# EUFAULA LAKE

# 5 YEAR

# LAKE MANAGEMENT PLAN

## FISHERIES DIVISION
## CENTRAL REGION

## OKLAHOMA DEPTMENT OF WILDLIFE CONSERVATION

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**Background**

Eufaula Lake is located on the Canadian river, 27 miles upstream from its confluence with the Arkansas River. The dam is 12 miles east of the city of Eufaula (Figure 12). Major tributaries include the North and South Canadian Rivers, the Deep Fork River, Duchess, Longtown and Gaines Creeks. It has over 600 miles of shoreline ranging from large areas of sandy beach to rocky bluffs. Construction began in December of 1956 and was completed in February of 1964. It is operated by the United States Army Corps of Engineers (USACE) for the purposes of flood control, water supply, hydroelectric power and navigation.

The contributing drainage area is 8,405 square miles and the total drainage area for the lake is 47,522 square miles including upstream projects. At impoundment, the reservoir covered 105,500 acres at normal pool with a storage capacity of 2,314,600 acre feet. However, the reservoir's storage capacity has been reduced by 12% in the last 40 years from siltation. The mean depth is 21.94 feet with a maximum of 87 feet. The shoreline development ratio is 13.4. The water exchange rate for 2007 was 3.49 and averaged 1.35 for the past five years. The maximum peak discharge occurred in May, 1990 at 389,000 cfs (cubic feet per second). Streambed elevation at the dam is 498 feet MSL (above Mean Sea Level), Conservation Pool elevation is 585 feet MSL. and the top of the dam is at 612 feet MSL. The dam is located at latitude N $35^0$ 18' 25" and longitude W $95^0$ 12' 45".

Natural fish habitat consists of large expanses of open water, areas of submerged standing timber, sandstone rock and coarse gravel, and mud or sand flats. Tributary creeks often are lined with laydown timber and brush carried from the watershed during flood events. Water willow (Justicia spp.) is established in some areas of the lake. It grows partially submerged to depths of one foot, upslope to one or two feet above Conservation Pool elevation. Denser stands are found in Longtown and Duchess Creeks and Brooken Cove but extended periods of high water during the past 20 years have hindered colony establishment. Some areas that once had large plant beds are now bare. Buttonbush (Cephalanthus occidentalis) is common along the shorelines in many areas of the lake, growing at or above Conservation Pool elevation.

Winds from the south and southwest predominate and average 7.3 mph annually. Maximum gusts recorded in McIntosh County were 63.0 mph and maximum sustained winds were 37.0 mph. Maximum gusts in Pittsburg County were 54.4 mph and maximum sustained winds were 33.3 mph. These winds and long fetch contribute to shoreline erosion problems on windward shores and to increased turbidity in shallow areas where wave action impacts mud bottoms. The topography of the land surrounding the lake is predominately hardwood-forested hills.

There is currently no agreement with the USACE for a water level management plan to benefit fisheries, however under the direction of the U.S. Fish and Wildlife Service (USFWS), a water level management plan is in effect for least tern (Sternula antillarum) management that has some fishery benefits. This plan calls for a rise in the seasonal pool from 585 MSL to 587 MSL by June 1st, holding this level until July 15th each year then returning to 585 MSL by the end of July. This water is released through the dam for the duration of the tern nesting season to protect nests on the islands in the river downstream from predators. This rise in the reservoir's summer

pool inundates terrestrial shoreline weeds, grasses and brush, increasing nursery habitat for juvenile fish. The late summer return to normal pool elevation allows for the regrowth of vegetation prior to winter.

Lake levels have fluctuated 5-15 feet the past five years and averaged 9.6 feet per calendar year. This fluctuation has limited the establishment of aquatic vegetation and produced scoured, bare shorelines in many areas of the lake. Soils have been transported downslope leaving underlying rock and gravel exposed. Fish species that prefer rocky habitat have benefited from this fluctuation while species dependent on shoreline vegetation for nursery areas have been limited in those areas.

The secchi disk reading in summer in the Central Pool averages 22.4 inches. Conductivity and pH values varied across the lake with lower values in the Gaines Creek arm and higher values in the Canadian River arm. Conductivity ranged from 50.4 µS/cm to 908.7µS/cm indicating moderate to high levels of salts in the lake. Values for pH ranged from 7.04 to 8.55 indicating neutral to slightly alkaline conditions. Thermal stratification occurred during the summer months at 16 to 39 ft., depending on location. Dissolved oxygen (DO) levels below the thermocline were less than 2.0 ppm (parts per million). From 18% to 56% of the water column has DO levels below 2.0 ppm during the summer months. The Oklahoma Water Resources Board (OWRB) considers Eufaula Lake to only partially meet the Fish and Wildlife Propagation (FWP) beneficial use described in the Oklahoma Water Quality Standards. The OWRB feels low DO could pose a potential threat to fish and wildlife and suggests regular monitoring of this problem.

The trophic state of the reservoir measured by the OWRB using Carlson's Trophic State Index (TSI, chlorophyll-a), was 52 in 2005, indicating the lake was eutrophic (i.e., having high primary productivity and nutrient levels). The TSI values varied seasonally, ranging from oligotrophic to hypereutrophic.

Turbidity values varied across the lake and were highest on average in the Gaines Creek arm. The OWRB found that Eufaula Lake was not supporting the FWP beneficial use based on turbidity with 53% of the turbidity levels above the Oklahoma Water Quality Standard of 25 NTU.

**History of Fishery**

Major sport fish species present in Eufaula Lake include largemouth bass (Micropterus salmoides), smallmouth bass (M. dolomieu), crappie (Pomoxis spp.), blue catfish (Ictalurus furcatus), white bass (Morone chrysops), and channel catfish (I. punctatus). Recent stockings are listed in Table 1.

A 14-inch minimum length limit on black bass has been in effect since 1987. This regulation was enacted to increase the number of spawning size bass in the lake and numbers of quality-sized bass for anglers to harvest.

The largemouth bass fishery has been characterized by variable recruitment over the last 20

years. Electrofishing catch per hour (C/f) has varied from 33.7 to 95.3 with an average over the last 10 years of 59.6 (Figure 1). Correlation between summer pool elevation and year class strength (recruitment) indicate that when water levels are at least one foot above normal through the summer that the year class is larger. Conversely water levels as little as one foot below normal in the summer cause a significant reduction in recruitment (Wright 1991).

Largemouth Bass Virus (LMBV) was found in the bass population in 2001. Sampling conducted in 2002 indicated 38.9% of the population was infected with the virus. This level declined to 19.4% in 2003 sampling. Unknown numbers of bass were lost to the disease. Dying bass were not found, but tournament results show significant increases in the average amount of time required to catch a 5 lb. bass during this time period (Figure 2). This figure also shows that the catch of larger bass has improved since 2003. Further LMBV sampling has not been conducted since 2003.

Largemouth bass abundance in the most recent spring electrofishing survey (2008) was the second highest recorded for the lake (C/f = 88.1, Table 2). Results indicated a good year class was produced in 2006 and 2007 (C/f <8 inches = 34.1) compared to an average for the last ten years of 22.7. The catch rates of largemouth 8-12" and >12" also met or exceeded recommended values for these length groups (C/f= 28.9 and 25.1 respectively) and exceeded the 10 year averages of 15.7 and 21.3 (Figure 1). Abundance of bass >14 inches (C/f = 14.9) was also higher than the 10 year average of 12.8. Eufaula Lake ranked seventh on the ODWC's Top 20 Tournament Lakes list in Oklahoma in 2007.

Florida strain largemouth bass have been stocked since the late 1980's with minimal success. Reports of trophy bass (> 8 pounds) or those recorded caught in bass tournaments are a rarity but the current Lake Record largemouth bass is 10.5 pounds. More concentrated stockings were attempted in the Longtown area in 2004 and 2005. These stockings resulted in 33% of the samples of age-1 largemouth bass collected for electrophoretic analysis from that area being pure Florida or first generation Florida x Northern crosses.

The abundance of spotted bass in the lake has been increasing in recent surveys (Table 3; Figure 3). Due to slow growth, a relatively small percentage of these fish reach harvestable size (>14 inches). There is concern that their numbers will increase further because changes in the reservoir environment as it ages may favor the reproduction and recruitment of this species. With the removal of length limits and bag limits on spotted bass statewide in 2009 it is hoped that anglers will harvest more of them thereby reducing competition with largemouth bass and smallmouth bass for available food.

Reservoir-strain smallmouth bass were first stocked into the lake in 1992. Stockings continued through 1998 with fish distributed in eight areas of the lake where there was suitable habitat. The fish were reared in a series of nursery ponds operated in conjunction with the now defunct Fishermen's Association of Oklahoma (FAO). Stocking was discontinued when natural reproduction was confirmed. The catch rate for smallmouth bass in 2007 fall night electrofishing (C/f = 15.3; Table 4) had declined from the peak seen in the 2005 survey but was still slightly above the minimum acceptable level for a quality smallmouth fishery of 15.0 (Figure 4). The

current state record smallmouth bass (8 lbs. 3 oz.) was caught in Eufaula Lake in 2006 and many other trophy-size smallmouth (> 6 pounds) have been caught in recent years.

Eufaula Lake has a national reputation for having great crappie fishing. In the most recent gillnetting survey in 2004, the abundance of crappie (C/f as number per 24 hours = 10.8) (was well above the minimum acceptable level for a quality fishery of 4.8 (Table 5, Figure 5). The abundance of crappie ≥10 inches (C/f =2.4) was higher than the minimum acceptable level of 0.96 (Figure 5). In 2003 trap netting, the catch rate for crappie (C/f = 22; Table 6) was slightly below the minimum acceptable level of 25.0 (Figure 6). Growth rates were good with crappie reaching 8 inches in two years (Table 7; Figure 7).

Blue catfish were abundant in the lake in the 2004 gillnetting survey (C/f as number per 24 hours = 11.52), exceeding the minimum acceptable level for a quality fishery of 2.4 (Table 8, Figure 8). Abundance of blue catfish ≥16 inches (C/f = 1.2) also exceeded the minimum acceptable level for a quality fishery of 0.72 (Figure 8). Age and growth data of blue catfish collected in 2005 indicated growth to 12 inches took an average of four years but growth to 16 inches took an additional five years (nine total) (Figure 9). Growth rates slowed markedly after ages 10 to 12.

Eufaula Lake is also known for excellent white bass fishing. The catch per 24 hours for white bass in the most recent gillnetting survey (C/f = 10.32) was well above the minimum acceptable rate for a quality white bass fishery (C/f = 4.8; Table 9, Figure 10). The catch rate for white bass >12 inches (C/f = 4.8) was also well above the minimum acceptable value of 2.4 (Figure 10).

Channel catfish abundance in 2004 was the highest recorded in fall gill netting (Catch per 24 hours of 6.96) and exceeded the minimum acceptable level for a quality fishery of 4.8 (Table 10, Figure 11). The abundance of channel catfish >16 inches (C/f = 1.12) was slightly below the minimum acceptable level of 1.2 (Figure 11).

The primary forage species in Eufaula Lake are gizzard shad (Dorosoma cepedianum) and threadfin shad (D. petenense). Gizzard shad abundance from the most recent gillnetting survey in 2004 was high (Catch per 24 hours = 36.72), exceeding the minimum acceptable value for a quality forage base of 4.8 (Table 11). The catch rate for gizzard shad <8" was also high (C/f = 20.4), well above the minimum desirable catch rate of 2.4 (Table 11). Threadfin shad abundance was also good in the 2004 survey (C/f = 57.12; Table 12). The relative weights ($W_r$) of sport fish populations in Eufaula Lake indicated adequate forage abundance and availability (Tables 2-10).

**Threats to fishery**

- Siltation – A 2004 sedimentation survey by the USACE concluded that approximately 12% of the water storage capacity of the lake below normal pool elevation of 585 MSL has been lost to sediment inflows since impoundment. This loss amounts to 289,967 acre/ft. The average annual loss is 7,249 acre/ft. The total surface area lost to sedimentation is unknown but both commercial and government-produced maps of the lake do not reflect these losses and may pose navigation hazards for anglers and boaters.
- Stratification – Based on OWRB sampling, the FWP beneficial use is considered only

partially supporting due to anoxic conditions found below the thermocline during the summer months.

