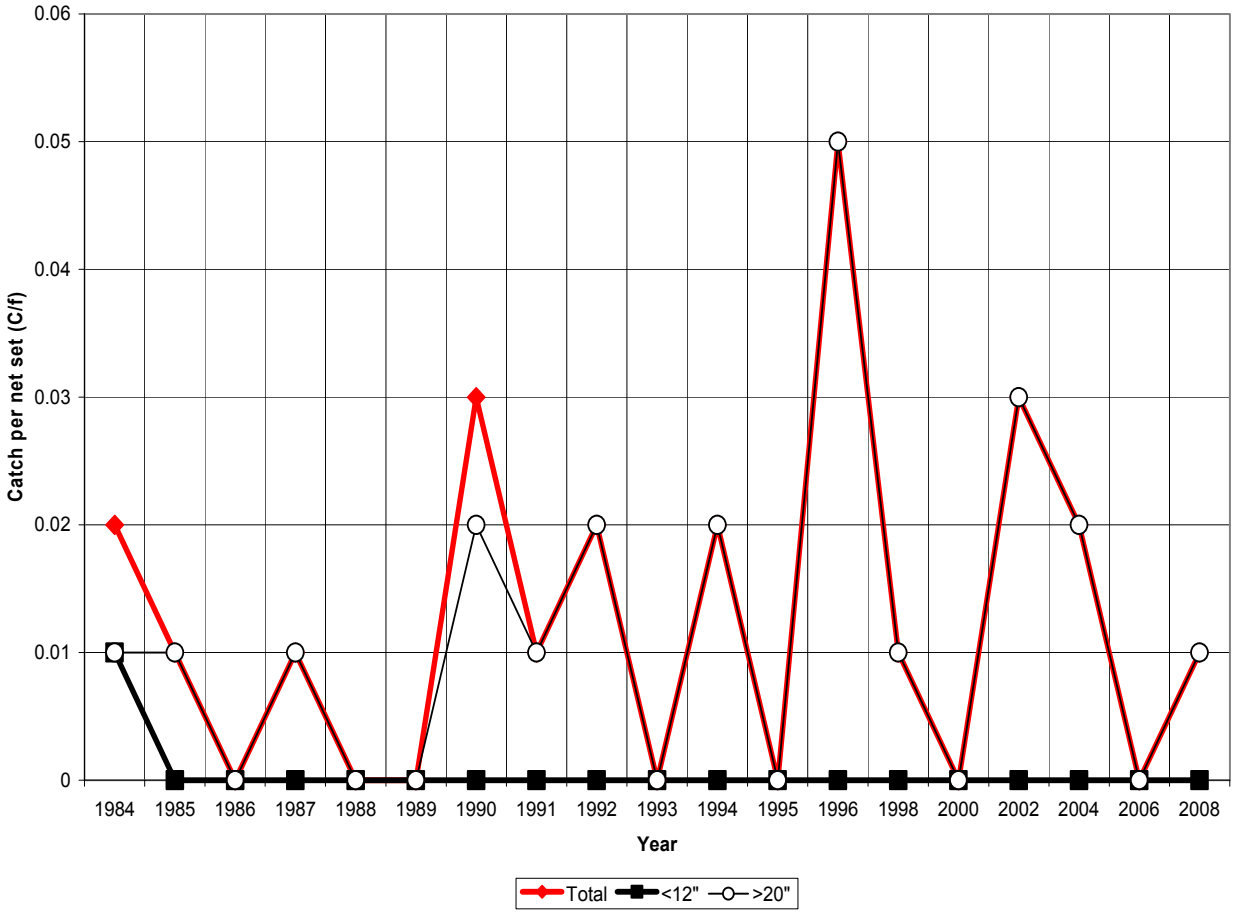

Figure 6. Flathead catfish catch per net set (C/f) in Konawa Lake 1984 – 2008.

