

LAKE THUNDERBIRD

5 YEAR

MANAGEMENT PLAN



**CENTRAL REGION
FISHERIES DIVISION**

**OKLAHOMA DEPTMENT OF
WILDLIFE CONSERVATION**

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SEPTEMBER 15, 2008

Introduction:

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

Use and ownership

Lake Thunderbird was constructed by the United States Department of the Interior's Bureau of Reclamation (BOR) to provide flood control, municipal water supply, recreation and wildlife habitat. Water usage is governed by the Central Oklahoma Master Conservancy District (COMCD). The cities of Norman, Del City, Moore and Midwest City rely heavily on Thunderbird for their water supply. Recreational facilities are managed by the Oklahoma Tourism and Recreation Department (Lake Thunderbird State Park) and the lake ranks high among BOR projects for visitation..

Physical features

Lake Thunderbird is a 6,070 acre reservoir that was constructed in 1965. It impounds the Little River and Hog Creek at their juncture in Northeast Cleveland County. The reservoir is located 13 miles east of Norman, Oklahoma at Longitude: 97° 13' 5" and Latitude: 35° 13' 15".

The lake has 86 miles of shoreline which is comprised of clay, sand and sandstone. The shoreline development index is 7.9. The watershed occupies 256 square miles of residential, commercial and agricultural lands. The surrounding woodland habitat is comprised of Post and Blackjack oak in the Cross timbers ecotype region of the Southern Plains. Average annual precipitation is 35.98 inches.

The conservation pool is 1,039 MSL (Mean sea level) and the reservoir has a total capacity of 119,600 acre-feet of water. The maximum depth near the dam is 57.6 feet and the average depth is 19.70 feet. The water exchange rate is 1.9 (inflow/storage capacity).

Prevailing winds are out of the SSE most of the year at 5 to 20 mph. The reservoir receives a total of 3,295 heating degree days. The lake level fluctuates on average 5.45 ft. each year. Currently, there is no water level management plan in place to benefit fisheries or wildlife.

Limnological properties

Chemical properties measured by the Oklahoma Water Resources Board (OWRB) in 2004 were within acceptable levels relative to the Oklahoma Water Quality Standards (OWQS). Normal surface temperatures range from 45 to 85 °F annually. The reservoir is somewhat turbid due to colloidal and planktonic particulates throughout the year with a secchi disk reading of 36 inches mid lake. Samples collected in 2004 indicated turbidity of 24 NTU (nephelometric turbidity units) which is just below the acceptable level described by OWQS. Salinity values range from

0.16 to 0.23 ppt (parts per thousand). The water is slightly hard with a reading of 8.2 pH. The conductivity was 308 to 461 $\mu\text{S}/\text{cm}$. Dissolved oxygen (DO) readings are above 4 ppm (parts per million) from the surface down to 21 feet during the majority of the year. The lake stratifies normally in mid-June and forms a thermocline at around 24 feet. The hypolimnion typically has less than 2.0 ppm DO. This has caused few problems historically to fish populations with the exception of occasional summer kills of larger saugeye. The OWRB has identified Lake Thunderbird as being eutrophic. The Carson's Trophic State Index indicates high primary productivity (TSI = 58).

Habitat types

Some of the major habitat types beneficial to fish and other aquatic organisms include: standing timber (3 %), aquatic vegetation (20%), terrestrial vegetation (10%), rip-rap (10%) and dock structures (2%). From 1970 to 1990, large beds of Eurasian Watermilfoil (Myriophyllum spicatum) covered the lake. Partial die offs took place in the mid 1980's. A large die off occurred in 1995 (J. Boxrucker, personal communication). Eurasian Watermilfoil is present today but in small quantities.

Several native aquatic plants species have been introduced by the ODWC and the OWRB in order to increase fish habitat, reduce shoreline erosion and improve water quality. Beginning in 2000, several sites around the lake were planted and protected with PVC coated welded wire and poultry fencing. Fencing was installed to exclude herbivores. Flood and drought conditions have hindered the overall success, but the plants have persisted and introductions continue.