- Turbidity – The FWP beneficial use based on turbidity and true color values was not supported. The OWRB found 38% of the turbidity values they collected were above the Oklahoma Water Quality Standard of 25 NTU. True color values exceeded the standard of 70 units in 51% of the values. Colloidal clay soils in the watershed, extensive shallow areas and strong prevailing winds all contribute to the turbidity.
- Aquatic Nuisance Species (ANS) – Zebra mussels (Dreissena polymorpha) are present in the McClellan-Kerr Arkansas River Navigation System, 27 miles from Eufaula Lake. Quagga mussels (Dreissena rostiformis bugensis) also pose a threat as they, and zebra mussels, can be transported on boats and trailers moving from infested waters. Silver carp (Hypophthalmichthys molitrix), bighead carp (Aristichthys nobilis) and grass carp (Ctenopharyngodon idella) also represent potential problems. Grass carp have been collected during ODWC sampling in Eufaula Lake and although reproduction has not been documented, they are known to have reproduced in Lake Texoma. No aquatic nuisance plant species have been documented in the lake however; Alligatorweed (Alternanthera philoxeroides) and Curlyleaf pondweed (Potamogeton crispus) are both established in the Arkansas River Navigation System and have been expanding their range in recent years.
- Competing water uses – Approximately 98% of the total water storage in the Conservation Pool of the lake is allocated to uses other than recreation. The main competing use of water from Eufaula Lake is hydropower generation. Eufaula dam has three 30,000 kilowatt generators creating 260 million kilowatt-hours of electricity for the Southwest Power Administration annually. About 96% of the conservation pool (roughly 1.43 million acre feet) is allocated to this use while the other 2% is allocated to power plant cooling water for the Kiowa Power Plant located just south of Kiowa, Oklahoma and municipal water supplies for cities and towns surrounding the lake.
- Declining water quality – Acid mine drainage (AMD) from abandoned coal mines impacts some of the feeder creeks in the Gaines Creek arm. The reduced metals from AMD and elevated nutrient levels cause increased oxygen demand contributing to an extensive anaerobic hypolimnion during summer thermal stratification. Connors State College at Warner is currently studying blue catfish with discolored eggs in the Deep Fork arm. They suspect the discoloration is pollution-related drainage from an Environmental Protection Agency (EPA) Superfund site located at an old lead and zinc smelter near the city of Henryetta. Testing is ongoing at this time.

**Management Objectives**

Sampling goals by species

- Largemouth bass – Increase the catch rate for largemouth bass to at least 90/hr with a catch rate of bass >14 inches exceeding 15/hr. Conduct spring electrofishing surveys annually in locations identified on Figures 13-17 to monitor progress. Collect age and growth data periodically and evaluate Florida largemouth bass stocking success the year following each stocking by collecting age-1 largemouth bass from stocked areas for genetic analysis.
- Smallmouth bass – Maintain a catch rate of at least 15/hr, conduct fall electrofishing, and

collect age and growth data periodically to monitor the status of the population.

- Crappie – Increase the catch rate of crappie collected by trap netting in locations identified on Figures 13-17 to at least 25/hr. Conduct trapnetting surveys and collect age and growth data periodically to monitor progress.
- Blue catfish – Maintain a catch rate of at least 4.8/net set of gill netting in locations identified on Figures 13-17, collect age and growth data periodically, and conduct electrofishing surveys every 3-5 years to monitor population status.
- White bass – Maintain a catch rate of at least 7.2/net set of gill netting and conduct gillnetting surveys every 3-5 years to monitor population status. Periodic age and growth information collected during gill netting would be useful to see if a length limit would produce a better quality fishery.
- 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 bi-annual stockings of Florida largemouth bass in the Longtown, Porum and Belle Starr areas to enhance trophy bass potential.

- The USFWS began stocking paddlefish in the lake to restore the species to historical parts of its range. In 2007, 1028 juvenile paddlefish were stocked.

- Threadfin shad are an important part of the forage base in Eufaula Lake. During very cold winters the lake cools enough to cause winterkill of this species and re-stocking has been necessary from time to time. If winterkill necessitates restocking, an ANS-free and disease-free source will have to be found.

2. Regulations

- The 14-inch minimum length limit on largemouth bass should be maintained. Use the FAST model to evaluate effectiveness of current length limit.

- The removal of length and bag limits on spotted bass should be accompanied by a publicity campaign to explain to anglers why it is important to harvest spotted bass.

3. Habitat improvement

- Strategies to improve habitat deficiencies – Crews have established 44 fish attractor sites consisting of cedar tree brush piles and/or spider blocks (Figure 12). Future efforts should be directed at improving fishing in selected areas of the lake through these and other methods.

- Water level management plan – Currently, the water level management plan in effect on Eufaula Lake is to enhance least tern nesting success downstream. Negotiations should be

started with the USACE and Southwest Power to modify the current plan and make it even more beneficial to fisheries such as starting the rise earlier (May 1) and attempting to hold the lake level steady in May as well as a longer period of high summer pool to provide additional nursery time.

- Vegetative plantings – Although water willow transplanting experiments have not been successful, consider additional attempts with this species and others only if sufficient public volunteer manpower can be organized to make planting worthwhile.

4. Angler Satisfaction

- A creel survey of Eufaula Lake should be planned and conducted during the spring fishing season in 2010. This survey will target certain areas of the lake rather than attempting to cover the entire 100,000+ acres. Preliminary surveys conducted in 2009 will help determine which smaller areas best represent the major sections of the lake.

Literature Cited

Wright, G. 1991. Results of a water level management plan on largemouth bass recruitment in Lake Eufaula, Oklahoma. Pages 126-130 in J. L. Cooper and R. H. Hamre, eds. Warmwater Fisheries Symposium I. U. S. Department of Agriculture, Forest Service General Technical Report RM-207, Ft. Collins, Colorado.

Table 1. Species, number and size of fish stocked in Eufaula Lake, 1987-2007.

| DATE | SPECIES | NUMBER | SIZE |
|---|---|---|---|
| 1987 | Walleye | 92,038 | fingerlings |
| | Intergrade LMB | 46,469 | fingerlings |
| | Channel catfish | 15,404 | fingerlings |
| | Blue catfish | 6,364 | fingerlings |
| 1988 | Threadfin shad | 31,788 | adults |
| | Walleye | 51,397 | fingerlings |
| | Florida LMB | 22,440 | fingerlings |
| | Intergrade LMB | 24,703 | fingerlings |
| 1989 | Threadfin shad | 6,351 | adults |
| | Walleye | 531,659 | fingerlings |
| | Intergrade LMB | 55,026 | fingerlings |
| 1990 | Walleye | 900,476 | fingerlings |
| | Florida LMB | 43,343 | fingerlings |
| 1991 | Walleye | 593,992 | fingerlings |
| | Florida LMB | 23,450 | fingerlings |
| 1992 | Florida LMB | 23,906 | fingerlings |
| | Walleye | 514,900 | fingerlings |
| | Smallmouth bass | 22,086 | fingerlings |
| 1993 | Florida LMB | 16,900 | fingerlings |
| | Smallmouth bass | 15,864 | fingerlings |
| 1994 | Florida LMB | 13,814 | fingerlings |
| | Smallmouth bass | 13,766 | fingerlings |
| 1995 | Florida LMB | 15,060 | fingerlings |
| | Smallmouth bass | `30,612 | fingerlings |
| 1996 | Smallmouth bass | 30,302 | fingerlings |
| 1997 | Florida LMB | 23,486 | fingerlings |
| | Smallmouth bass | 18,120 | fingerlings |
| 1998 | Smallmouth bass | 24,406 | fingerlings |
| 2001 | Threadfin shad | 3,000 | adults |
| 2002 | Threadfin shad | 215,040 | juveniles |
| 2004 | Florida LMB | 132,551 | fingerlings |
| 2005 | Florida LMB | 100,071 | fingerlings |
| 2007 | Paddlefish | 1,028 | juveniles |

Table 2. Total number (No.), catch per hour (C/f), and relative weights ($W_r$) by size groups of **largemouth bass** collected by spring electrofishing (VVP 1980-1988; GPP 1989-2008) and seining from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are ≥90. The 14-inch minimum length limit was implemented in 1987.

| | Spring Electrofishing | | | | | | | | | | Seining |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total (≥40) | | <8 inches (15-45) | | 8-12 inches (15-30) | | >12 inches (≥15) | | ≥14 inches (≥10) | | Age 0 (≥1.0) |
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f |
| 1981 | 745 | 28.9 | 11.5 | 85 | 11.3 | 91 | 6.1 | 102 | 3.9 | -- | 0.2 |
| 1982 | 471 | 17.0 | 3.6 | 97 | 7.9 | 89 | 5.5 | 103 | 3.5 | 107 | 1.3 |
| 1983 | 491 | 13.5 | 1.9 | 101 | 6.6 | 95 | 4.9 | 93 | 1.8 | 94 | 3.9 |
| 1984 | 423 | 10.3 | 3.4 | 90 | 3.0 | 93 | 4.0 | 90 | 2.1 | 89 | 0.6 |
| 1985 | 663 | 21.7 | 5.7 | 91 | 9.7 | 95 | 6.3 | 100 | 2.8 | 103 | 0.2 |
| 1986 | 446 | 14.9 | 3.0 | 96 | 3.9 | 95 | 8.0 | 95 | 4.7 | 96 | 3.6 |
| 1987 | 722 | 24.1 | 7.8 | 98 | 5.1 | 102 | 11.2 | 100 | 7.5 | 99 | 2.7 |
| 1988 | 1262 | 42.1 | 14.2 | 91 | 16.5 | 90 | 11.4 | 97 | 7.2 | 98 | 0.3 |
| 1989 | 1555 | 51.8 | 13.0 | 98 | 18.2 | 92 | 20.6 | 99 | 11.6 | 102 | 6.4 |
| 1991 | 1238 | 41.3 | 9.8 | 93 | 13.6 | 93 | 17.9 | 94 | 11.2 | 94 | 2.5 |
| 1992 | 1203 | 40.1 | 8.4 | 92 | 7.7 | 94 | 24.0 | 97 | 14.5 | 97 | 3.8 |
| 1994 | (seining only | | | | | | | | | | 1.5 |
| 1996 | 767 | 52.9 | 20.1 | 92 | 11.1 | 94 | 21.7 | 96 | 15.6 | 96 | 0.8 |
| 1997 | 599 | 39.9 | 5.2 | 94 | 10.4 | 90 | 24.3 | 94 | 17.8 | 95 | 2.6 |
| 1998 | 746 | 49.7 | 11.6 | 94 | 10.5 | 95 | 27.7 | 95 | 18.1 | 96 | 0.2 |
| 2000 | 973 | 64.9 | 15.2 | 95 | 24.2 | 99 | 25.5 | 93 | 15.3 | 92 | 2.7 |
| 2002 | 337 | 33.7 | 7.3 | 100 | 6.8 | 98 | 19.6 | 92 | 10.5 | 92 | 1.0 |
| 2003 | 383 | 38.3 | 10.2 | 102 | 7.4 | 101 | 20.8 | 95 | 12.5 | 95 | 5.2 |
| 2004 | 472 | 47.2 | 20.5 | 95 | 13.7 | 96 | 13.1 | 97 | 10.3 | 98 | 13.2 |
| 2005 | 953 | 95.3 | 59.9 | 92 | 18.2 | 94 | 17.6 | 98 | 9.4 | 98 | 0.7 |
| 2008 | 881 | 88.1 | 34.1 | 92 | 28.8 | 94 | 25.5 | 95 | 14.9 | 95 | -- |

Table 3. Total number (No.), catch per hour (C/f), and relative weights ($W_r$) by size groups of **spotted bass** collected by spring electrofishing (VVP 1980-1988; GPP 1989-2008) and seining from Eufaula Lake. Acceptable $W_r$ values are ≥90. A 14 inch minimum length limit was implemented in 1987.

| | Spring Electrofishing | | | | | | | | | | Seining |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | <8 inches | | 8-12 inches | | ≥12 inches | | ≥14 inches | | Age 0 |
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f |
| 1982 | 166 | 6.0 | 1.5 | 96 | 3.1 | 80 | 1.4 | 97 | 0.7 | 101 | 1.0 |
| 1983 | 41 | 1.1 | 0.4 | 81 | 0.7 | 81 | 0.1 | 84 | 0.0 | -- | 0.4 |
| 1984 | 66 | 1.6 | 0.1 | 79 | 0.8 | 84 | 0.7 | 88 | 0.1 | 95 | 0.3 |
| 1985 | 236 | 7.7 | 2.0 | 75 | 4.5 | 84 | 1.2 | 97 | 0.4 | 103 | 0.0 |
| 1986 | 184 | 6.1 | 0.8 | 82 | 3.3 | 84 | 2.0 | 92 | 0.3 | 96 | 1.1 |
| 1987 | 226 | 7.5 | 2.0 | 83 | 2.2 | 89 | 3.3 | 98 | 0.8 | 100 | 1.3 |
| 1988 | 319 | 10.6 | 5.3 | 82 | 3.6 | 83 | 1.8 | 89 | 0.5 | 91 | 0.4 |
| 1989 | 543 | 18.1 | 4.7 | 79 | 10.6 | 84 | 2.8 | 92 | 1.0 | 97 | 1.1 |
| 1991 | 385 | 12.8 | 3.0 | 82 | 7.1 | 83 | 2.7 | 84 | 0.6 | 88 | 0.7 |
| 1992 | 487 | 16.2 | 4.4 | 81 | 6.0 | 84 | 5.8 | 89 | 1.3 | 95 | 0.7 |
| 1994 | (seining only) | | | | | | | | | | 0.7 |
| 1996 | 214 | 14.8 | 2.8 | 77 | 3.7 | 90 | 8.3 | 92 | 2.4 | 97 | 0.2 |
| 1997 | 285 | 19.0 | 4.9 | 78 | 8.1 | 84 | 6.1 | 88 | 2.1 | 90 | 0.8 |
| 1998 | 295 | 19.7 | 4.0 | 82 | 8.3 | 84 | 7.3 | 88 | 2.5 | 91 | 0.2 |
| 2000 | 292 | 19.5 | 4.5 | 98 | 9.5 | 96 | 5.5 | 92 | 1.2 | 94 | 0.3 |
| 2002 | 155 | 15.5 | 4.3 | 94 | 6.8 | 98 | 5.3 | 94 | 1.9 | 93 | 0.7 |
| 2003 | 179 | 17.9 | 7.4 | 98 | 7.0 | 97 | 3.5 | 98 | 1.6 | 102 | 2.0 |
| 2004 | 244 | 24.4 | 9.6 | 100 | 7.5 | 98 | 7.6 | 101 | 3.5 | 103 | 0.4 |
| 2005 | 237 | 23.7 | 9.4 | 91 | 9.7 | 94 | 4.6 | 100 | 3.0 | 100 | 0.0 |
| 2008 | 203 | 20.3 | 4.8 | 89 | 10.1 | 92 | 5.4 | 90 | 2.1 | 89 | -- |

