ARCADIA RESERVOIR

5 YEAR

MANAGEMENT PLAN

CENTRAL REGION
FISHERIES DIVISION

OKLAHOMA DEPTMENT OF
WILDLIFE CONSERVATION

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Background:

The purpose of this document is to assemble all pertinent biological and physical data to construct and implement a management plan for improving Arcadia Reservoir's aquatic resources. To create a more comprehensive plan, all lake stakeholders will be invited to participate in the planning process. Plans from other government agencies that have already been developed are being implemented and will be taken into consideration.

Use and ownership

The U.S. Army Corps of Engineers (COE) began constructing the reservoir in 1985 for flood control, municipal water supply, recreation and wildlife habitat. Water usage is controlled by the City of Edmond. Edmond uses the lake water for recreation and municipal water needs. The surrounding lake property is controlled by the COE and is occupied by Edmond Parks and Recreation Department and the Oklahoma Department of Wildlife Conservation (ODWC). Some private residences occupy the south side of the lake.

Physical features

Arcadia Reservoir occupies 1,820 surface acres and became operational in 1987. Arcadia reservoir sits on the Deep Fork River which runs through the heart of Oklahoma City. The Deep Fork runs southeasterly from Arcadia Reservoir approximately 185 river miles and empties in to Eufaula Reservoir. Other tributaries that feed the reservoir include Tinker and Spring Creeks. The reservoir is located 6 miles east of downtown Edmond, Oklahoma at latitude: 35°N 38' 54" and longitude -97°W 21' 47".

Arcadia Reservoir has 26 miles of shoreline which is comprised mostly of sand and red clay. The shoreline development ratio is 15:11. The watershed occupies 105 square miles of urban, rural and agricultural lands. The surrounding rolling red prairie occupies the Cross Timbers eco-type region of the Southern Plains. Average annual precipitation is 36.21 inches.

The conservation pool is 1,006 MSL (mean ft. above sea level) and the reservoir has a total capacity of 27,520 acre-feet of water. The maximum depth near the dam is 56 feet and the average depth is 15.44 feet. The water exchange rate is 0.783 (inflow/storage capacity). Prevailing winds are out of the south most of the year at 5 to 10 mph. The reservoir receives a total of 3,659 heating degree days. Currently, there is no water level management plan in place to benefit fisheries or wildlife.

Limnological features

Chemical properties were measured by the Oklahoma Water Resources Board (OWRB) in 2006 and 2007 according to their Beneficial Use Monitoring Program (BUMP). Samples collected were compared to the Oklahoma Water Quality Standards (OWQS) and fell within acceptable levels. Normal surface temperatures range from 48 to 90 degrees Fahrenheit annually. The reservoir is somewhat turbid the majority of the time due to suspended clay particles or phytoplankton. OWRB samples revealed an average secchi disk reading of 26.4 inches at mid lake. BUMP measurements showed that the reservoir has moderate turbidity with a Nephalometric Turbidity Unit (NTU)) score of 42. Oklahoma Water Quality Standards prefer a NTU of 25 or less for a healthy body of water. Salinity values range from 0.10 to 0.20 ppt (parts per thousand). The water is neutral to slightly alkaline with pH values ranging from 7.32 to 8.47. The conductivity ranges from 209.7 to 422 µS/cm. Dissolved oxygen (DO) readings were under 2 ppm (parts per million) for 38% of the water column in August. The lake stratifies normally in mid-June and forms a thermocline at around 7 feet. The hypolimnion typically has less than 2.0 ppm dissolved oxygen. The OWRB has identified Arcadia Reservoir as being eutrophic. The Carson's Trophic State Index indicates high primary productivity (TSI = 58). The lake is phosphorus limited with a Nitrogen to Phosphorus ratio of 15:1.

Habitat types

Natural habitat types beneficial to fish and other aquatic organisms include: aquatic vegetation (1%), terrestrial vegetation (20%), rip-rap / sand stone (1%) and standing timber (8%). Overall, the reservoir is limited on providing adequate fish habitat such as aquatic vegetation, shrubs, timber and rock. Most of the original shoreline cover has been eliminated due to shoreline erosion and natural aging processes. High turbidity levels affect the lake's productivity and ecology. Fish populations, especially sunfish, have suffered over the years due to the lack of adequate nursery cover and fluctuating water levels.

Aquatic vegetation restoration project

A joint venture between the Lewisville Aquatic Ecosystem Restoration Facility of the COE and the ODWC was initiated in 1987 to establish founder colonies throughout the lake. The primary objective was to improve fish habitat. Twenty-two species of native aquatic plants were introduced at 15 sites around the reservoir. Fencing was erected at all sites to protect the plants from herbivores. Success varied by site, but overall survival and spread of plants in and around the cages was observed. High and low water events along with grazing by carp, beaver and turtles severely limited the overall success of the project. By 2001, the project was abandoned. Improved levels of recruitment by sunfish species could not be verified during or after the project.

Fish species

Sportfish in Arcadia Reservoir include: largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus*), blue catfish (*Ictalurus furcatis*), channel catfish (*I. punctatus*), flathead catfish (*Plyodictus olivaris*), white bass (*Morone chrysops*), Hybrid striped bass (*M. chrysops* x *M. saxatilis*), bluegill sunfish (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), redear sunfish (*L. microlophus*), longear sunfish (*L. megalotus*), warmouth sunfish (*L. gulosus*) and the orangespotted sunfish (*L. humilus*). Crappie, channel catfish and blue catfish have been the predominant species supporting the fishery. Other fish species include: common carp (*Cyprinus carpio*), white amur (*Ctenopharyngodon idella*), gizzard shad (*Dorosoma cepedianum*), inland silverside (*Menidia beryllina*), black bullhead (*Ameiurus melas*), red shiner (*Notropis lutrensis*) and mosquito fish (*Gambusia affinis*).

Largemouth bass -

Arcadia Reservoir has historically produced a low density largemouth bass population. Limited nursery and spawning habitat has impaired bass numbers. Fish who do manage to survive into their second year grow quickly and become top predators. Arcadia Reservoir is a popular destination for the serious angler willing to expend a lot of effort in order to catch a lunker bass.

In order to accentuate trophy bass numbers, Florida strain largemouth bass (FLMB) were stocked beginning in 1988 by ODWC (Table 1). As a result, several 8 pound+ bass were reported by anglers or sampled during ODWC surveys (Table 2). Additional FLMB introductions have been suspended due to limited availability of fingerlings and poor survival due to cold winter temperatures.

In general, total catch rates for largemouth bass by electrofishing have been comparable to balanced population levels (Table 3). However, catch rates for juvenile fish were below preferred levels. Figure 3 reveals how catches of Age 1 fish numbers improved noticeably due to elevated water levels during the months of May, June and July in 1988, 1992, 1999, 2002 and 2010. Normal to above normal water levels during these years shoreline vegetation was flooded, providing nursery cover for juvenile fish. Recent surveys have produced good catches of legal sized fish (Figure 3). Body condition has stayed constant as adult fish appear very healthy. Overall, the absence of suitable nursery cover has severely impacted the survival and recruitment of bass in the past. Year class strength appears to be low based on the overall sample size collected from year to year (Table 3). Fluctuation of water levels has severely hampered sunfish species spawning attempts.

A 22-inch minimum length limit, 3 fish per day creel, was applied to the lake in 1993. This recommendation was adopted as an ordinance by the City of Edmond. In 2008 at the city's request, the limit was replaced with a 14-inch minimum and a 6 fish per day creel.

Currently, there is no lake record for largemouth bass at Arcadia Reservoir. The minimum weight for the lake record is 6 pounds.

Crappie species -

Arcadia has produced good fishing opportunities for white and black crappie over the years. According to the ODWC 2009 Angling Guide, Arcadia ranked 2nd overall statewide in numbers and size of fish surveyed. Crappie populations are known to be cyclic and this is no exception at Arcadia. Strong year classes were observed in the 1990's (Table 4). White crappie body condition has been good according to trapnet surveys (Table 4). Age and growth analysis via otolith samples from white crappie in 2005 revealed that the crappie grew faster at Arcadia than at other regional lakes (Figure 5). Black crappie are present but occur in very low numbers.

Currently, there is no lake record for crappie at Arcadia Reservoir. The minimum weight for the lake record is 2 pounds. Anglers are allowed to harvest 37 fish per day and there is no length limit.