Fish species

Sportfish in Lake Thunderbird include: largemouth bass (Micropterus salmoides), white and black crappie (Pomoxis spp.), blue catfish (Ictalurus furcatus), channel catfish (I. punctatus), flathead catfish (Plyodictus olivaris), white bass (Morone chrysops), saugeye (Sander vitreus x S. Canadensis), bluegill sunfish, green sunfish and redear sunfish (Lepomis spp.). Bass, crappie and catfish have been the predominant species supporting the fishery. White bass numbers have fluctuated over the decades. The saugeye population is supported by annual stockings.

Other endemic fish species include: common carp (Cyprinus carpio), small mouth buffalo (Ictiobus bubalus), big mouth buffalo (Ictiobus cyprinellus), river carp sucker (Carpionodes carpio), fresh water drum (Aplodinotus grunniens), spotted gar (Lepisosteus oculatus), gizzard shad (Dorosoma cepedianum), inland silverside (Menidia beryllina), warmouth and longear sunfish (Lepomis spp.), yellow bullhead (Ameiurus natalis), red shiner (Cyprinella lutrensis), blunt nose minnow (Pimephales notatus) and mosquito fish (Gambusia affinis).

Largemouth bass -

Lake Thunderbird has historically had a low density largemouth bass population. Possible factors include: lack of adequate nursery habitat, lack of adequate ambush habitat for adult fish, high competition with other sunfish species, low productivity due to turbid conditions and overharvest. Table 2 reveals that electrofishing catch rates for largemouth bass have been below

minimum statewide levels for balanced populations. However, it has continued to produce fair to good numbers of quality sized fish throughout the years.

A 14-inch minimum length limit was applied in 1989. The regulation is still in affect today. Angling pressure and harvest have remained stable throughout the years (Figure 6). Floods and droughts have effected bass reproduction and recruitment. Figure 2 shows how bass recruitment responded to high and low water levels. Acceptable numbers of young-of-year fish were sampled in 1990, 1991, 2002 and 2005.

Largemouth bass virus (LMBV) was confirmed in the largemouth bass population from 2000 to 2002. Isolated fish kills were noticed during the summer months but no large die offs were observed. According to ODWC bass tournament report data, anglers had to fish longer in order to catch bass over five pounds as a result of the infection (Table 6). The bass population has recovered according to recent surveys.

Florida largemouth bass were introduced into Lake Thunderbird beginning in 1973 to increase trophy bass numbers. In some years, fingerlings were reared at the Lake Thunderbird nursery pond (Table 1).

Forage abundance has been adequate to maintain bass body condition with relative weight values near or above 100 (Table 2).

Crappie spp. -

White crappie were historically slow growing or stunted (Boxrucker, 1992). Age and growth studies revealed that fish at or below 6 inches were not converting over to a fish diet until age 6 (Figure 10). Several management tools were applied to correct this situation. The saugeye, a predator was introduced in 1985. Trials in Ohio with stunted panfish populations showed positive results when saugeye were introduced. Additional prey species (inland silversides and threadfin shad, *D. pentenense*) were stocked as added food for largemouth bass, crappie and saugeye (Table 1). Crappie size structure has improved in recent years (Figure 15). Recent trapnet surveys along with reports by anglers have shown a two-fold increase in 10-inch fish compared to previous years (Figure 3). White crappie condition has remained fair with a mean Relative Weight of 86.0 (Table 3). Black crappie are present but found in very low numbers.

Saugeye –

Walleye were introduced into Lake Thunderbird as an added sportfish and to help control stunted crappie from 1966 through 1976. Survival of walleye fry was limited due to predation, low stocking rates, limited food availability, turbidity and less than optimal temperatures. Saugeye, the walleye x sauger hybrid, was stocked experimentally in 1985 and has been stocked regularly since then (Table 1). Saugeye fingerlings have been obtained from out-of-state sources, ODWC hatcheries and have been reared at the Lake Thunderbird Nursery pond on occasion.