Table 4. Total number (No.), catch per hour (C/f), and relative weights ($W_r$) by size groups of **smallmouth bass** collected by fall night electrofishing from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are ∃90.

| | Total (∃15) | | <8 inches -- | | 8-12 inches -- | | ∃12 inches -- | | ∃14 inches (∃2) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ |
| 1993 | 14 | 3.5 | 3.3 | -- | 0.3 | 88 | 0.0 | -- | 0.0 | -- |
| 1994 | 51 | 34.0 | 10.7 | 79 | 17.3 | 90 | 6.0 | 93 | 0.7 | 96 |
| 1995 | 42 | 14.0 | 8.7 | 89 | 2.3 | -- | 3.0 | 89 | 1.7 | 89 |
| 1996 | 55 | 16.9 | 8.0 | 84 | 6.5 | 89 | 2.5 | 93 | 0.9 | 98 |
| 1997 | 102 | 25.5 | 16.0 | 89 | 6.3 | 89 | 3.3 | 94 | 1.3 | 102 |
| 1998 | 9 | 6.0 | 2.7 | -- | 2.7 | 86 | 0.7 | 95 | 0.7 | 95 |
| 1999 | 40 | 8.0 | 1.2 | 97 | 2.4 | 82 | 4.4 | 84 | 3.4 | 85 |
| 2001 | 22 | 14.7 | 4.0 | 91 | 4.0 | 88 | 6.7 | 90 | 0.0 | -- |
| 2003 | 89 | 29.7 | 27.7 | 91 | 2.0 | 95 | 0.3 | 90 | 0.3 | 90 |
| 2004 | 163 | 36.2 | 28.4 | 88 | 5.6 | 82 | 2.2 | 89 | 0.7 | 101 |
| 2005 | 96 | 21.3 | 6.7 | 90 | 12.4 | 88 | 2.2 | 90 | 0.7 | 102 |
| 2007 | 69 | 15.3 | 2.7 | 82 | 12.0 | 85 | 0.7 | 84 | 0.2 | 92 |

Table 5. Total number (No.), catch per net set (C/f), and relative weights ($W_r$) by size groups of **crappie** collected by gill netting from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are $\geq$90.

| | Total (≥4.8) | | <8 inches (1.2-7.2) | | ≥8 inches (≥1.92) | | ≥10 inches (≥0.96) | |
|---|---|---|---|---|---|---|---|---|
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ |
| 1980 | 376 | 14.88 | 6.0 | -- | 8.64 | -- | -- | -- |
| 1981 | 168 | 6.0 | 1.2 | -- | 5.04 | -- | 1.92 | -- |
| 1982 | 32 | 1.44 | 0.48 | 92 | 0.96 | 90 | 0.48 | 94 |
| 1983 | 243 | 10.56 | 5.76 | 93 | 4.8 | 106 | 1.68 | 102 |
| 1984 | 124 | 5.04 | 2.64 | 96 | 2.4 | 97 | 0.72 | 100 |
| 1985 | 138 | 5.76 | 3.6 | 111 | 2.16 | 104 | 1.2 | 104 |
| 1986 | 155 | 6.72 | 3.84 | 88 | 2.64 | 96 | 1.68 | 98 |
| 1987 | 265 | 12.0 | 6.96 | 92 | 5.04 | 98 | 2.16 | -- |
| 1988 | 107 | 4.8 | 1.44 | 96 | 3.6 | 95 | 1.68 | -- |
| 1989 | 204 | 8.4 | 3.36 | 96 | 5.04 | 102 | 2.88 | -- |
| 1990 | 212 | 9.12 | 4.32 | 98 | 4.8 | 100 | 2.88 | -- |
| 1991 | 123 | 5.52 | 3.36 | 96 | 2.16 | 101 | 1.2 | 105 |
| 1992 | 241 | 10.56 | 5.52 | 97 | 5.04 | 100 | 1.92 | 102 |
| 2004 | 248 | 10.8 | 5.76 | 93 | 5.04 | 99 | 2.4 | 101 |

Table 6. Total number (No.), catch per net set (C/f), and relative weights ($W_r$) by size groups of **crappie** collected by trap netting from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are $\geq$90.

| | Total (>25) | | <5 inches (≥5) | | ≥5 inches (10-40) | | ≥8 inches (≥10) | | ≥10 inches (≥4) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ |
| 1981 | 1140 | 46.8 | 0.2 | | 46.6 | | 14.3 | | 3.2 | |
| 1987 | 192 | 14.4 | 4.7 | 82 | 9.8 | 88 | 3.3 | 92 | 0.5 | 90 |
| 1988 | 475 | 9.8 | 4.1 | 88 | 5.7 | 92 | 2.4 | 96 | 1.1 | 99 |
| 1989 | 617 | 13.4 | 5.5 | 84 | 7.9 | 94 | 4.0 | 98 | 0.9 | 101 |
| 1990 | 399 | 11.0 | 5.7 | 95 | 3.1 | 96 | 1.2 | 103 | 0.7 | 104 |
| 1991 | 1545 | 29.8 | 22.2 | 83 | 7.6 | 93 | 3.6 | 101 | 1.8 | 105 |
| 1992 | 387 | 18.5 | 7.7 | 91 | 10.7 | 93 | 5.0 | 100 | 1.9 | 100 |
| 2000 | 671 | 26.8 | 14.9 | 93 | 12.0 | 97 | 6.0 | 100 | 1.5 | 100 |
| 2003 | 552 | 22.0 | 10.0 | 91 | 13.0 | 94 | 7.9 | 97 | 2.1 | 100 |

Table 7. Mean length at age of **crappie** collected by trap netting from Eufaula Lake. Numbers in parentheses represent values for acceptable growth rates.

| Year | Age 1 (≥6.3 inches) | Age 2 (≥8 inches) | Age 3 (≥8.8 inches) | Age 4 (≥10 inches) |
|---|---|---|---|---|
| 1987 | 5.9 | 8.98 | 10.59 | -- |
| 1988 | 5.87 | 8.66 | 10.24 | 11.61 |
| 1989 | 7.36 | 9.45 | 10.24 | 10.16 |
| 1990 | 5.83 | 9.61 | 10.75 | 11.14 |
| 1991 | 6.57 | 9.88 | 11.06 | 11.42 |
| 1992 | 6.61 | 9.84 | 11.18 | -- |
| 2000 | 6.89 | 8.27 | 10.12 | 12.68 |
| 2003 | 7.12 | 9.49 | 11.42 | 11.81 |

Table 8. Total number (No.), catch per net set (C/f), and relative weights ($W_r$) by size groups of **blue catfish** collected by gill netting from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are $\geq$90.

| Year | Total (≥2.4) No. | Total (≥2.4) C/f | <12 inches (≥1.2) C/f | <12 inches (≥1.2) $W_r$ | ≥12 inches (≥1.2) C/f | ≥12 inches (≥1.2) $W_r$ | ≥15.7 inches (≥0.72) C/f | ≥15.7 inches (≥0.72) $W_r$ |
|---|---|---|---|---|---|---|---|---|
| 1980 | 102 | 4.08 | 2.16 | -- | 1.68 | -- | 0.96 | -- |
| 1981 | 83 | 2.88 | 1.2 | -- | 1.92 | -- | 1.2 | -- |
| 1982 | 84 | 3.6 | 2.4 | 94 | 1.2 | 87 | 0.48 | 92 |
| 1983 | 73 | 3.12 | 1.92 | 105 | 1.2 | 94 | 0.96 | 95 |
| 1984 | 96 | 3.84 | 2.16 | 99 | 1.68 | 95 | 1.2 | 96 |
| 1985 | 100 | 4.08 | 2.64 | 112 | 1.44 | 99 | 1.2 | 99 |
| 1986 | 117 | 5.04 | 3.6 | 99 | 1.44 | 95 | 0.96 | 94 |
| 1987 | 85 | 3.84 | 2.64 | 95 | 1.2 | 89 | 0.72 | 91 |
| 1988 | 75 | 3.36 | 2.16 | 93 | 1.2 | 91 | 0.72 | 93 |
| 1989 | 97 | 4.08 | 2.88 | 96 | 1.2 | 90 | 0.48 | 93 |
| 1990 | 107 | 4.56 | 3.84 | 100 | 0.72 | 89 | 0.24 | 90 |
| 1991 | 122 | 5.52 | 4.32 | 93 | 1.2 | 85 | 0.72 | 86 |
| 1992 | 147 | 6.48 | 4.08 | 98 | 2.4 | 91 | 1.68 | 93 |
| 2004 | 269 | 11.52 | 8.88 | 89 | 2.4 | 83 | 1.2 | 82 |

Table 9. Total number (No.), catch per net set (C/f), and relative weights ($W_r$) by size groups of **white bass** collected by gill netting from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are $\geq$90.

| Year | Total (≥2.4) No. | Total (≥2.4) C/f | <8 inches (≥1.2) C/f | <8 inches (≥1.2) $W_r$ | 8-12 inches (1.2-7.2) C/f | 8-12 inches (1.2-7.2) $W_r$ | ≥12 inches (≥2.4) C/f | ≥12 inches (≥2.4) $W_r$ |
|---|---|---|---|---|---|---|---|---|
| 1980 | 265 | 10.32 | 3.84 | -- | 4.08 | -- | 2.64 | -- |
| 1981 | 158 | 5.76 | 0.96 | -- | 2.88 | -- | 1.92 | -- |
| 1982 | 64 | 2.88 | 0.24 | 92 | 1.44 | 87 | 0.96 | 93 |
| 1983 | 126 | 5.52 | 1.68 | 97 | 2.16 | 98 | 1.68 | 96 |
| 1984 | 176 | 7.2 | 0.96 | 98 | 2.88 | 89 | 3.12 | 96 |
| 1985 | 170 | 6.96 | 2.16 | 116 | 1.92 | 105 | 3.12 | 98 |
| 1986 | 160 | 6.72 | 1.2 | 89 | 2.4 | 90 | 3.12 | 93 |
| 1987 | 379 | 17.04 | 4.8 | 92 | 7.2 | 91 | 5.28 | 92 |
| 1988 | 222 | 10.08 | 0.72 | 97 | 4.56 | 90 | 4.8 | 84 |
| 1989 | 157 | 6.48 | 2.16 | 97 | 1.44 | 95 | 3.12 | 94 |
| 1990 | 111 | 4.8 | 1.2 | 96 | 1.92 | 91 | 1.68 | 87 |
| 1991 | 125 | 5.76 | 0.72 | 95 | 2.4 | 87 | 2.64 | 88 |
| 1992 | 190 | 8.4 | 1.2 | 96 | 3.12 | 87 | 4.08 | 87 |
| 2004 | 243 | 10.32 | 1.44 | 90 | 4.08 | 88 | 4.8 | 89 |

Table 10. Total number (No.), catch per net set (C/f), and relative weights ($W_r$) by size groups of **channel catfish** collected by gill netting from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are $\geq$90.

| | Total ($\geq$4.8) | | <12 inches ($\geq$2.4) | | $\geq$12 inches ($\geq$2.4) | | $\geq$15.7 inches ($\geq$1.2) | |
|---|---|---|---|---|---|---|---|---|
| Year | No. | C/f | C/f | $W_r$ | C/f | $W_r$ | C/f | $W_r$ |
| 1980 | 173 | 6.72 | 6.0 | -- | 0.96 | -- | 0.48 | -- |
| 1981 | 175 | 6.24 | 5.76 | -- | 0.72 | -- | 0.48 | -- |
| 1982 | 64 | 2.88 | 1.44 | 89 | 1.2 | 87 | 0.48 | 88 |
| 1983 | 72 | 3.12 | 2.16 | 91 | 1.12 | 86 | 0.24 | 98 |
| 1984 | 120 | 4.8 | 3.84 | 100 | 1.2 | 88 | 0.48 | 94 |
| 1985 | 82 | 3.36 | 2.4 | 118 | 1.12 | 101 | 0.24 | 104 |
| 1986 | 41 | 1.68 | 0.96 | 98 | 0.72 | 90 | 0.24 | 105 |
| 1987 | 85 | 3.84 | 2.16 | 89 | 1.68 | 87 | 1.12 | 90 |
| 1988 | 82 | 3.84 | 2.64 | 94 | 1.2 | 87 | 0.48 | 84 |
| 1989 | 72 | 2.88 | 1.92 | 89 | 1.2 | 84 | 0.48 | 91 |
| 1990 | 69 | 2.88 | 1.92 | 87 | 1.12 | 83 | 0.24 | 83 |
| 1991 | 78 | 3.6 | 2.16 | 95 | 1.2 | 83 | 0.72 | 85 |
| 1992 | 49 | 2.16 | 1.2 | 88 | 1.12 | 84 | 0.24 | 88 |
| 2004 | 165 | 6.96 | 4.8 | 85 | 2.16 | 87 | 1.12 | 93 |