Hybrid striped bass -

A total of 196,200 hybrid striped bass fry were stocked in 1988 and 1990 with good results (Table 1.) The goal was to provide an additional sport fish for anglers as well as to utilize the abundant 6-inch and above gizzard shad population. Occasional reports of catches by anglers were noted over the years, but none were sampled during ODWC gillnet surveys. Fish were not stocked again until 2007 as the trophy largemouth bass program was given time to develop. Hybrid fingerlings were stocked again starting in 2007 at the request of the City of Edmond in a renewed effort to provide additional. sport fishing opportunities. Experimental gill net catches were fair (Table 5).

The current lake record hybrid striped bass is 12.5 pounds caught in March of 2010. The minimum weight required is 8 pounds. There are no regulations for hybrids currently. Starting in 2012, the limit will be 5 per day of which only 2 fish may be longer that 20 inches.

Channel catfish -

Since 1986, the ODWC has stocked over 76,000 channel catfish into the lake (Table 1). Status of the channel catfish population is fair. Gill net surveys show low catch rates for all years except in 2003 (Table 6). Health of channel catfish sampled expressed in (Wr) for all length groups has been good.

Currently there is no lake record for channel catfish at Arcadia Reservoir. The minimum weight required is 15 pounds.

Blue catfish -

Sixty-five thousand plus fish were stocked initially in to Arcadia resulting in the best bluecat fishery in the OKC metropolitan area (Table 1). Anglers annually catch good numbers of quality sized fish. Previous surveys by gill net for bluecat have produced low catch rates for all size groups. Gillnet surveys statewide have not provided adequate sample sizes and this is probably the case at Arcadia (Table 8). Future bluecatfish populations analyses should be performed by roving electrofishing at randomly selected sites according to the grid map (Figure 10).

Currently, there is no lake record for bluecat at Arcadia Reservoir. The minimum weight required is 40 pounds.

Gizzard shad -

Gill net surveys from 1987 to present have shown fair numbers of shad both above and below 6 inches (Table 8). Recent surveys have shown good numbers of shad available for predators. New 40-foot, floating shad nets are now being used to sample shad. Twelve sites are selected at random using GPS coordinates on a grid map of 300 ft. x 300 ft. quadrants (Figure 10).

Threats to the fishery:

Pollution and trash

- Non-point source - Urban runoff from commercial, residential and agricultural practices around the lake.
- Point source - None were reported as of 2009 by the OWRB and DEQ.
- Increased visitation due to added park features around lake.
- Lake level fluctuation

Declining water quality

- Due to erosion and turbidity the lake has below average water clarity. The OWRB posted a 14 NTU in 2008. Listed as partially supporting its beneficial use.
- Accelerated algae levels due to high primary productivity according to OWRB.
- Poor oxygen levels in mid summer at the meso-limnion and hypo-limn ion.
- E. coli outbreaks at some of the swim beaches posing health issues to the swimmers.

Competing water uses

- Increasing municipal water demand by the City of Edmond.

Non-native species

- Common carp are very abundant in the lake and are constantly hindering the spawning success of centrarchids and aquatic plant propagules. Zebra mussels (*Dreissena polymorpha*), Quagga mussel (*Dreissena rostiformis bugensis*), hydrilla (*Hydrilla verticillata*), salt cedar (*Tamarix aphylla*) and common reed (*Phragmites australis*) are not present in the lake but pose threats. All of these organisms are exotic and could become problematic. These organisms will compete with native species, destroy native habitat and disrupt the overall balance of the ecosystem.

- Other water born organisms - Viral hemorrhagic septicemia (VHS), golden algae (*Prymnesium parvum*) and Largemouth Bass Virus (LMBV). The reservoir was sampled in 2002 for LMBV by Oklahoma Fishery Research Laboratory personnel. A 12 fish sample was sent off to the USFWS Diagnostic Laboratory at Pinetop, AZ for analysis. The sample was determined to be negative for LMBV.

- Fish consumption advisory - The Oklahoma Department of Environmental Quality (DEQ) sampled the lake in 2009 for their Toxics Monitoring Program. Mercury levels were below serious levels and no advisories are in place at this time. However, persons should pay attention to the statewide advisory where children under age 15 and women of childbearing age are advised to consume no more than one meal per week of predator species.

- **Review and note existing plans from other agencies:**

- OWRB - Beneficial Use Monitoring Plan (BUMP)
- ODWC - Conservation Wildlife Management Strategy (CWMS)
- HACCP (Hazard Analysis and Critical Control Point) plans
- Watershed development and land use practices (shoreline erosion and siltation) follow OWRB and Oklahoma Conservation Commission plans (Project 10)
- Oklahoma Comprehensive Water Plan
- LAERF Report on Arcadia Plant Restoration Project

Management Objectives:

Sampling schedule

- Trap netting for crappie - monitor catch, size structure, age & growth and population trends (5 yr cycle starting in 2012)
- Electrofishing for bass - catch (annual assessment), age & growth, size structure and population trends (5 year cycle starting in 2011)
- Gill netting for hybrid striped bass, white bass, channel catfish and gizzard shad - catch, size structure and trends (5 year cycle starting in 2011)
- Remove all remaining plant restoration project materials in fall of 2011.
- Refer to Figures 10 for electroshocking and net sampling locations at Arcadia Reservoir.

Fish stocking

- Stock Florida largemouth bass on alternate years when available according to ODWC stocking criteria.
- Stock hybrid striped bass on alternate years according to ODWC stocking guidelines beginning in 2011. A stocking rate of 5 fingerlings per acre will be requested totaling 9,100 fish.

Habitat improvement projects

- Negotiate with City of Edmond and COE to maintain stable lake levels or flood shoreline areas by 1- 2 foot on alternate years from April through July to enhance sunfish species reproduction and survival.
- Begin planting waterwillow (*Justica americana*) at select shoreline areas in 2012.
- Recharge existing brush piles (4-year cycle starting in 2011)
- Mark all habitat sites with fish attractor buoys, maintain existing buoys, record and publish GPS coordinates.

Angler satisfaction

- Conduct annual stakeholder meetings to exchange information on management progress and get input on modifications that the public would like to see.

Lake access

- Continue to utilize U.S. Fish and Wildlife Boating and Fishing Access funds when needed and available.
- Assist with installation of new 33rd street boat ramp and courtesy dock.

Recent progress towards management strategies:

2010: Took depth profiles at new 33rd St. boat ramp site for ramp and dock installation.

2010: 100 large cedar trees were cut at Spring Creek Area. Existing fish attractor sites in the Spring Creek Arm were recharged. Local volunteers assisted ODWC personnel with the project.

2011: Installed 50 cedar trees and 75 spider blocks at new fishing pier at “The Point”.

References:

Boxrucker, Jeff. 1987. Largemouth Bass Influence on Size Structure of Crappie Populations in Small Oklahoma Impoundments. North American Journal of Fisheries Management, Volume 7, Issue 2, pp. 273-278

Dick, Gary, O. and E. R. Gilliland. 2004. Aquatic Vegetation Restoration in Arcadia Lake, Oklahoma: A Case Study. USACE Report # ERDC/EL TR-04-7 53 pp.

Miller, Rudolph, J. and Henry W. Robison. 2004. Fishes of Oklahoma. University of Oklahoma Press. 450 pp.

Oklahoma Department of Wildlife Conservation. 2009. Standardized Sampling Procedures for Lake and Reservoir Management Recommendations. F-69-D-4-J02. Oklahoma City, OK. 44 pp.

Oklahoma Department of Wildlife Conservation. 2008. Okla. Comprehensive Wildlife Conservation Strategy. 208 pp.

Oklahoma Geological Survey. 2008. Earth Sciences and Mineral Resources of Oklahoma. Educational Publication 9. Norman, OK. 21 pp.

Oklahoma Water Resources Board. 2009. Arcadia Beneficial Use Monitoring Program (BUMP) Report. Oklahoma City, OK.

Oklahoma Water Resources Board. 2010. Lakes of Oklahoma. Oklahoma City, OK. 178 pp.