Saugeye numbers have remained fairly constant in recent years (Table 4). Electrofishing catch rates have been good compared to statewide averages. An 18-inch length limit was applied in

1993. Since then, catches of 10 fish per hour or better have been observed (Figure 4). Saugeye are in good condition when compared to statewide values with a Relative Weight of 98.4 (Table 4).

Flathead catfish -

Numbers of catfish collected by electrofishing are considered acceptable (Table 5). A 20-inch minimum length limit was applied to flathead catfish in 1995.

Prey species -

Bluegill, redear, green, longear, and warmouth sunfish numbers are high, Inland silversides numbers are moderate, Threadfin shad abundance is low, Gizzard shad numbers are moderate. Predator Relative Weights and abundance forage abundance information indicate that the system may be at carrying capacity.

Threats to the fishery:

Pollution and trash, OWRB

- Non-point source - storm drain runoff from urban sites and rural seepage
- Point source - None
- Park visitors - discarded trash into the lake

Declining water quality, OWRB

- Due to erosion and turbidity the lake has average water clarity. The OWRB posted a 24 NTU in 2004. Listed as partially supporting beneficial use.
- High algal levels due to high primary productivity according to OWRB. High phosphorus and nitrogen levels
- Poor oxygen levels mid Summer and Fall at hypolimnion

Competing Water uses

- COMCD supplies water from Lake Thunderbird to area municipalities. Currently they supply water to approximately 175,000 persons. The number served will rise to approx. 225,000 by 2010. The capacity of Lake Thunderbird to deliver sufficient water will be met in a few years (COMCD, 2004).

Non-native species

- Spotted bass (*M. punctulatus*), grass carp (*Ctenopharyngodon idella*), white perch (*Morone americana*), zebra mussels (*Dreissena polymorpha*), Quagga mussel (*Dreissena rostriformis bugensis*), hydrilla (*Hydrilla verticillata*), salt cedar (*Tamarix aphylla*) and common reed (*Phragmites australis*). All of these are exotic and could be problematic to Lake Thunderbird.

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) and golden algae (Prymnesium parvum)
- Fish consumption advisory - The Oklahoma Department of Environmental Quality (DEQ) sampled the lake in 1999 as part of their Toxics Monitoring Program. There is a statewide advisory for mercury. Children under age 15 and women of childbearing age are advised to consume no more than one meal per week of predator species. No other compounds were detected at the DEQ screening or consumption advisory level. The lake is fully supporting its Fish Consumption beneficial use.

Review and include existing plans from other agencies:

- OWRB - Beneficial Use Monitoring Plan (BUMP)
- ODWC - Conservation Wildlife Management Strategy (CWMS) and HACCP (Hazard Analysis and Critical Control Point) plans
- City of Norman Storm Water Plan
- Watershed development and land use practices (shoreline erosion and siltation) follow OWRB and Oklahoma Conservation Commission plans (Project 10)
- Oklahoma Comprehensive Water Plan

Management Objectives:

Regulations

- Initiate age and growth study on largemouth bass using FAST model (Spring 2008) and evaluate current 14-inch largemouth bass length limit
- Evaluate current 18-inch saugeye length limit using FAST model
- Increase all LMB, WC, SGE and BC Wr and CPUE in 5 years by 5 %

Sampling schedule

- Trap netting for crappie - monitor catch, size structure, age & growth and trends (3 yr cycle starting in 2009)
- Electrofishing for bass - catch (annual assessment), age & growth, size structure and trends (3 year cycle starting in 2008)
- Electrofishing for catfish - catch, age & growth, size structure and trends (3 year cycle starting in 2009)
- Gill netting for shad - catch, size structure and trends (2 year cycle starting in 2008)
- Gill netting for white bass - catch, size structure and trends (3 yr cycle start in 2009)

Fish stocking

- Renovate Lake Thunderbird nursery pond and produce advanced FLMB fingerlings in 2009.