Table 11. 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 1989-2002), gill netting, and seining from Eufaula Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable $W_r$ values are ≥90.

| | Spring Electrofishing | | | | Fall Gillnetting | | | | 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 |
| 1983 | 1906 | 72.6 | 67.4 | 87 | 203 | 9.6 | 9.6 | 91 | 5585 | 32.1 |
| 1984 | 1249 | 32.2 | 30.1 | 112 | 641 | 26.4 | 21.6 | 110 | 14214 | 81.7 |
| 1985 | 1997 | 107.4 | 103.1 | 90 | 649 | 26.4 | 21.6 | 113 | 1734 | 10.0 |
| 1986 | 2908 | 140.2 | 115.8 | 77 | 352 | 14.4 | 12.0 | 75 | 4830 | 27.8 |
| 1987 | 1630 | 83.6 | 80.0 | 85 | 537 | 24.0 | 24.0 | 85 | 753 | 4.3 |
| 1988 | 2121 | 80.8 | 72.1 | 82 | 850 | 38.4 | 38.4 | -- | 677 | 3.9 |
| 1989 | 2298 | 116.4 | 99.1 | 84 | 515 | 21.6 | 19.2 | 82 | 1612 | 9.3 |
| 1990 | | | | | 422 | 19.2 | 16.8 | 109 | 1899 | 16.4 |
| 1991 | 2022 | 87.0 | 81.8 | 88 | 655 | 28.8 | 28.8 | 105 | 1213 | 10.5 |
| 1992 | 993 | 74.9 | 67.6 | 83 | 510 | 21.6 | 21.6 | 119 | 687 | 5.9 |
| 1994 | | | | | | | | | 283 | 2.4 |
| 1996 | 1017 | 78.2 | 75.1 | 85 | | | | | 475 | 4.6 |
| 1997 | 926 | 142.5 | 96.0 | 83 | | | | | 221 | 2.7 |
| 1998 | 1265 | 126.5 | 92.1 | -- | | | | | 413 | 5.9 |
| 2000 | 378 | 56.0 | 50.8 | 83 | | | | | 694 | 12.5 |
| 2002 | 2443 | 337.0 | 243.4 | -- | | | | | 351 | 6.1 |
| 2003 | | | | | | | | | 340 | 5.9 |
| 2004 | | | | | 512 | 36.72 | 20.4 | | 2058 | 35.5 |
| 2005 | | | | | | | | | 28 | 0.5 |

Table 12. Total number (No.) and catch rates (C/f) of **threadfin shad** and silversides collected by spring electrofishing, gill netting, and seining from Eufaula Lake.

| | Threadfin shad | | | | | | Silversides | |
|---|---|---|---|---|---|---|---|---|
| | Total[1] | | Total[2] | | Total[3] | | Total[3] | |
| Year | No. | C/f | No. | C/f | No. | C/f | No. | C/f |
| 1984 | 0 | 0.0 | 143 | 4.8 | 3 | 0.0 | 66020 | 379.4 |
| 1985 | 0 | 0.0 | 1 | 0.0 | 0 | 0.0 | 20556 | 118.1 |
| 1986 | 121 | 5.8 | 9 | 0.0 | 1610 | 9.3 | 23600 | 135.6 |
| 1987 | 1570 | 80.5 | 125 | 4.8 | 9564 | 55.0 | 35233 | 202.5 |
| 1988 | 113 | 4.3 | 148 | 7.2 | 87 | 0.5 | 40282 | 231.5 |
| 1989 | 292 | 14.8 | 55 | 2.4 | 2046 | 11.8 | 35608 | 204.6 |
| 1990 | | | 171 | 7.2 | 2007 | 17.3 | 8267 | 71.3 |
| 1991 | 167 | 7.2 | 85 | 4.8 | 824 | 7.1 | 12364 | 106.6 |
| 1992 | 2018 | 152.3 | 211 | 9.6 | 1691 | 14.6 | 6513 | 56.2 |
| 1994 | | | | | 174 | 1.5 | 1478 | 12.7 |
| 1996 | 140 | 10.8 | | | 248 | 2.4 | 1761 | 16.9 |
| 1997 | 1515 | 233.1 | | | 114 | 1.4 | 2010 | 24.8 |
| 1998 | 978 | 97.8 | | | 207 | 3.0 | 762 | 10.9 |
| 2000 | 3460 | 512.6 | | | 695 | 12.5 | 6606 | 118.6 |
| 2002 | 3 | 0.4 | | | 0 | 0.0 | 2200 | 37.9 |
| 2003 | | | | | 10 | 0.2 | 4497 | 77.5 |
| 2004 | | | 624 | 57.12 | 2320 | 40.0 | 7320 | 126.2 |
| 2005 | | | | | 412 | 7.1 | | |

[1] Spring electrofishing (VVP 1980-1988; GPP 1989-2002)
[2] Gill netting
[3] Seining

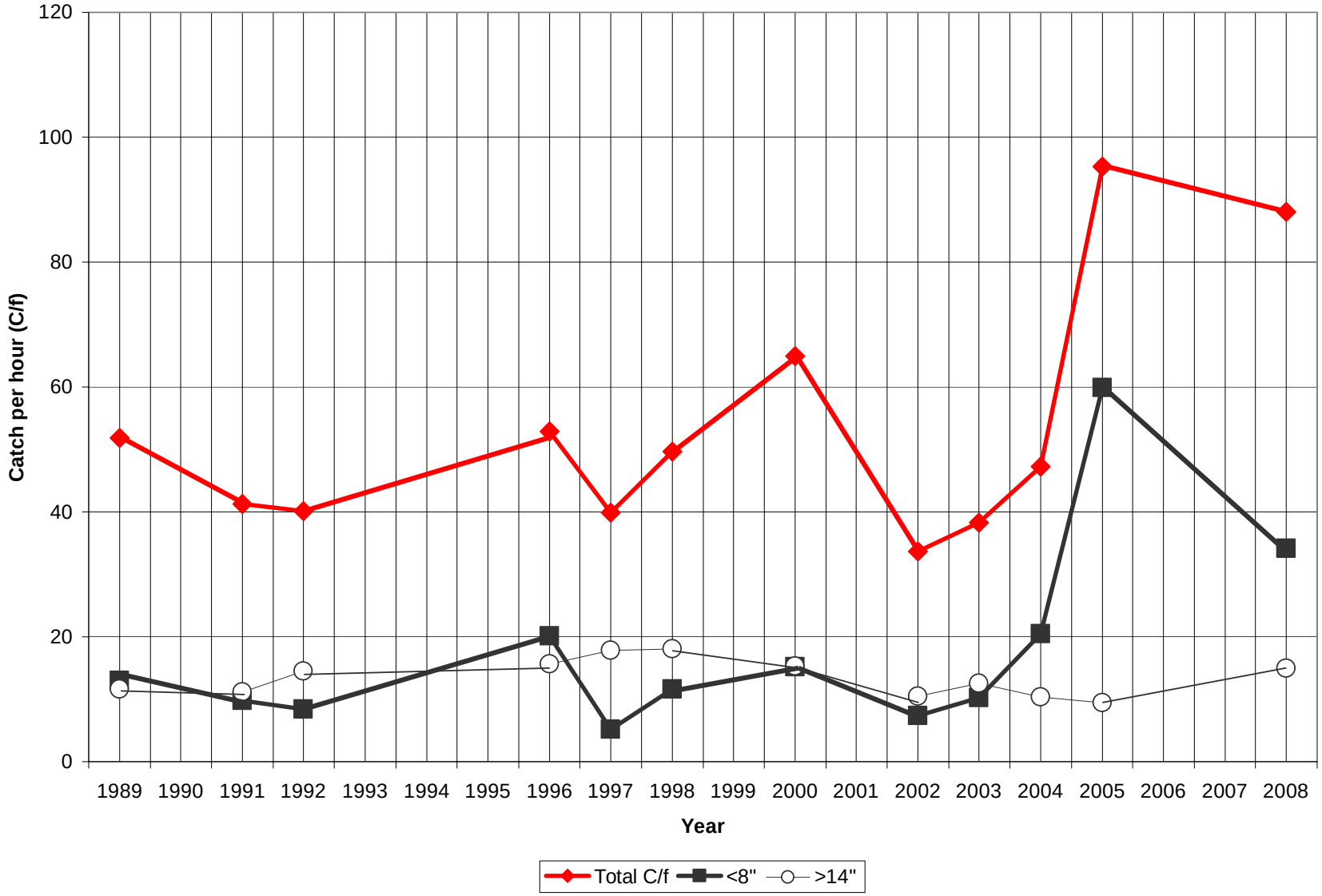


Figure 1. Largemouth bass catch per hour (C/f) by electrofishing in Eufaula Lake 1989-2008.

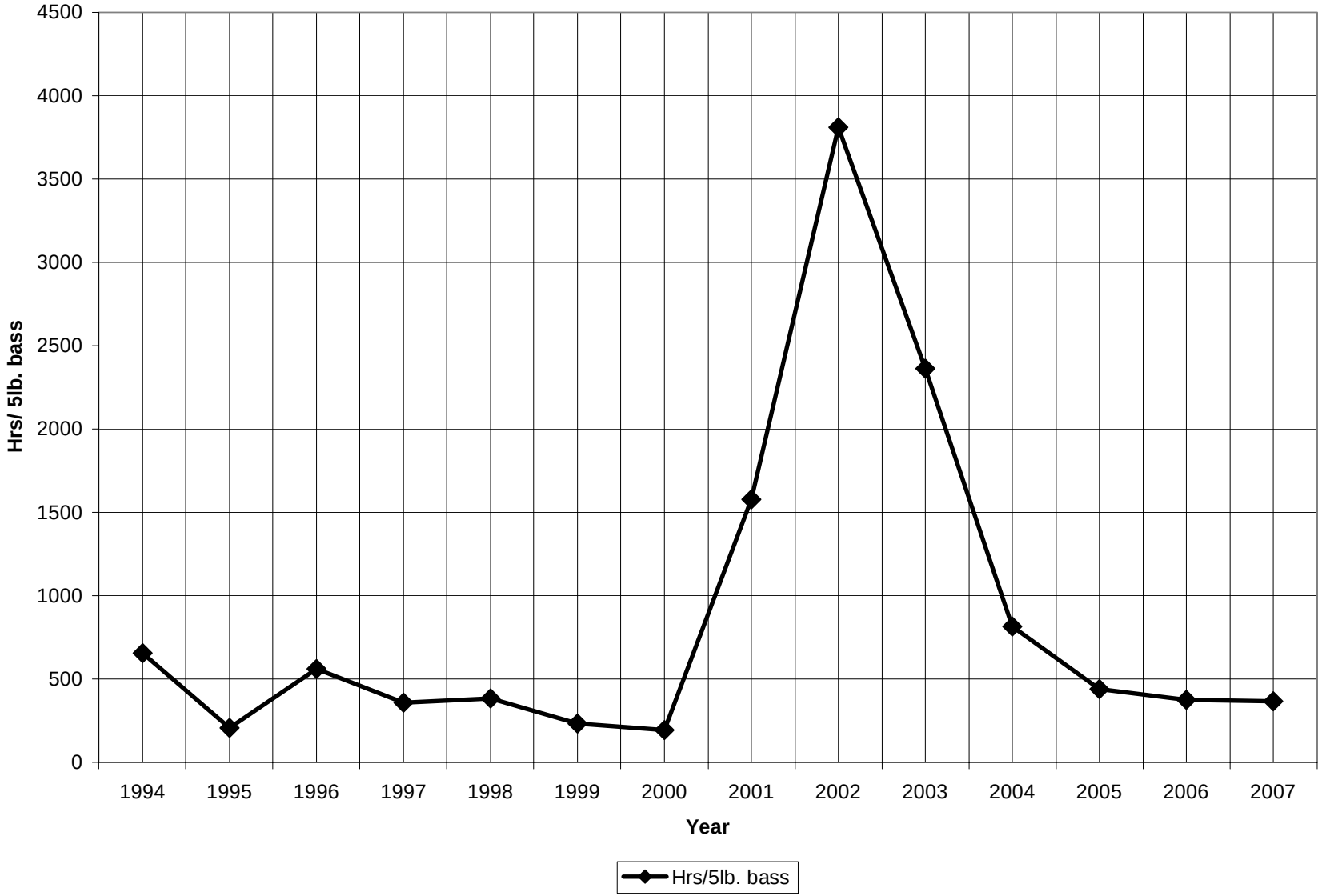


Figure 2. Tournament hours fished per 5 lb. bass caught 1994-2007.