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Table 1. Fish stocking records at Arcadia Reservoir (impoundment to 2010)

Date	Species	Size (in)	Number	Weight (pounds)
09-19-1986	Channel catfish	2.3	76,000	253
11-19-1986	Blue catfish	5.0	56,000	1,400
11-19-1986	Blue catfish	4.0	9,330	93
11-19-1986	Bluegill sunfish	1.25	256,000	273
05-08-1987	Native largemouth bass	0.5 - 0.75	197,550	18.99
09-30-1987	Redear sunfish	0.5	274,000	228
05-27-1988	Certified Florida LMB	1.5	5,850	15
05-27-1988	Certified Florida LMB	2.0	108,768	309
05-27-1988	Certified Florida LMB	1.75	38,110	103
06-03-1988	Striped bass hybrids	Fry	178,200	N/A
05-24-1989	Certified Florida LMB	2.0	22,275	45
05-25-1989	Certified Florida LMB	2.0	158,765	338.5
04-26-1990	Striped bass hybrids	Fry	18,000	N/A
06-19-1990	Certified Florida LMB	3.0	18,000	90
06-26-1990	Certified Florida LMB	2.0	27,000	98.5
05-15-1991	Certified Florida LMB	1.5	106,895	78.59
05-22-1991	Certified Florida LMB	1.5	62,000	44.8
06-07-1993	Certified Florida LMB	3.0	36,287	241.91
06-27-1996	Certified Florida LMB	3.0	36,000	180
07-02-1996	Certified Florida LMB	3.0	23,432	149.25
07-02-1997	Florida largemouth bass	3.0	18.450	102.5
07-03-1997	Florida largemouth bass	3.0	19,600	98
06-09-1998	Certified Florida LMB	3.0	36,241	326.5
06-21-1999	Certified Florida LMB	3.0	13,588	110
06-15-2000	Certified Florida LMB	3.0	37,122	269
06-26-2002	Certified Florida LMB	2.75	19,780	134
06-26-2002	Certified Florida LMB	3.0	8,230	77
06-26-2002	Certified Florida LMB	2.0	8,120	58
06-15-2004	Florida largemouth bass	1.5	22,614	12.9
12-12-2006	Channel catfish	16.0	55	N/A
06-08-2007	Striped bass hybrids	1.5	18,000	19.1
06-12-2008	Striped bass hybrids	1.25	9,100	10
06-30-2009	Striped bass hybrids	1.75	9,112	13.5
06-30-2010	Striped bass hybrids	2.0	9,100	26.4

Table 2. Trophy bass management results for Arcadia Reservoir. Values are expressed by the percent of Florida phenotypes (% F+F1) for age-1 fish. Also, number of fish > 8 lbs. identified through ODWC surveys and the Angler Recognition Program.

Lake	Region	Year	% F+F1	# of fish > 8 lbs
Arcadia	CRW	1990	Low sample	0
Arcadia	CRW	1991	75	0
Arcadia	CRW	1992	17	0
Arcadia	CRW	1993	18	0
Arcadia	CRW	1994	14	0
Arcadia	CRW	1995	22	0
Arcadia	CRW	1996	18	0
Arcadia	CRW	1997	34	0
Arcadia	CRW	1998	N/A	0
Arcadia	CRW	1999	73	0
Arcadia	CRW	2000	78	1
Arcadia	CRW	2001	N/A	1
Arcadia	CRW	2002	9	0
Arcadia	CRW	2004	40	1
Arcadia	CRW	2008	N/A	0
Arcadia	CRW	2009	N/A	3
Arcadia	CRW	2010	N/A	1
Arcadia	CRW	2011	N/A	1

Table 3. Spring electrofishing total catch rate (C/f), catch by size group and mean relative weight (Wr) for **largemouth bass** at Arcadia Reservoir**.** Numbers in parenthesis represent preferred C/f values for a quality fishery. Acceptable Wr values above 90.

Year	N	Total C/f (≥ 40)	C/f ≤ 8 inch (> 15)	C/f ≥ 14 inch (≥ 10)	Effort (hours)	(Wr)
1988	157	78.50	24.50	0.50	2.00	102
1989	130	74.29	4.57	18.29	1.75	111
1991	217	48.22	3.60	30.00	4.50	103
1992	155	56.36	20.36	25.45	2.75	111
1993	159	35.30	2.44	21.11	4.50	107
1994	183	33.27	0.73	22.36	5.50	107
1995	175	35.00	4.00	25.80	5.00	108
1996	165	41.25	3.25	30.50	4.00	108
1997	173	31.45	1.27	23.64	5.50	111
1998	100	33.33	4.00	26.00	3.00	112
1999	125	50.00	11.60	29.20	2.50	103
2002	123	49.20	14.00	26.40	2.50	104
2008	88	20.76	2.12	12.47	4.25	102
2009	85	18.89	0.67	14.00	4.50	103
2010	104	23.11	5.78	11.55	4.50	104
2011	83	18.44	3.56	8.22	3.00	104

Table 4. Total catch rate (C/f), catch rate by size group and mean relative weight (Wr) for **white crappie** collected by trap net at Arcadia Reservoir. Numbers in parentheses represent preferred C/f values for a quality fishery. Acceptable Wr values are above 90.

Year	N	Effort	Total C/f (>25)	C/f ≥ 10 in. (>4)	(Wr)
1991	533	9	56.88	7.57	95
1993	1180	24	49.68	8.63	85
1995	1339	9	147.46	3.08	96
1999	1088	18	58.97	3.41	89
2005	665	14	48.82	1.68	95

Table 5**.** Total number (N.), catch per net set (C/f), and relative weights (Wr) by size groups for **hybrid striped bass** collected by gill netting from Arcadia Reservoir. Numbers in parentheses represent preferred C/f values for a quality fishery. Acceptable Wr values are above 90.

Year	N	Total C/f (≥ 2.4)	C/f < 12 inch (≥ .7)	W_r	C/f ≥ 12-20 inch (≥ 1.2)	W_r	C/f ≥ 20 inch (≥ .5)	W_r
2007	32	0.17	0.17	85	0	0	0	0
2009	3	0.25	0.05	87	0.19	90	0	0

Table 6**.** Total number (N.), catch per net set (C/f), and relative weights (Wr) by size groups for **channel catfish** collected by gill netting from Arcadia Reservoir. Numbers in parentheses represent preferred C/f values for a quality fishery. Acceptable Wr values are above 90.

Year	N	Total C/f (≥ 4.8)	C/f < 12 inch (≥ 2.4)	W_r	C/f ≥ 12 inch (≥ 2.4)	W_r	C/f ≥ 15.7 inch (≥1.2)	W_r
1990	3	0.03	0	0	0	0	0.03	140
1991	4	0.04	0.04	135	0	0	0	0
1995	8	0.07	0.02	89	0.02	85	0.03	91
2003	139	0.69	0.32	99	0.37	89	0.13	88
2007	134	0.738	0.09	107	0.63	92	0.22	97
2009	55	0.33	0.07	92	0.26	91	0.08	93

Table 7. Total number (N.), catch per net set (C/f), and relative weights (Wr) by size groups of **blue catfish** collected by gill netting from Arcadia Reservoir. Numbers in parentheses represent preferred C/f values for a quality fishery. Acceptable Wr values are above 90.

Year	N	Total C/f (≥ 2.4)	C/f < 12 inch (≥ 1.2)	W_r	C/f ≥ 12 inch (≥ 1.2)	W_r	C/f ≥ 15.7 inch (≥ 0.7)	W_r
1990	18	0.43	0	0	0.44	120	0.44	120
1991	32	0.29	0	0	0.29	150	0.29	150
1995	16	0.14	0.08	117	0.06	102	0.03	133
2003	47	0.23	0.01	120	0.23	92	0.13	93
2007	22	0.12	0.01	128	0.12	94	0.11	94
2009	20	0.12	0.06	103	0.07	94	0.07	94

Table 8. Total number (N.), catch rates (C/f), and relative weights (Wr) by size groups of **gizzard shad** collected by gill netting from Arcadia Reservoir. Numbers in parentheses represent preferred C/f values for a quality fishery. Preferred Wr values are ≥ 90.