- Continue stocking saugeye fingerlings at 20/acre following ODWC Stocking Criteria.
- Stock threadfin shad in 2009 to provide additional prey for saugeye, crappie and bass.
- Rotate species at nursery pond 1st year with bass, 2nd year with saugeye and 3rd year with channel catfish. Catfish will be raised for AREP events and lake stockings.

Habitat improvement projects

- Negotiate with COMCD and BOR to maintain stable lake level during spring and summer months in order to improve bass and sunfish recruitment.
- Continue aquatic plant introductions by maintaining existing sites and adding new locations with appropriate permission and compliance documents.
- Continue brush pile construction and maintenance.
- Construct additional gravel shoals on road beds and points with 2-inch coarse gravel or larger stone. Evaluate effectiveness of sites with electrofishing surveys.
- Mark all habitat sites with fish attractor buoys, maintain existing buoys, record and publish GPS coordinates.

Angler satisfaction

- Conduct creel survey on Lake Thunderbird every 3 years (start in 2010)
- Utilize Sportfish Restoration Boating and Fishing access funds to improve existing sites and add new ones. Coordinate with State Parks, Absentee-Shawnee Tribe, BOR and Friends of Lake Thunderbird.
- Conduct annual stakeholder meetings to exchange information on management progress and get input on modifications that the public would like to see.

References

- Boxrucker, Jeff. 1992. Growth responses of white crappie and recruitment of largemouth bass following the introduction of threadfin shad in Thunderbird Reservoir. Oklahoma Department of Wildlife Conservation, Federal Aid Report Final Report. F-37-R-15 Job 15. Oklahoma City. 27pp.
- Oklahoma Water Resources Board. 2004. Lake Thunderbird Capacity and Water Quality 2004. Report to the Central Oklahoma Master Conservancy District. Oklahoma City. 12 pp.

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Table 1. ODWC fish stocking records for Lake Thunderbird (impoundment to present)

<u>DATE</u>	<u>SPECIES</u>	<u>SIZE</u>	<u>NUMBER</u>	<u>WEIGHT</u> <u>LBS</u>
1/27/1965	Largemouth bass	N/A	19,860	N/A
1/28/1965	Largemouth bass	N/A	35,880	N/A
7/12/1965	Largemouth bass	Fry	250,000	N/A
7/12/1965	Flathead catfish	Fry	2,475	17.83
1966	Blue catfish	N/A	N/A	N/A
1/31/1966	Channel catfish	N/A	48,750	3.5
3/28/1966	Walleye	Fry	500,000	N/A
3/30/1966	Threadfin shad	Adult	2,500	N/A
3/31/1966	Largemouth bass	N/A	80,217	N/A
3/1/67	Walleye	Fry	500,000	N/A
3/2/1968	Walleye	Adult	6	12
3/25/1968	Walleye	Fry	500,000	N/A
4/10/1969	Walleye	Fry	250,000	N/A
10/24/1973	Florida largemouth bass	Fingerlings	1,150	95.83
3/22/1974	Walleye	Fry	1,092,042	N/A
3/25/1974	Walleye	Fry	1,320,769	N/A
4/1/1974	Walleye	Fry	562,224	N/A
7/9/1974	Florida largemouth bass	3 - 3.5	5,400	70.0
7/26/1974	Largemouth bass	3 - 5.0	5,000	79.0
3/25/1975	Walleye	Fry	111,200	N/A
3/28/1975	Walleye	Fry	337,000	N/A
3/31/1975	Walleye	Fry	1,900,000	N/A
4/4/1975	Walleye	Fry	477,500	N/A
4/18/1975	Walleye	Fry	278,500	N/A
7/3/1975	Largemouth bass	Fingerling	50,000	50
8/11/1975	Florida largemouth bass	Adv. Fry	1,054	2.5
9/9/1975	Florida largemouth bass	N/A	5,909	6.3
3/21/1976	Walleye	Fry	260,300	N/A
3/27/1976	Walleye	Fry	146,000	N/A
3/29/1976	Walleye	Fry	300,000	N/A
3/30/1976	Walleye	Fry	99,000	N/A
4/1/1976	Walleye	Fry	195,000	N/A
9/30/1983	Channel catfish	3.0	30,475	244.0
10/5/1983	Channel catfish	3.0	33,480	273.37
1985	Saugeye	Fry	98,000	N/A
1985	Threadfin shad	Adult	13,700	N/A
3/31/1986	Saugeye	Fry	94,080	N/A
4/25/1986	Saugeye	1	111,000	37.0
1986	Threadfin shad	Adult	15,280	N/A
5/5/1987	Saugeye	1.5	23,500	23.14
5/8/1987	Saugeye	1.25 - 1.75	58,150	51.81
1987	Threadfin shad	Adult	2,000	N/A
5/5/1988	Saugeye	1.25	33,400	22.3
5/6/1988	Saugeye	1.25	96,000	64.0
5/10/1988	Saugeye	1.25	42,000	28.0
1988	Threadfin shad	Adult	3,000	N/A
4/24/1989	Saugeye	1.5	80,000	55.8
4/27/1989	Saugeye	1.25	40,500	30.0
4/28/1989	Saugeye	1.5	45,000	50