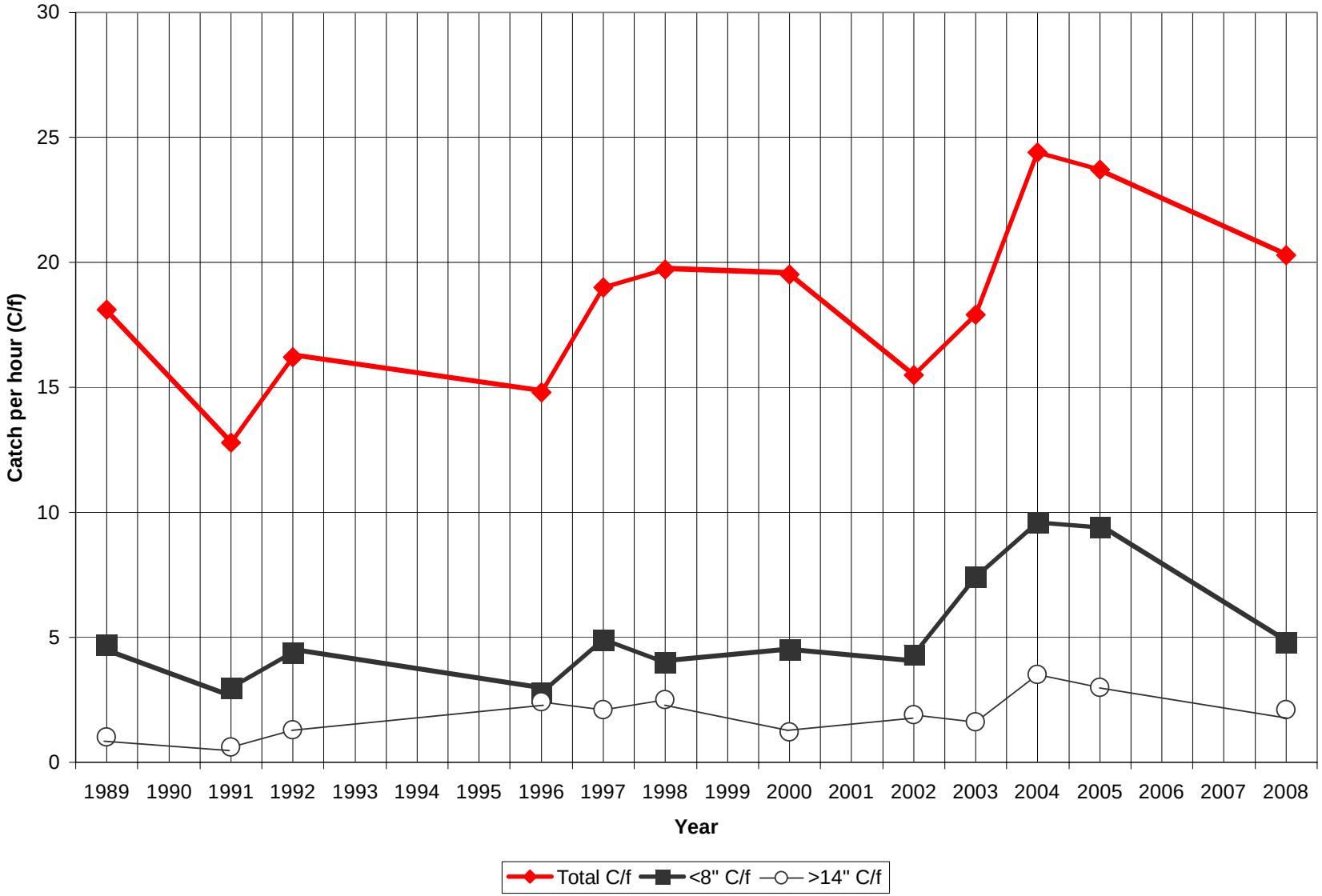


Figure 3. Spotted bass catch per hour by electrofishing in Eufaula Lake 1989-2008.


Figure 4. Smallmouth bass catch per hour by electrofishing in Eufaula Lake 1993-2007.

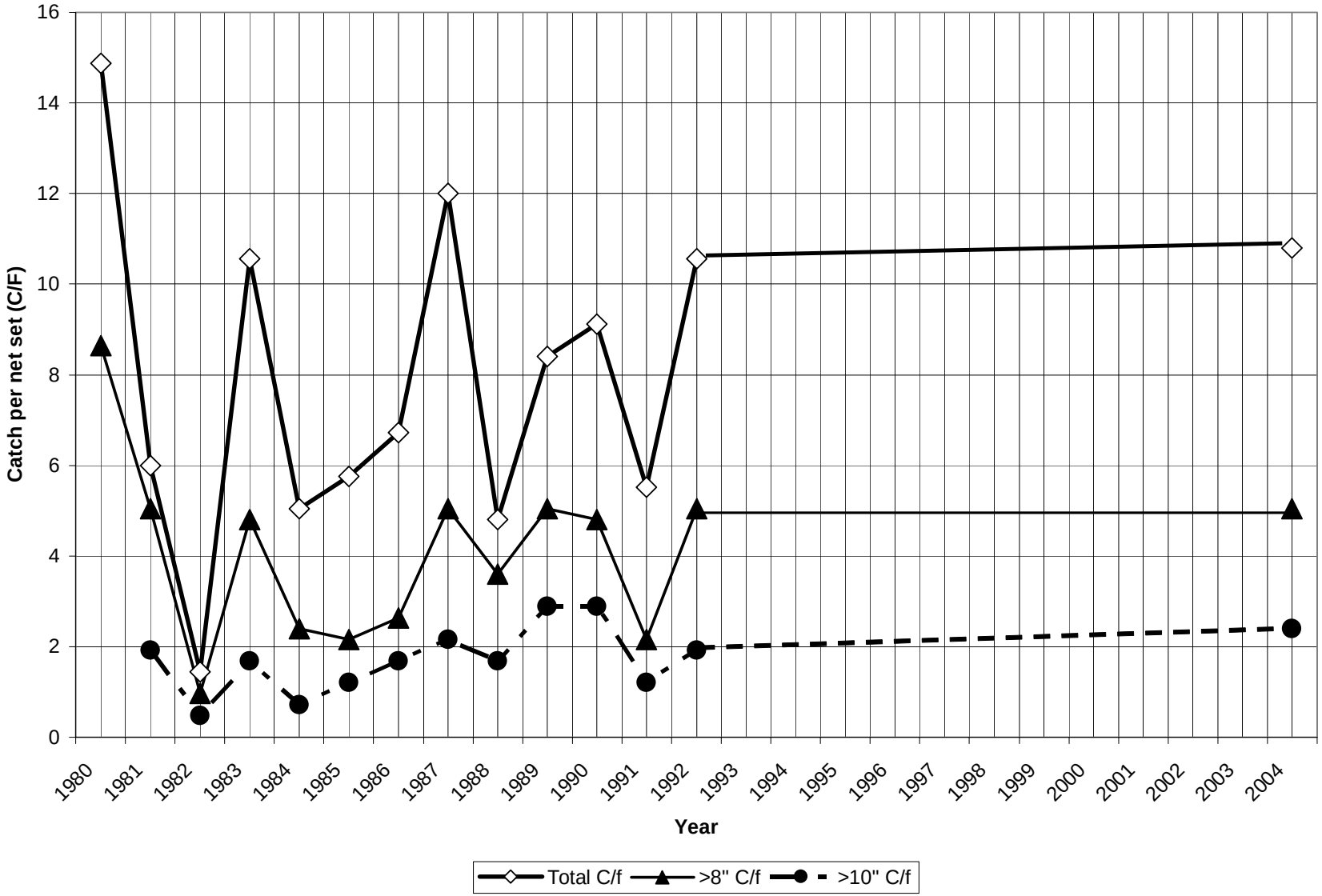


Figure 5. Crappie catch per net set (C/f) by gillnetting in Eufaula Lake 1980-2004.

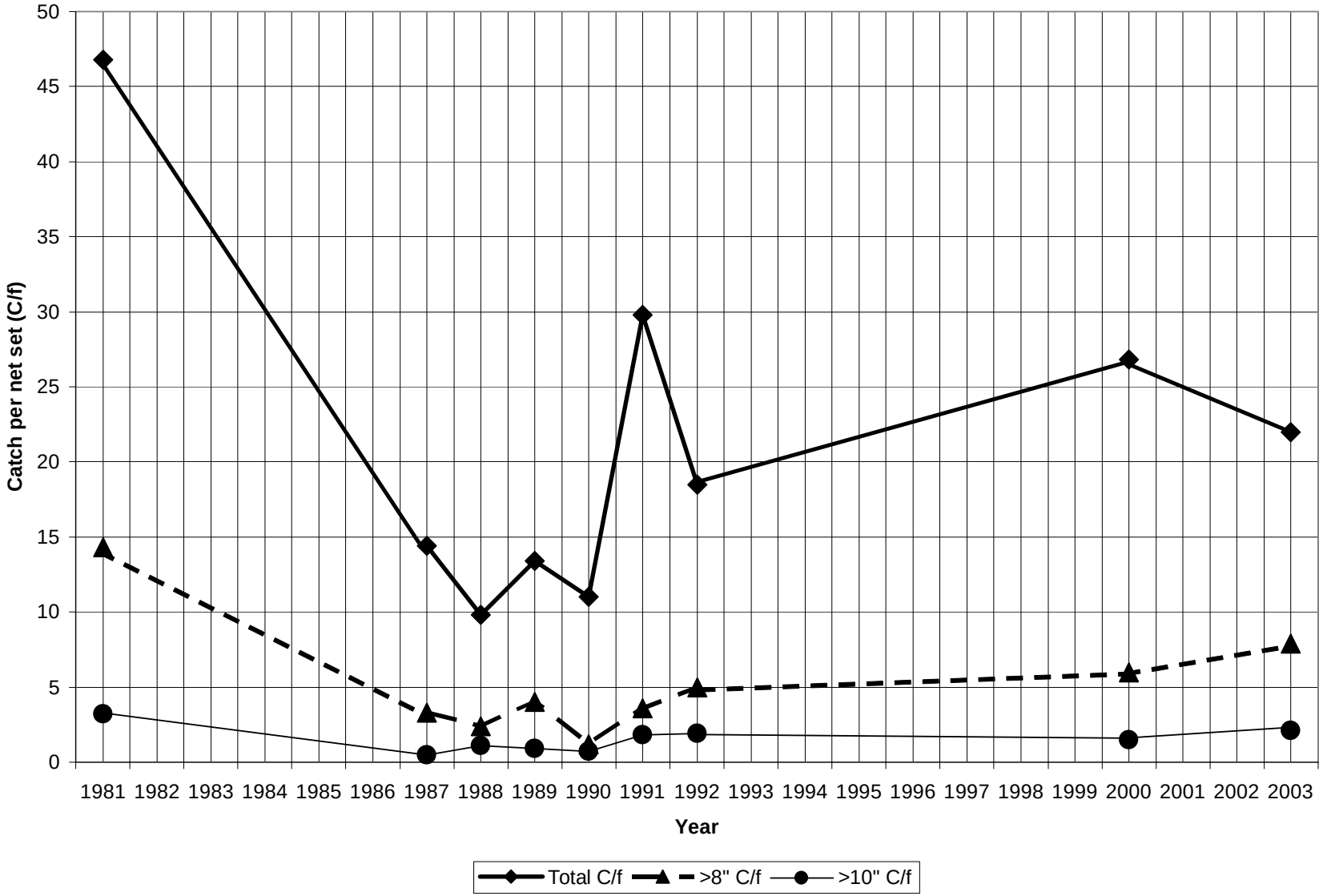


Figure 6. Crappie catch per net set (C/f) by trapnetting in Eufaula Lake 1981-2003.