Year	N	Total C/f (> .20)	C/f < 6 inch (≥ ?)	W_r	C/f ≥ 6 inch (≥ ?)	W_r
1990	15	0.15	0.11	104	0.04	82
1991	6	0.05	0.04	148	0.02	138
2003	526	2.59	0.26	N/A	2.34	N/A
2007	451	2.45	0.87	N/A	1.59	N/A
2009	75	0.47	0.03	N/A	0.44	86
2010*	58	0.21	0.21	N/A	0	0

* 40 ft. floating shad nets. All previous years 200 ft. experimental nets

Table 9. Description of "Fishing Area" sites at Arcadia Reservoir**.**

ID #	Habitat Type	Area name	Marked	Bank access	Date Installed	Depth (ft)	Latitude	Longitude
2	Brush row	Tinker Creek	Yes	No	2003	15	35° 37' 43"	-97° 22' 13"
3	Brush pile	Tinker Creek	Yes	Yes	2003	15'	35° 37' 52"	-97° 22' 29"
5	Brush pile	Spring Creek	Yes	Yes	2007	9'	35° 38' 27"	-97° 22' 50"
6	Brush row	Spring Creek	Yes	Yes	2007	15'	35° 38' 29"	-97° 22' 55"
7	Brush row	Spring Creek	Yes	Yes	2000	12'	35° 38' 32"	-97° 23' 08"
8	Brush pile	Spring Creek	Yes	Yes	2007	12'	35° 38' 33"	-97° 23' 21"
9	Brush pile	Comanche Pavilion	Yes	No	2007	17'	35° 38' 32"	-97° 23' 10"
10	Brush pile	Spring Creek	Yes	No	2007	17'	35° 38' 35"	-97° 23' 24"
11	Brush pile	Spring Creek	Yes	Yes	2007	10'	35° 38' 46"	-97° 23' 12"
12	Brush pile	Spring Creek	No	Yes	2007	10'	35° 38' 41"	-97° 23' 45"
13	Brush row	Central State	Yes	Yes	2007	10'	35° 38' 47"	-97° 22' 35"
14	Brush pile	Creek Pavilion	No	Yes	2007	10'	35° 38' 44"	-97° 23' 30"
18	Brush pile	Deep Fork	Yes	No	2003	12'	35° 37' 40"	-97° 23' 09"
19	Brush pile	Deep Fork	No	No	2003	12'	35° 37' 43"	-97° 23' 12"
20	Brush pile	Deep Fork	No	No	2003	12'	35° 37' 15"	-97 23' 54"
21	Brush Pile	Deep Fork	No	No	2003	12'	35° 37' 01"	-97° 23' 53"
22	Pier	Spring Creek	No	Yes	2010	14'	35° 38' 32"	-97° 23' 0"
23	Pier	The Point	No	Yes	2011	10'	35° 22' 48"	-97°13 ' 12 "

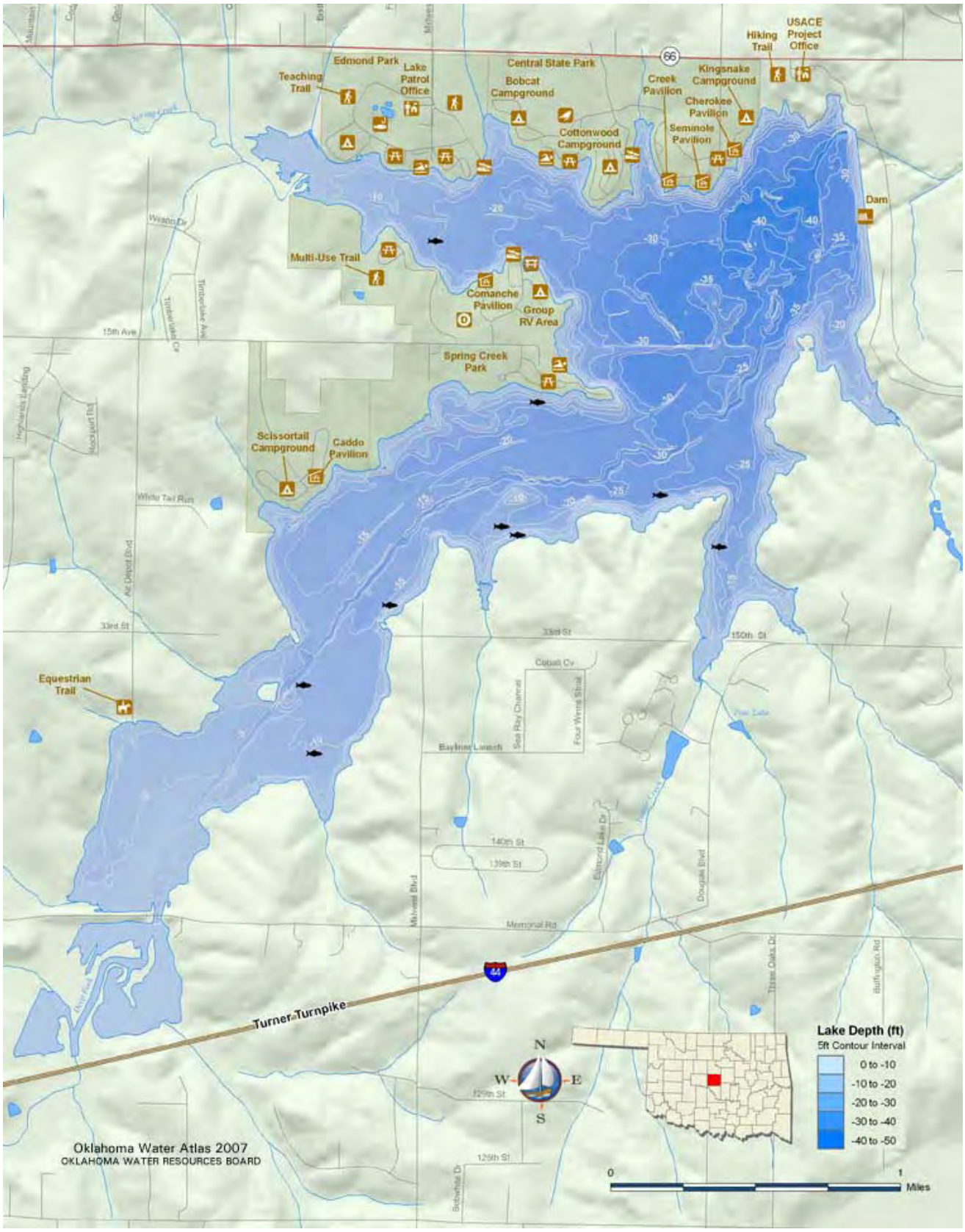

Figure 1. Arcadia Reservoir, Edmond, Oklahoma, Oklahoma County, Oklahoma.