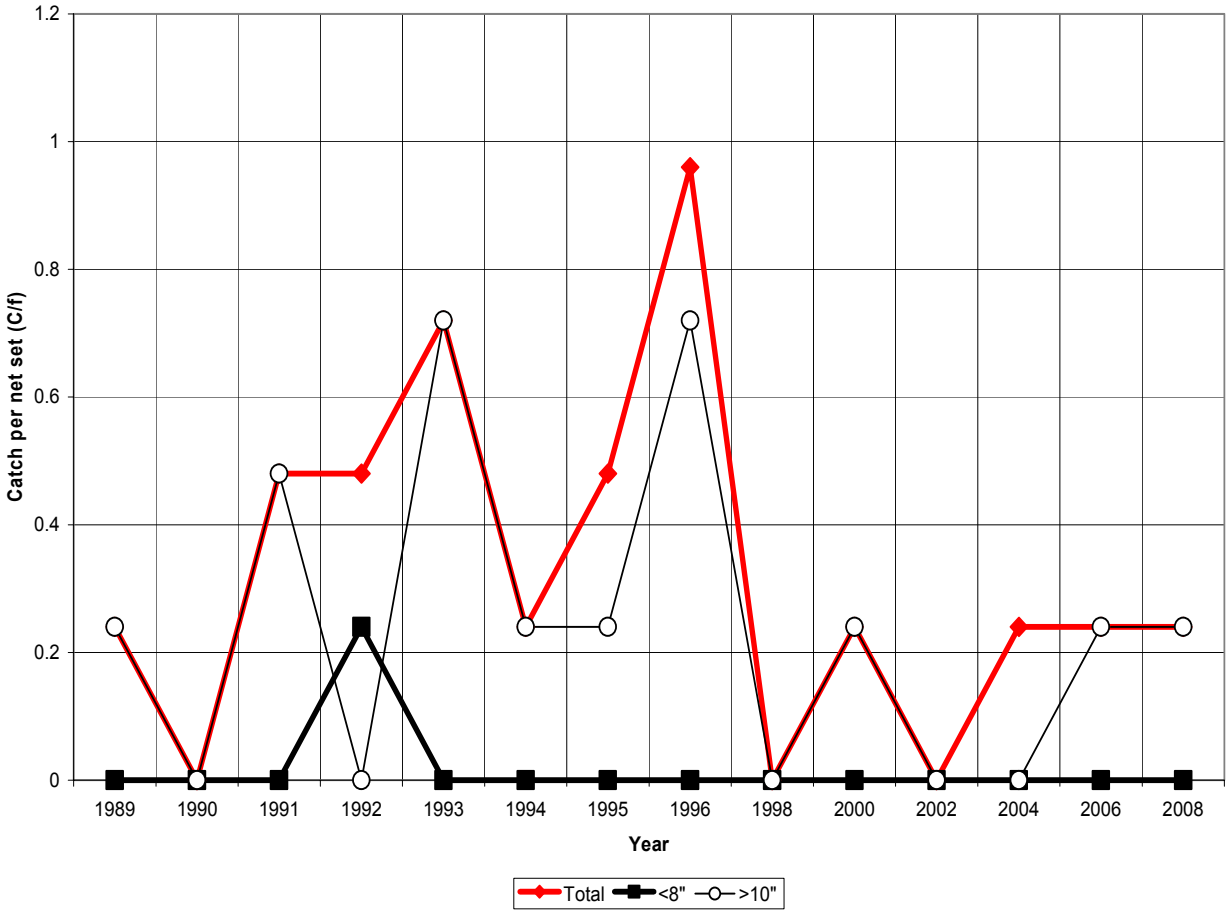

Figure 7. White crappie catch per net set (C/f) in Konawa Lake 1989 – 2008.

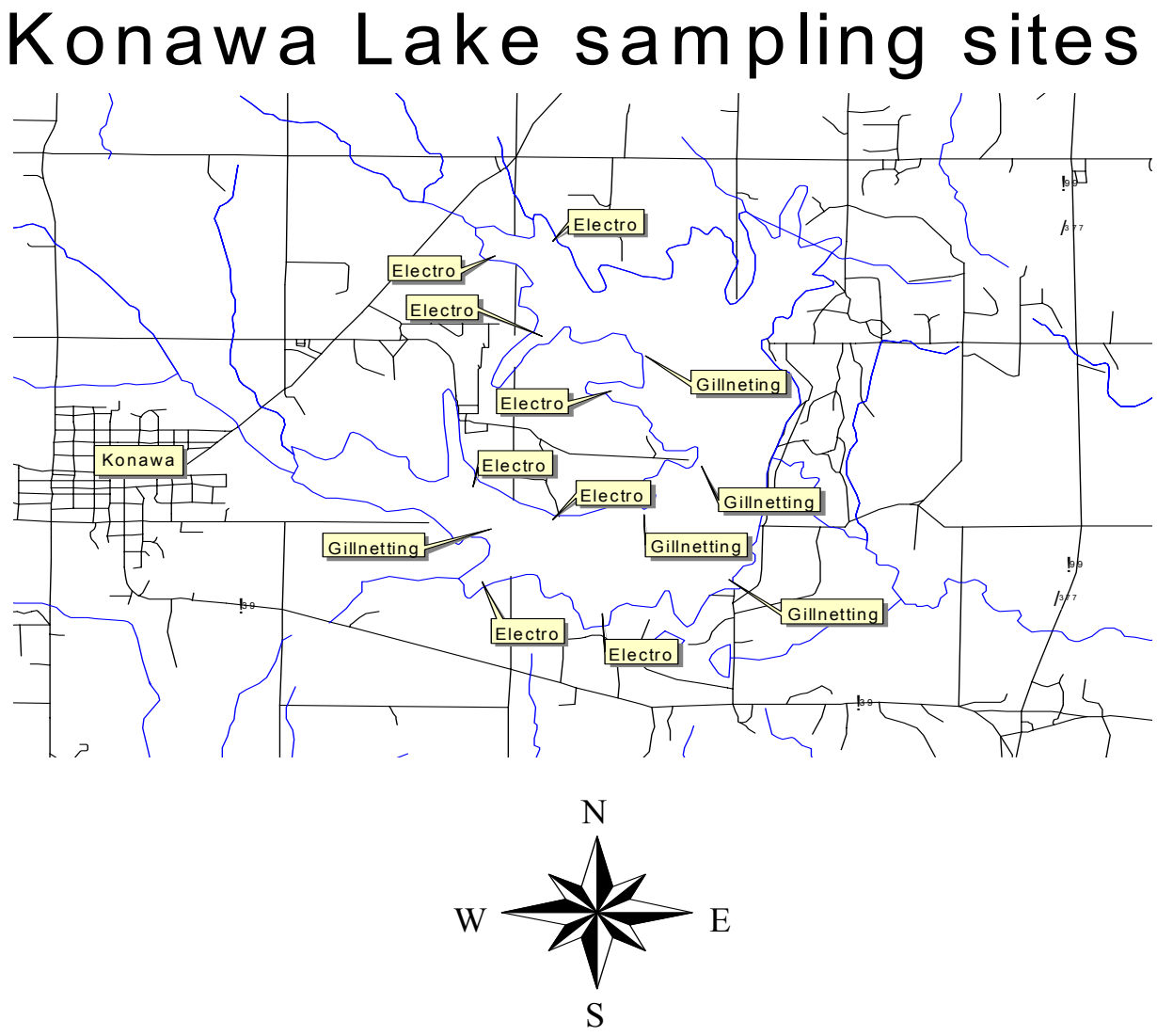

Figure 8. Sampling sites on Konawa Lake.