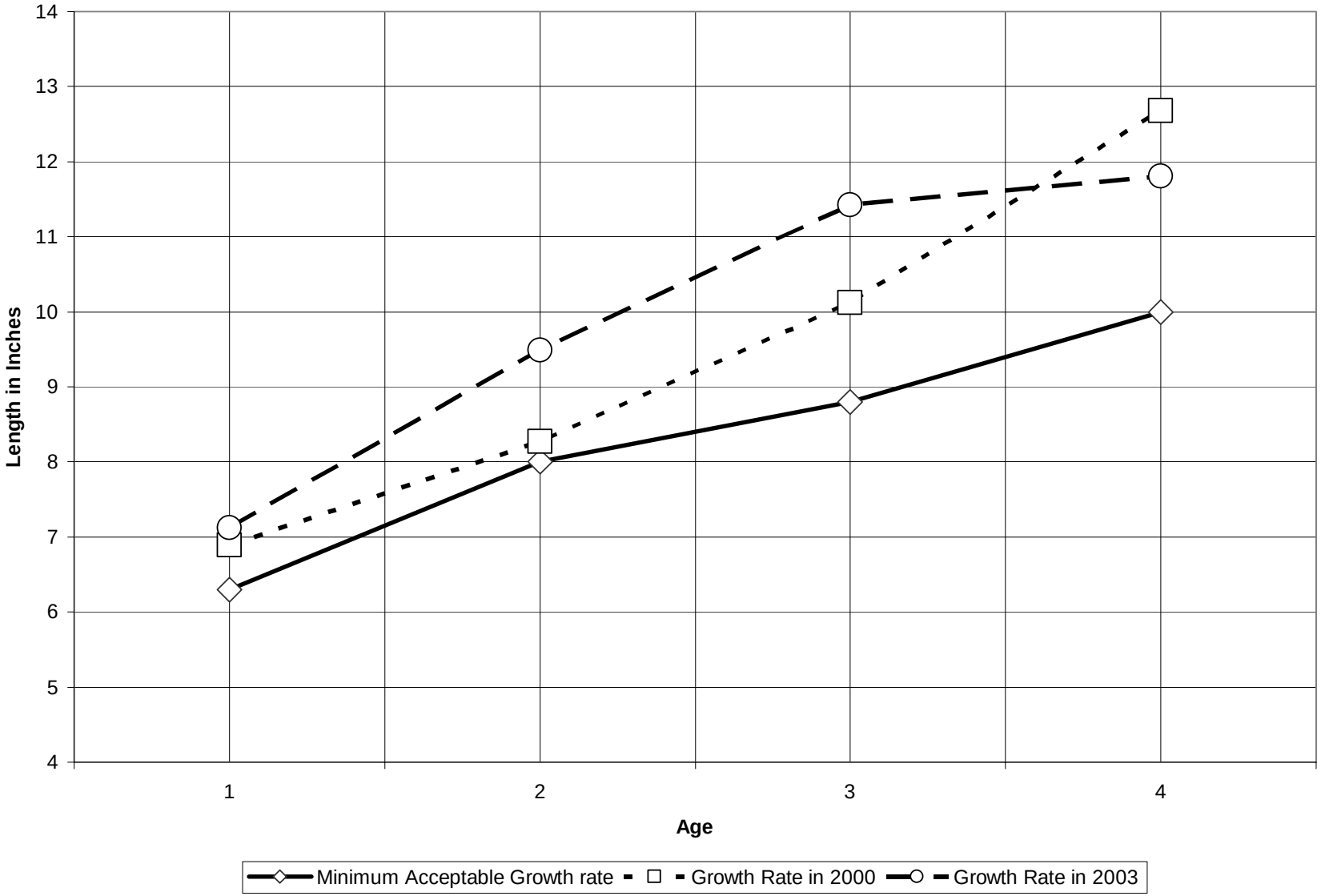


Figure 7. Age and growth of crappie collected by trapnetting in Eufaula Lake in 2000 and 2003 compared to the minimum acceptable growth rate for a quality crappie fishery.

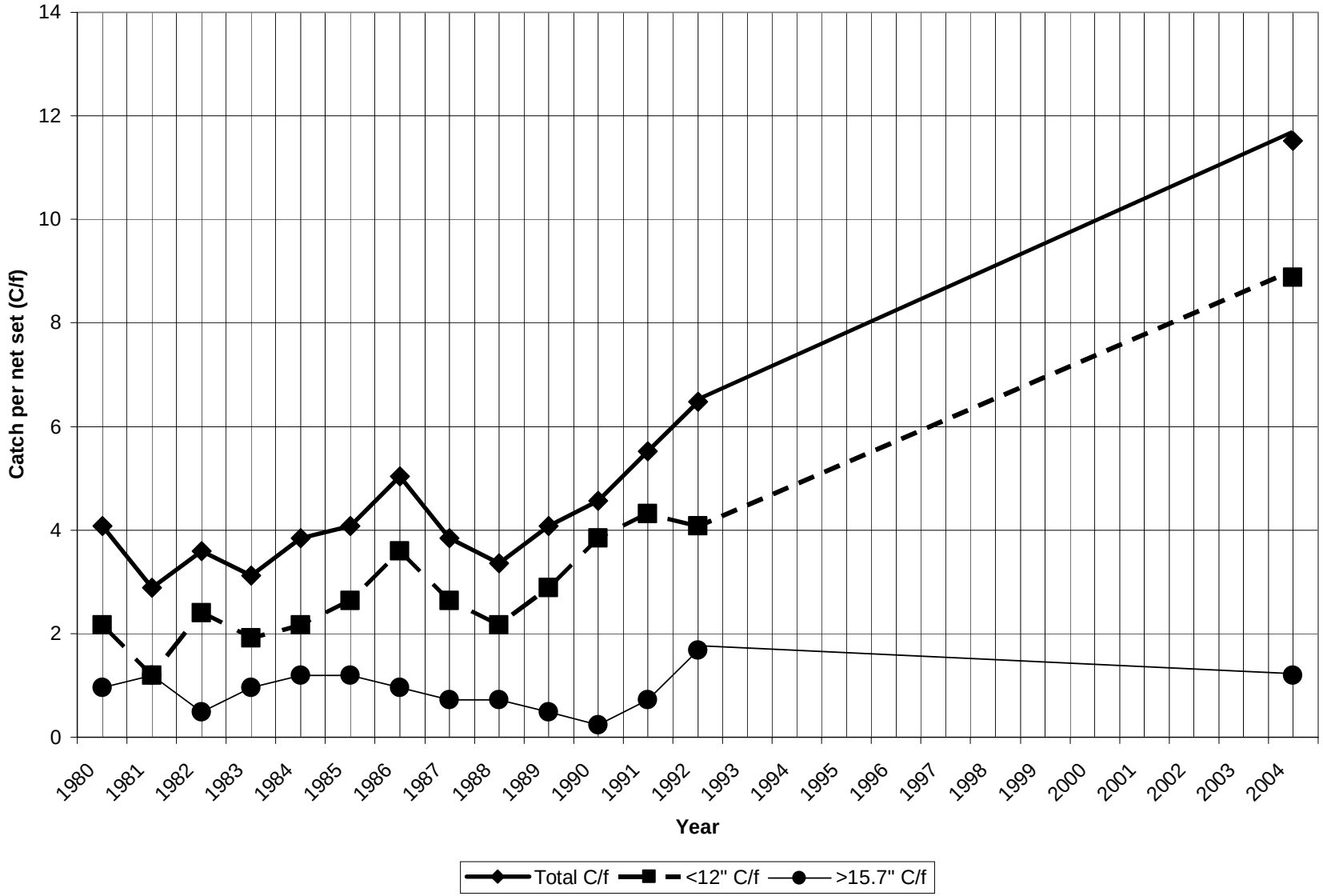


Figure 8. Blue catfish catch per net set (C/f) by gillnetting in Eufaula Lake 1980-2004.

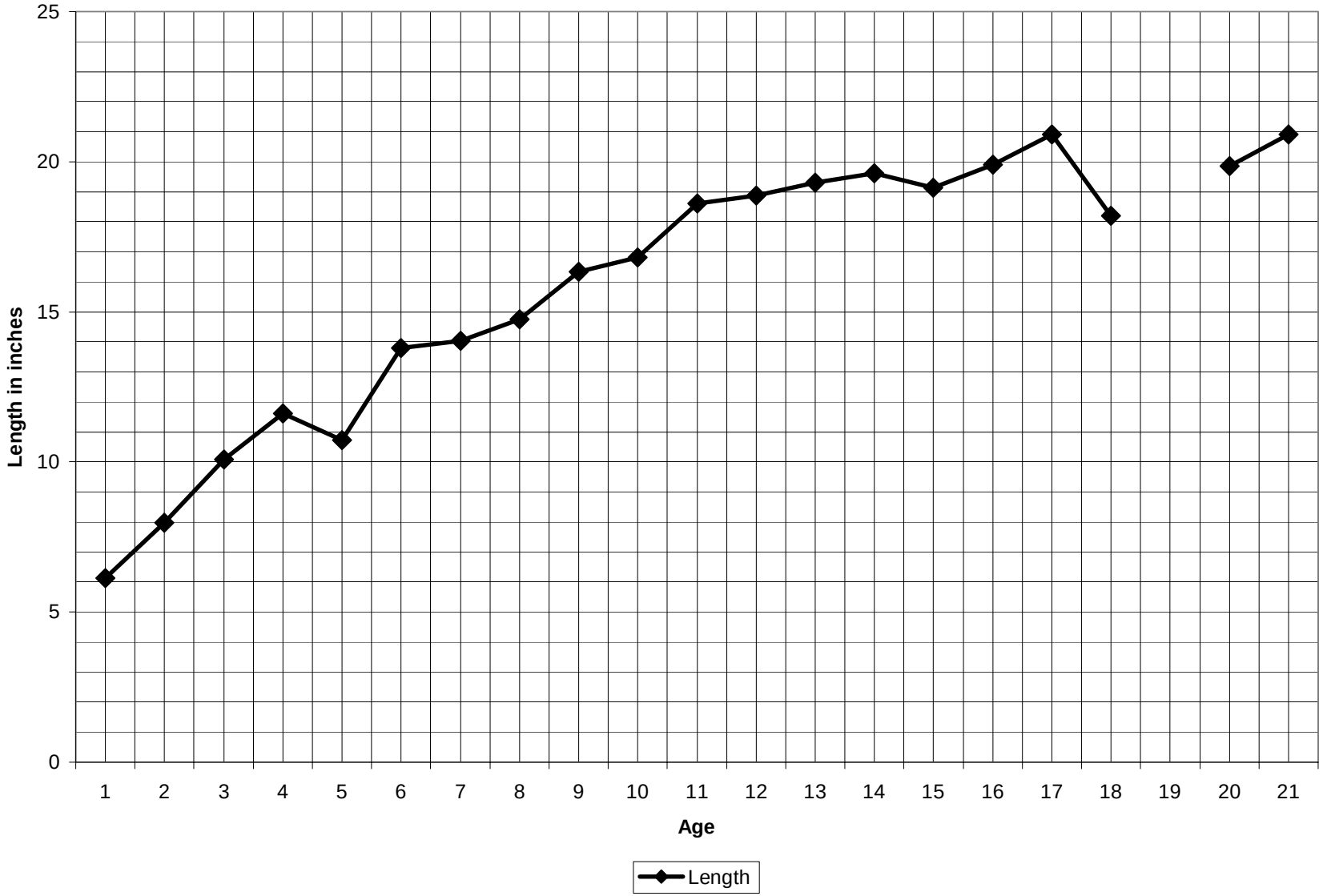


Figure 9. Mean length at age of blue catfish collected in Eufaula Lake by summer electrofishing in 2005.

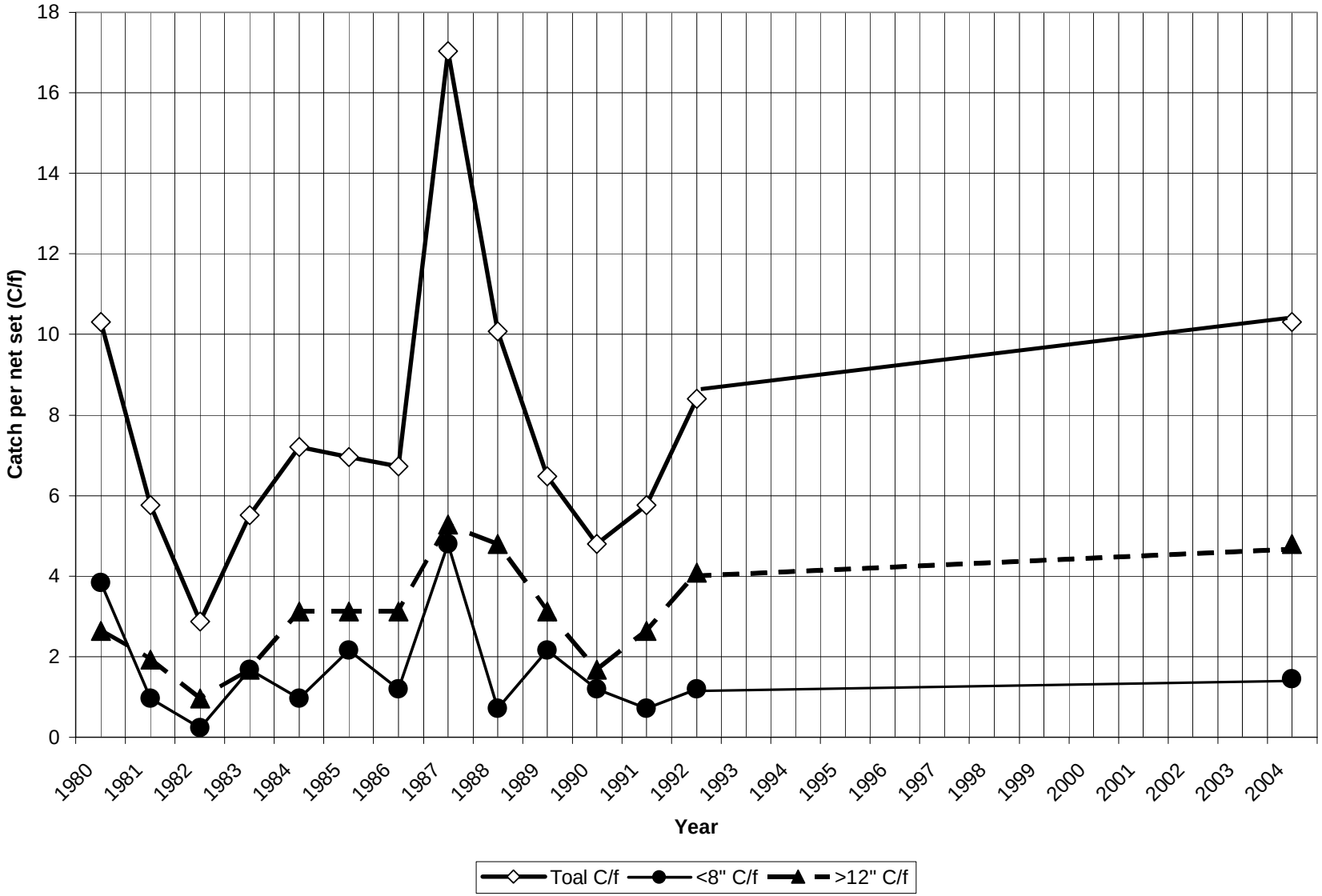


Figure 10. White bass catch per net set (C/f) by gillnetting in Eufaula Lake 1980-2004.