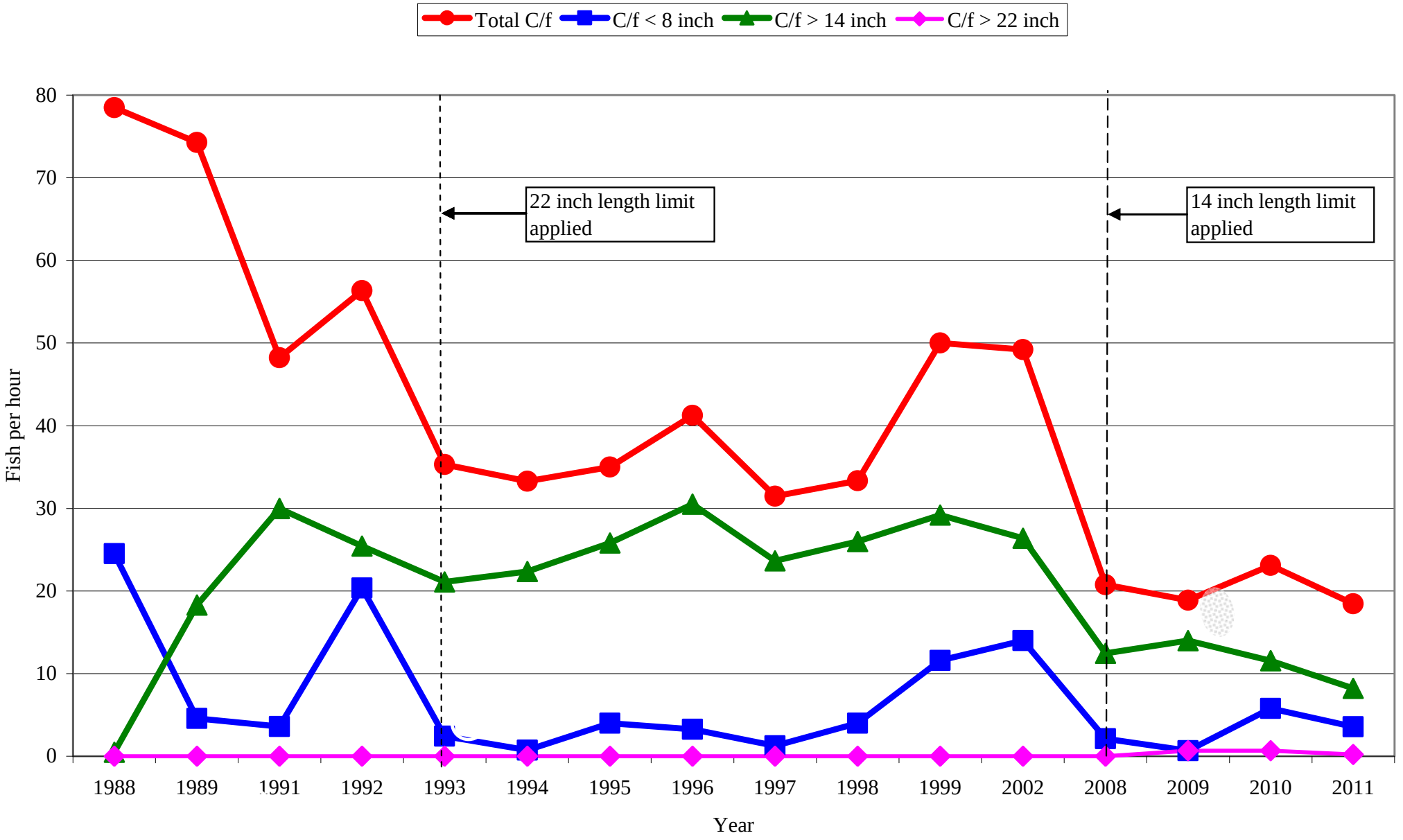

Figure 2. Largemouth bass catch rates by spring electrofishing at Arcadia Reservoir from 1988-2011.

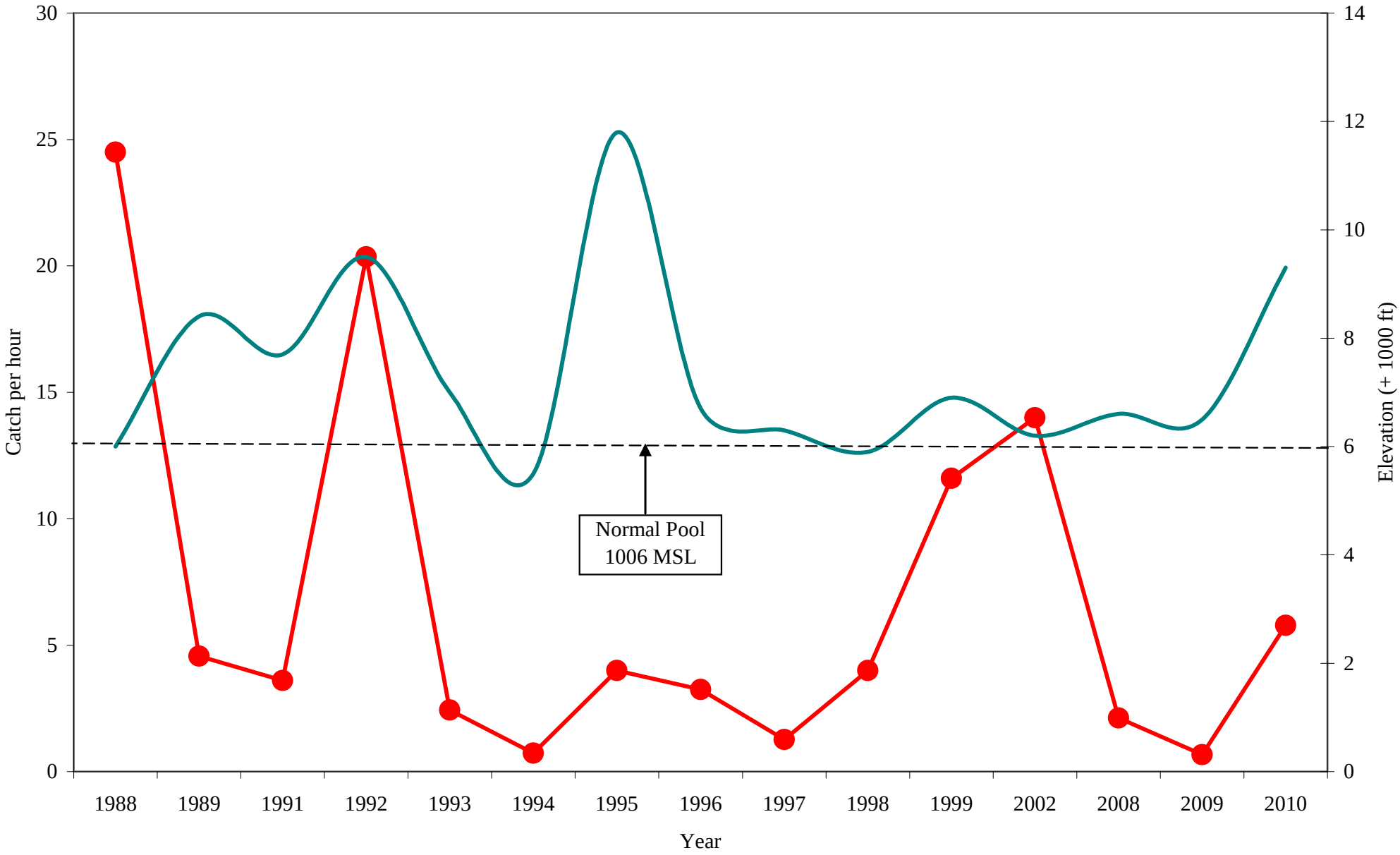

Figure 3. Age 1 largemouth bass catch versus 3 month average of water levels at Arcadia Reservoir