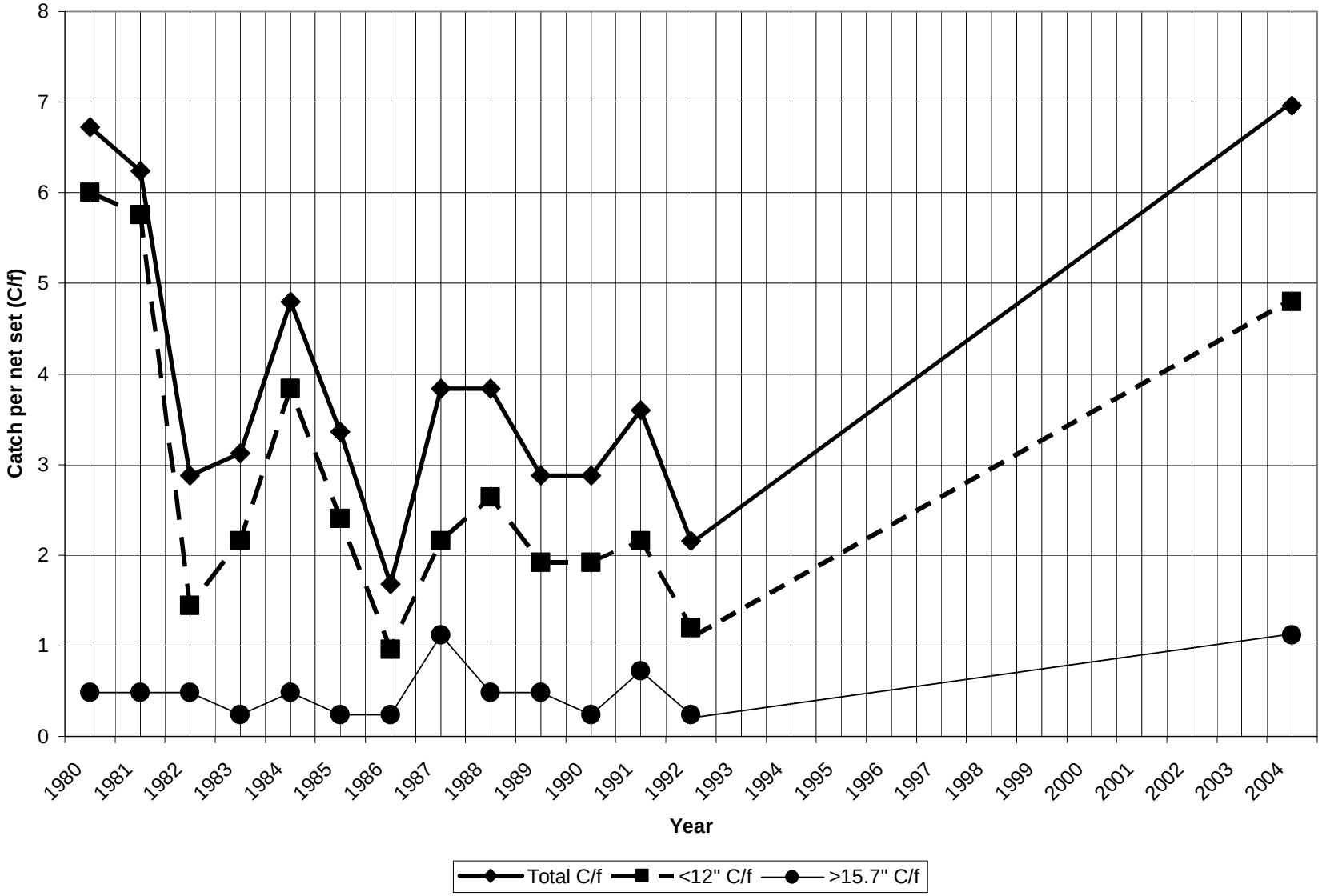


Figure 11. Channel catfish catch per net set (C/f) by gillnetting in Eufaula Lake 1980-2004.

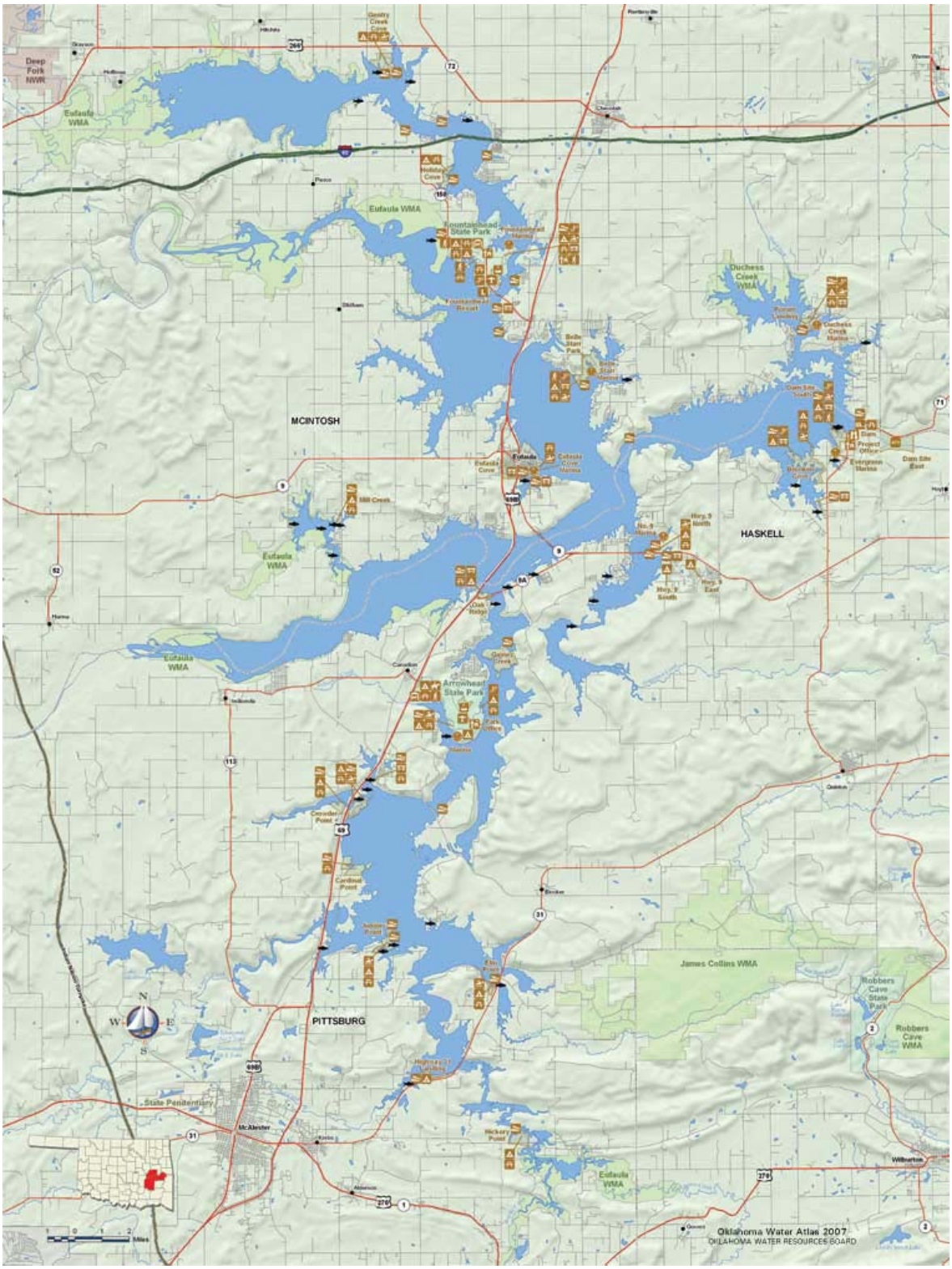


Figure 12. Eufaula Lake with ODWC fish attractor sites denoted as fish symbols.

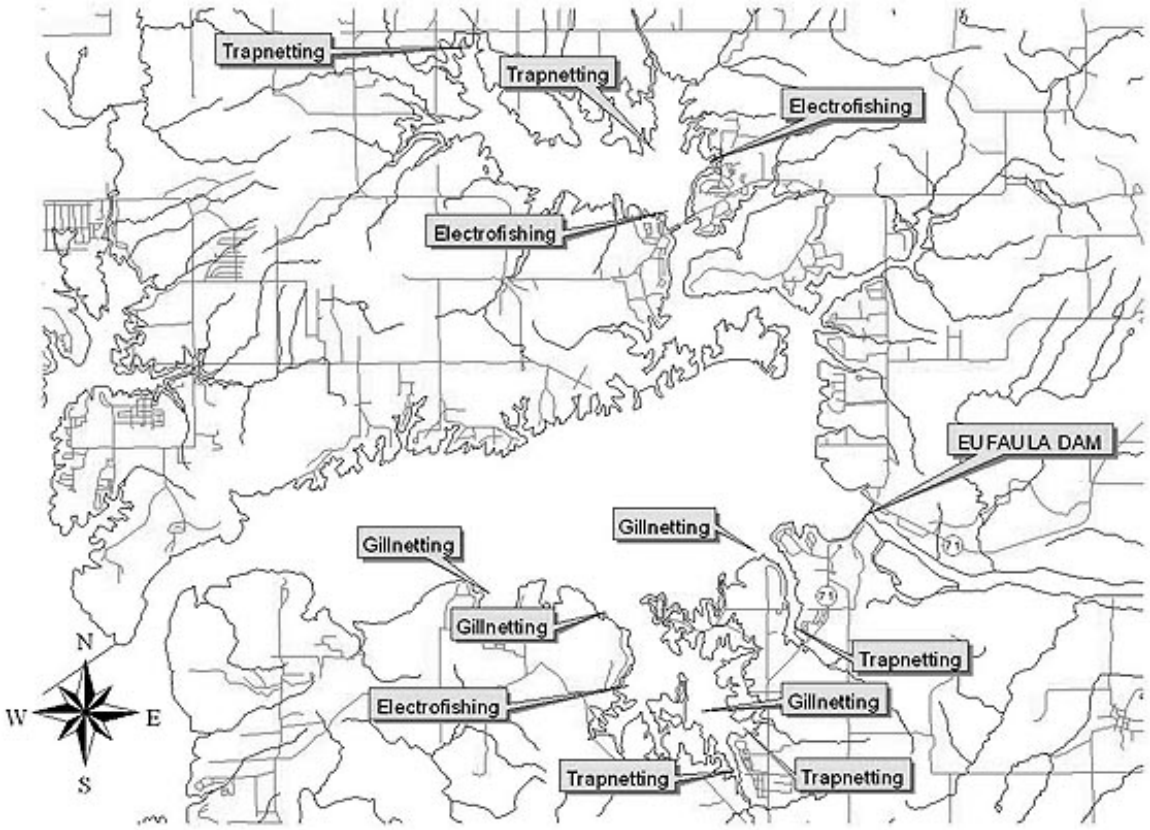


Figure 13. Electrofishing, trapnetting and gillnetting stations in the Central Pool of Eufaula Lake.

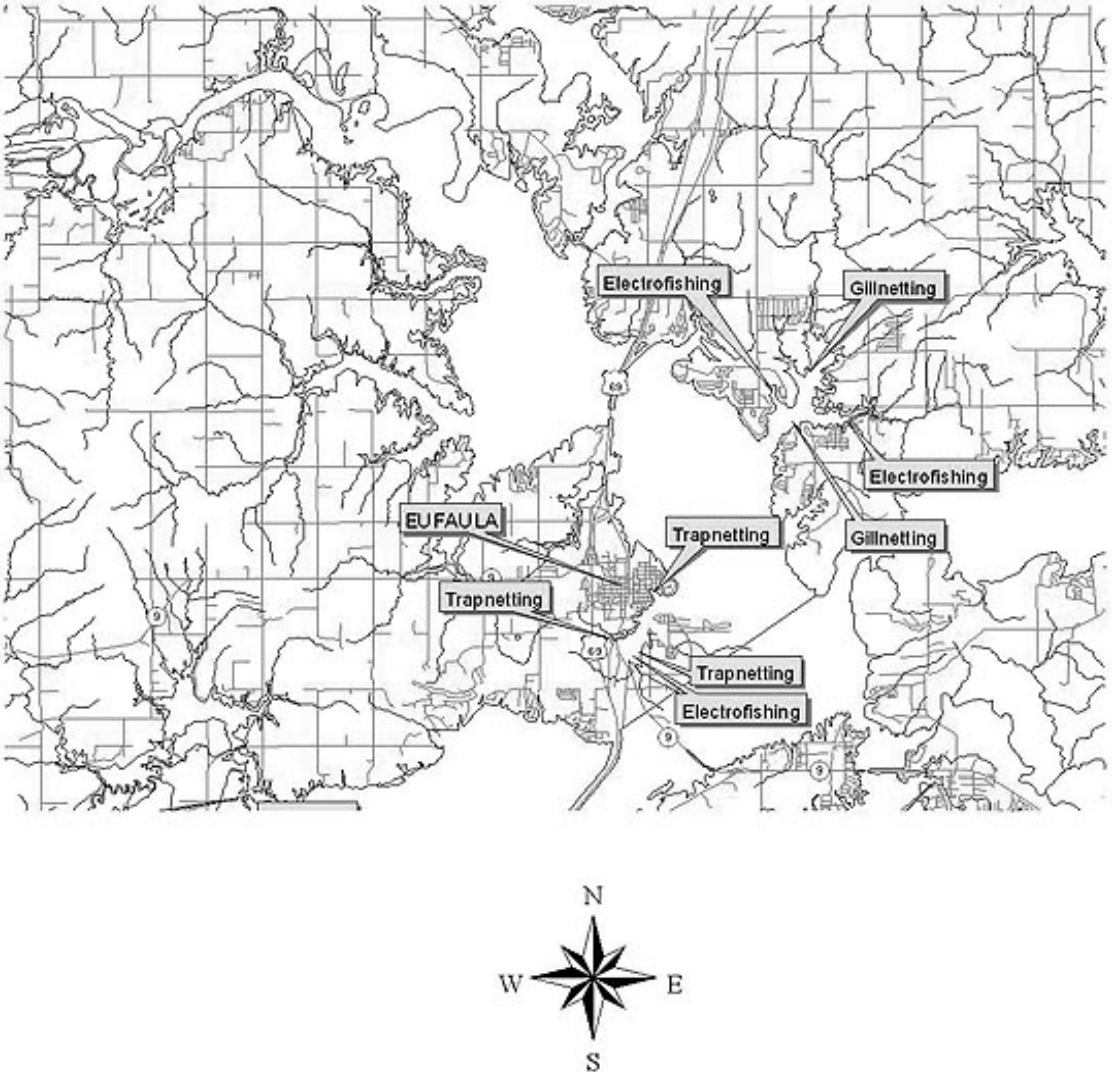


Figure 14. Electrofishing, trapnetting and gillnetting stations in the North Canadian arm of Eufaula Lake.

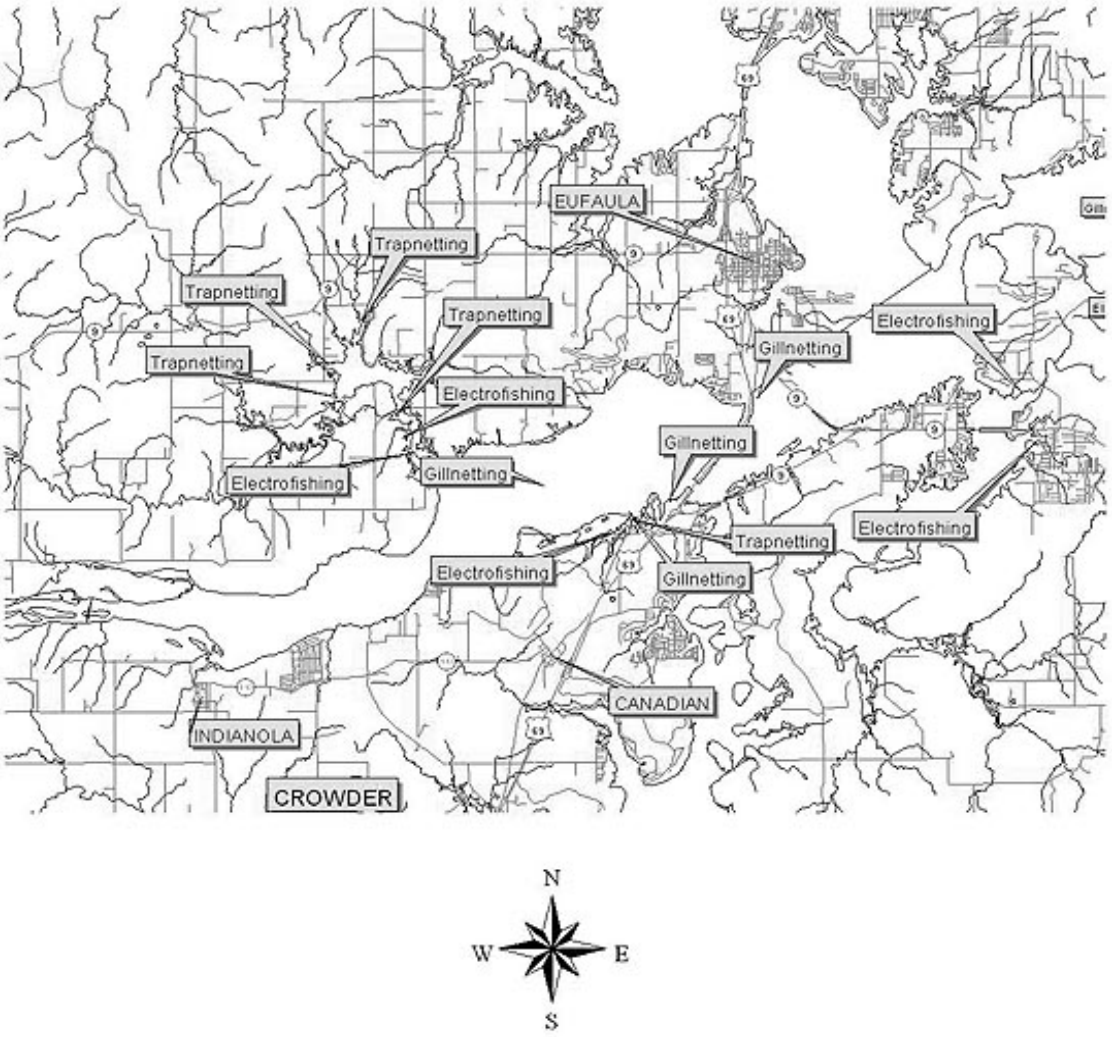


Figure 15. Electrofishing, trapnetting and gillnetting stations in the South Canadian arm of Eufaula Lake.

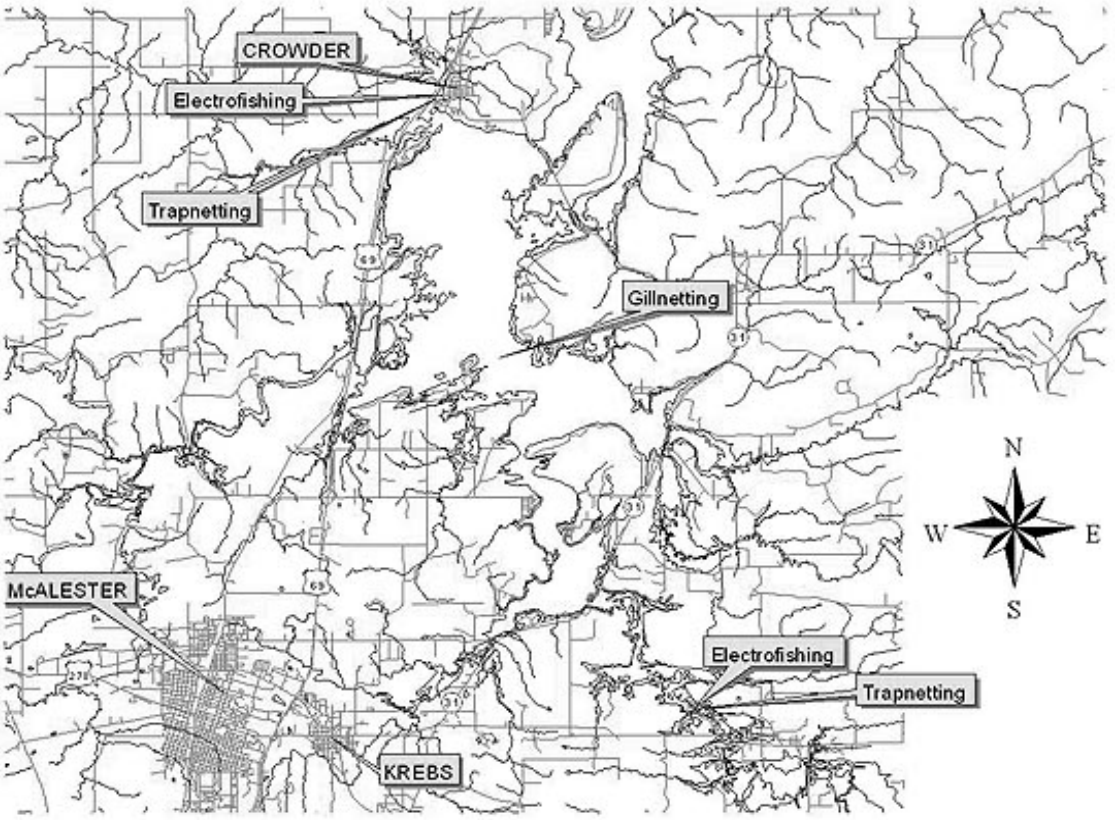


Figure 16. Electrofishing, trapnetting and gillnetting stations in the Gaines Creek arm of Eufaula Lake.

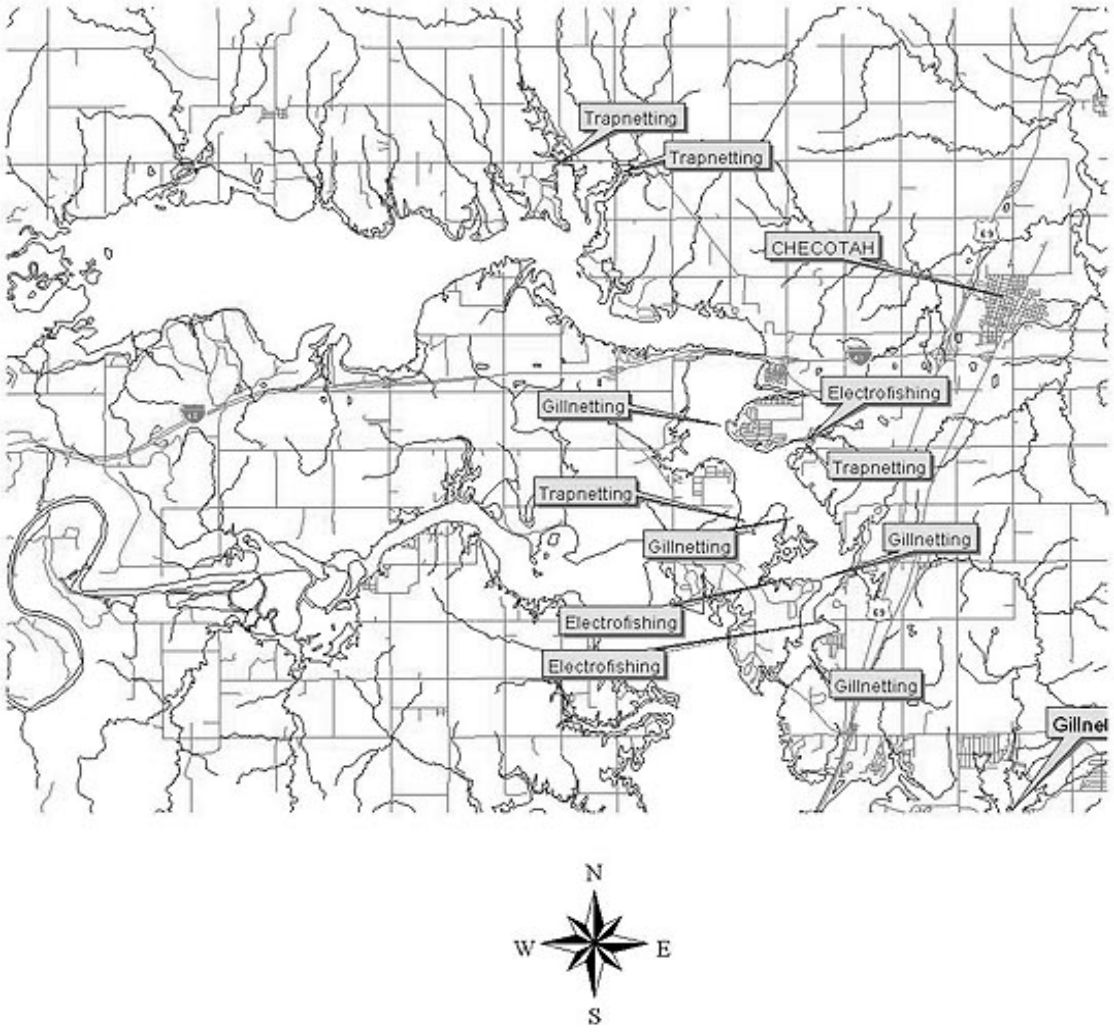


Figure 17. Electrofishing, trapnetting and gillnetting stations in the Deep Fork arm of Eufaula Lake.

Electrofishing, gillnetting and trapnetting site GPS coordinates by arm for Eufaula Lake.

| | Electrofishing | Gillnetting | Trapnetting |
|---|---|---|---|
| Central Pool | (Enter GPS Coordinates) | | |
| North Canadian | | | |
| South Canadian | | | |
| Gaines Creek | | | |
| Deep Fork | | | |