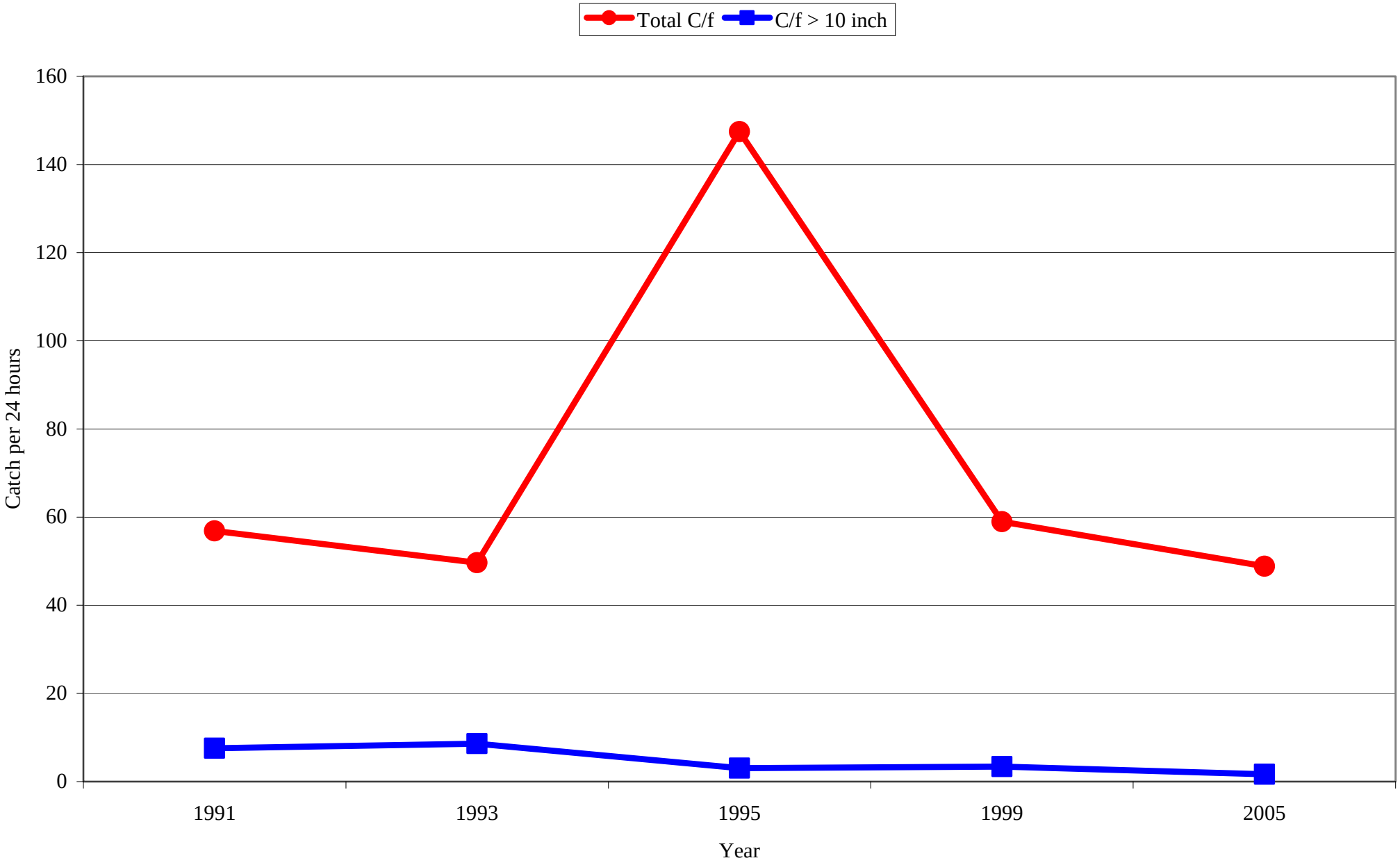

Figure 4. White crappie catch rates by fall trapnetting at Arcadia Reservoir from 1991-2005.

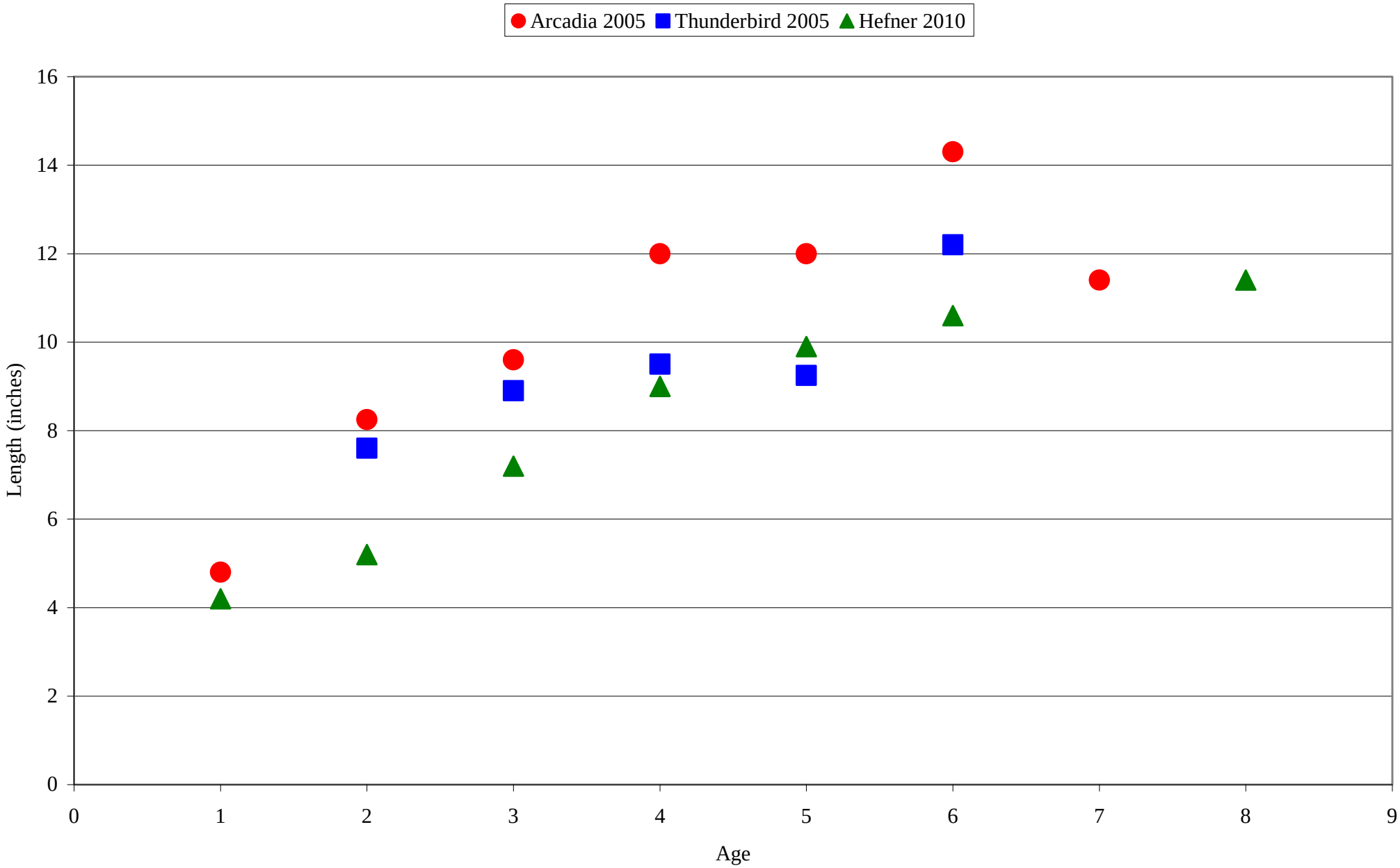

Figure 5. Arcadia white crappie mean length at age vs.Central Region values from trappnetting.

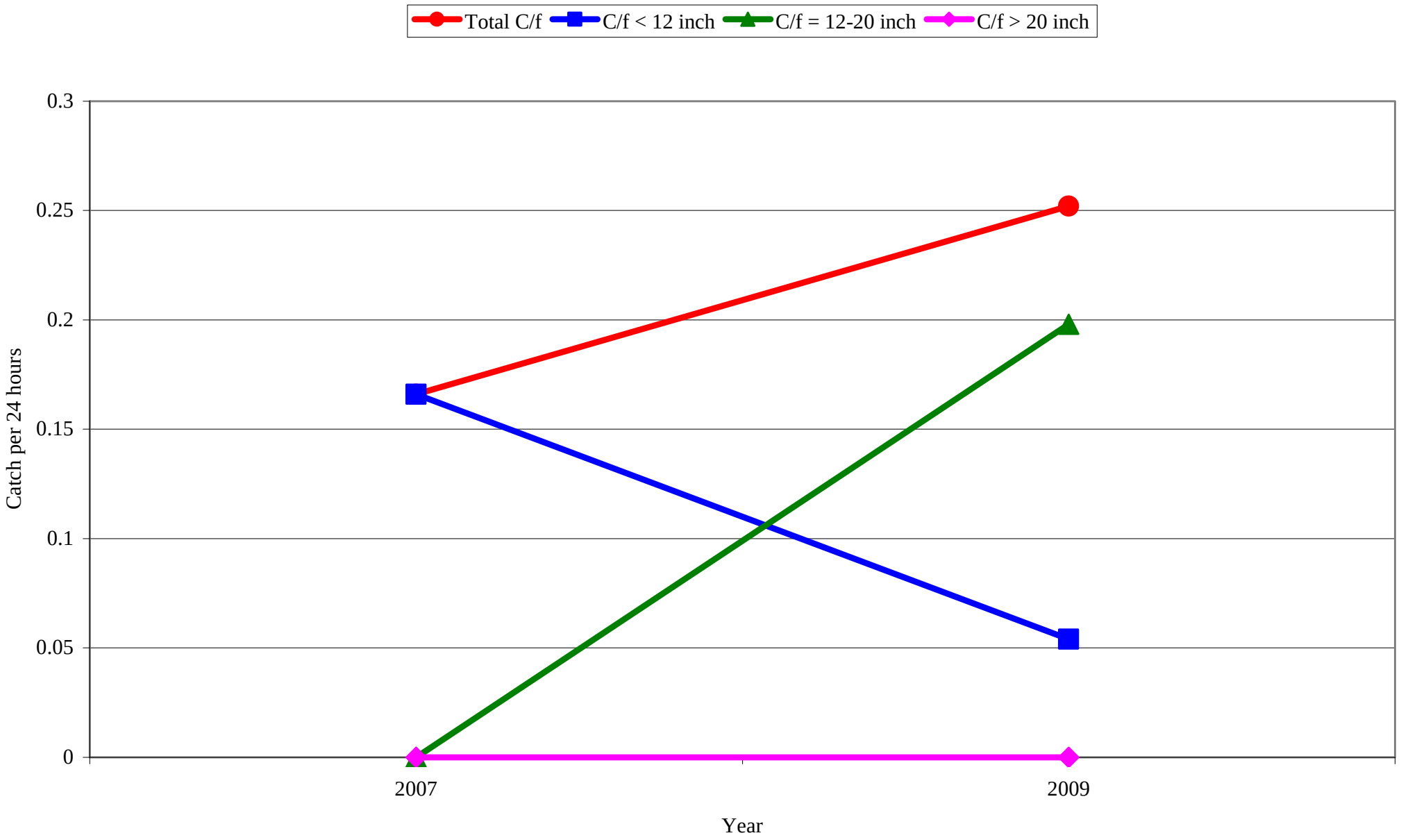

Figure 6. Hybrid striped bass catch per net set by experimental gill net at Arcadia Reservoir from 2007-2009

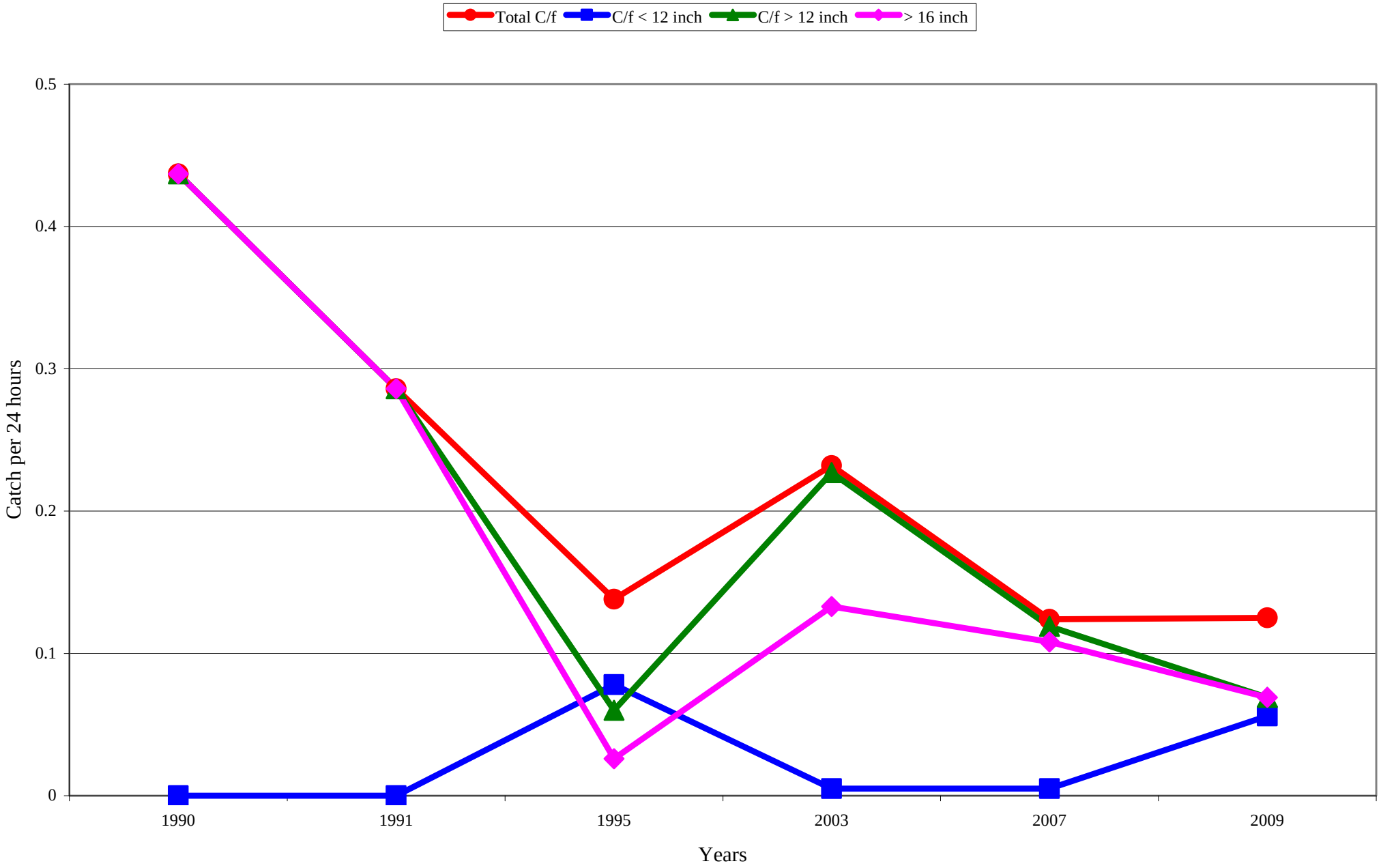

Figure 7. Blue catfish catch per net set by experimental gill net at Arcadia Reservoir from 1990 to 2009.

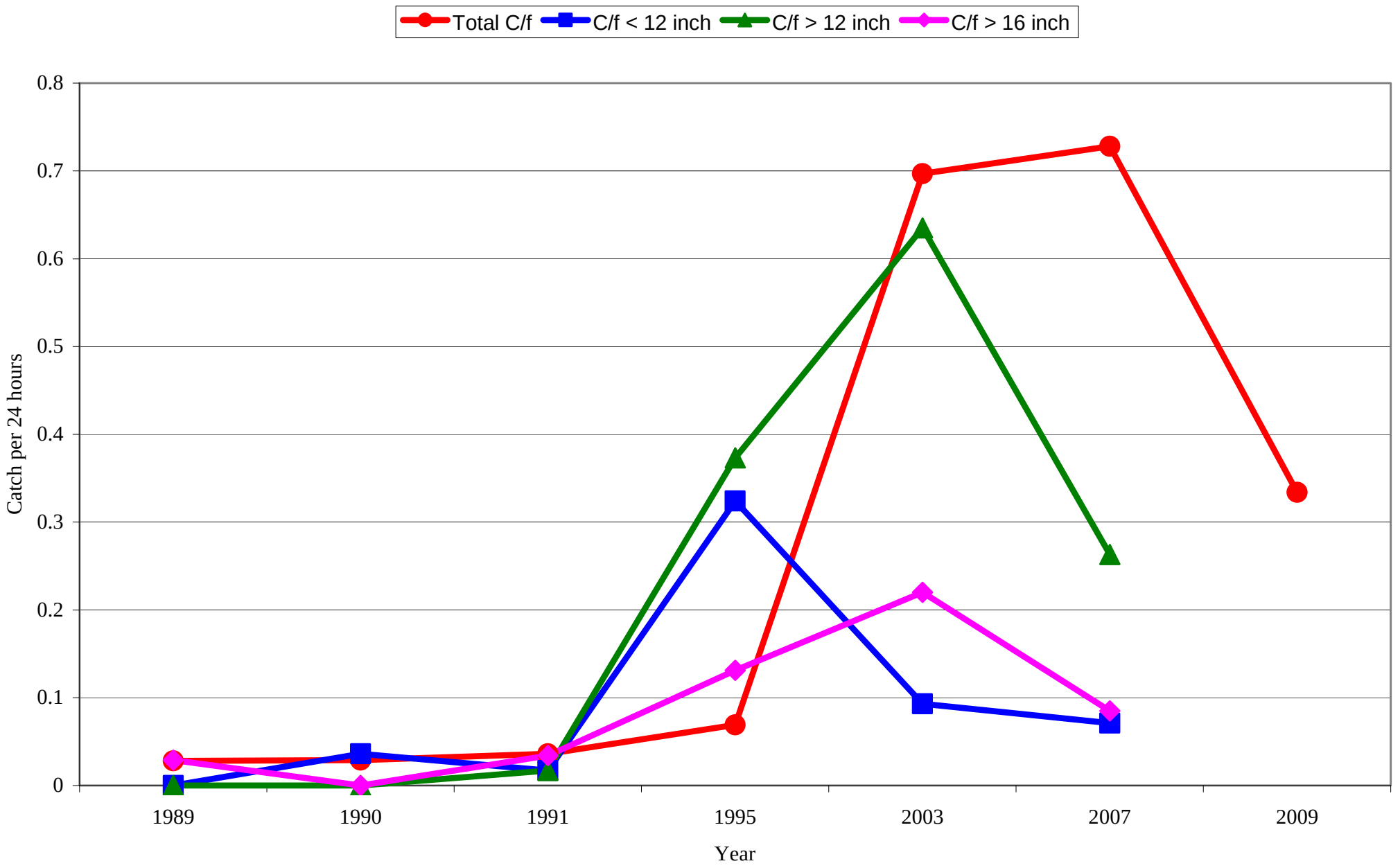

Figure 8. Channel catfish catch per net set by experimental gill net at Arcadia Reservoir from 1989 to 2009.

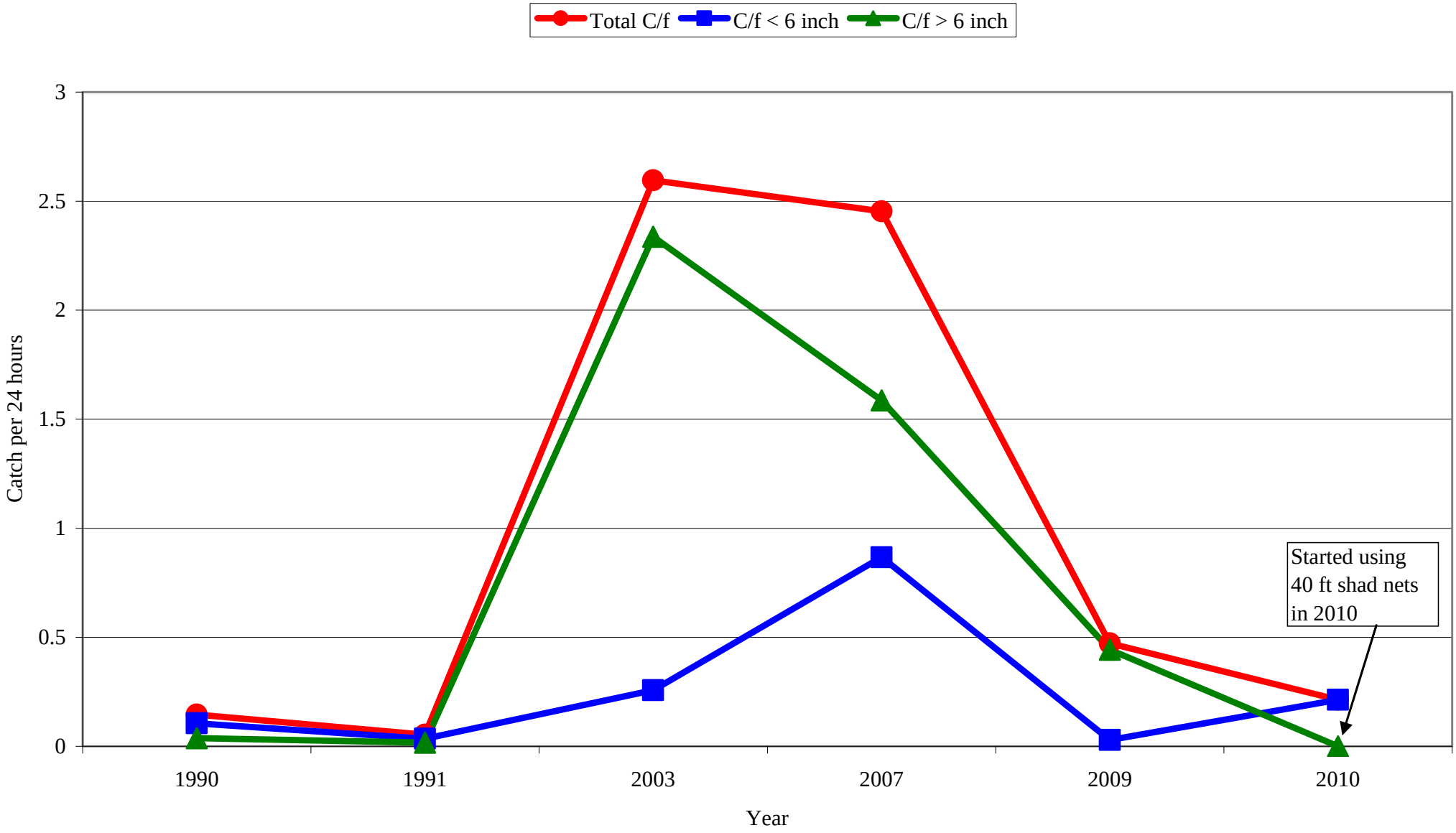

Figure 9. Gizzard shad catch by experimental and floating gill nets at Arcadia Reservoir from 1990-2010.

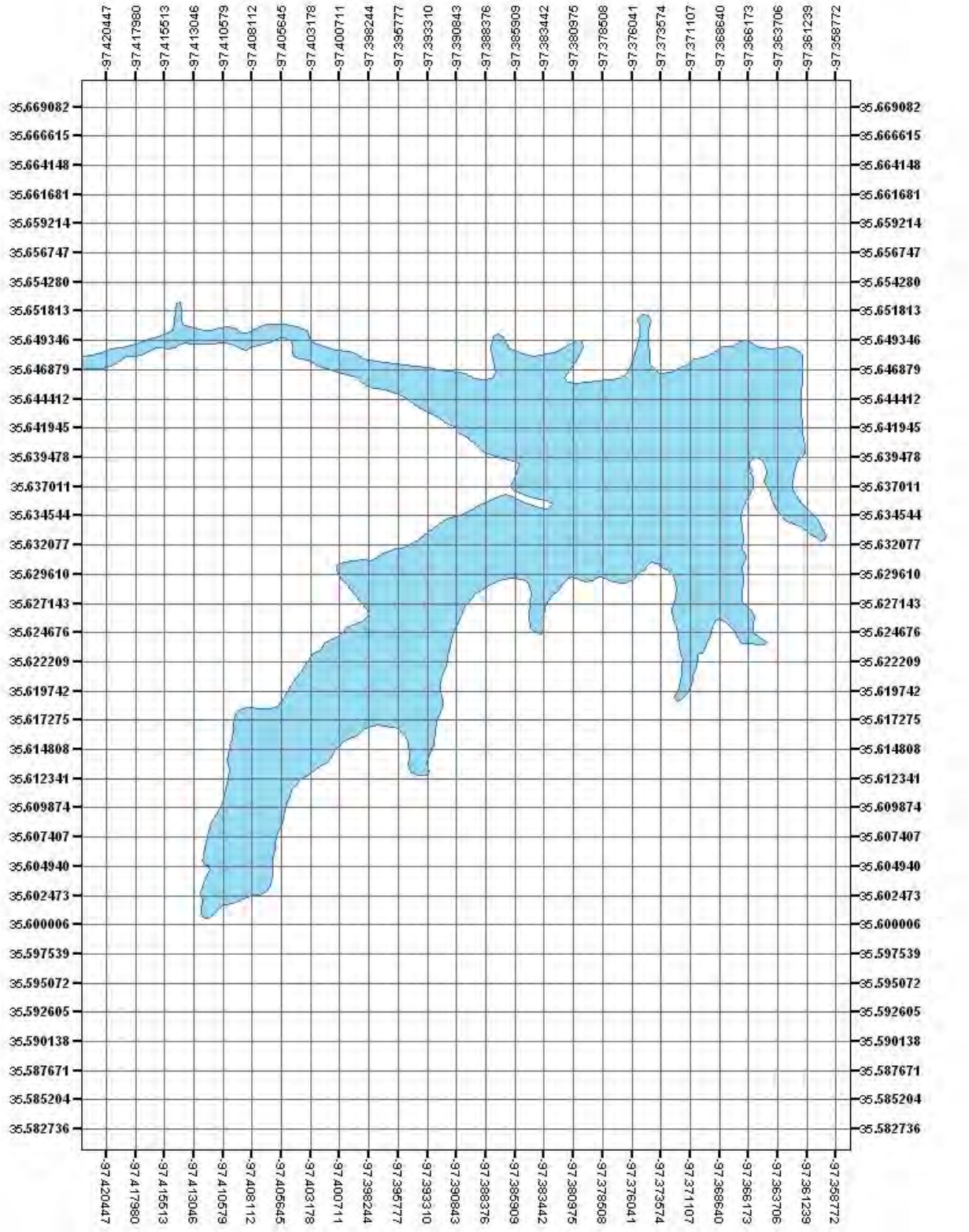

Figure 10. Sampling map for electrofishing and netting. Grid units are 300’ x 300’