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<u>DATE</u>	<u>SPECIES</u>	<u>SIZE</u>	<u>NUMBER</u>	<u>WEIGHT</u> <u>LBS</u>
4/2/1990	Saugeye	Fry	125,000	N/A
1989	Threadfin shad	Adult	6,700	N/A
5/21/1990	Saugeye	1.5	100,176	131.82
5/24/1990	Saugeye	1.25 - 1.5	126,880	136.75
7/13/1990	Flathead catfish	1.0	10,250	1.5
9/11/1990	Florida largemouth bass	5.0 - 10.0	3,769	N/A
1990	Threadfin shad	Adult	10,000	N/A
5/2/1991	Saugeye	1.25	74,350	62
7/26/1991	Florida largemouth bass	3.0 - 6.0	2,022	48
5/14/1991	Saugeye	2.0	20,500	34.9
4/28/1992	Saugeye	1.125	63,000	42
5/26/1992	Saugeye	1.75	49,075	75.5
5/27/1992	Saugeye	1.5 - 1.75	70,625	97.5
9/28/1992	Florida largemouth bass	3.0 - 5.0	930	27.4
5/12/1993	Florida largemouth bass	Fry	10,000	N/A
5/17/1993	Saugeye	1.75	24,623	40.8
5/18/1993	Saugeye	1.75 - 2.0	30,900	60
6/3/1993	Saugeye	1.5	54,000	65
6/16/1993	Florida largemouth bass	Fry	700	N/A
9/21/1993	Florida largemouth bass	3.0	1,782	21.7
9/21/1993	Florida largemouth bass	9.0	111	35.8
5/9/1994	Saugeye	1.6 - 1.75	52,570	87
5/11/1994	Saugeye	1.5 - 1.6	36,707	49
9/19/1994	Florida largemouth bass	3.0 - 5.0	292	N/A
9/19/1994	Florida largemouth bass	6.0 - 8.0	180	N/A
6/14/1995	Saugeye	1.5	120,000	122
6/13/1995	Saugeye	1.5 - 2.0	27,700	N/A
5/29/1996	Saugeye	1.5	70,034	87.5
6/5/1996	Saugeye	1.6	49,000	59
7/10/1997	Florida largemouth bass	3.0 - 6.0	6,560	N/A
5/15/1998	Saugeye	2.0	87,600	146
5/26/1998	Saugeye	1.75	34,710	39
11/4/1998	Florida largemouth bass	3.0 - 5.0	998	37.5
11/4/1998	Florida largemouth bass	6.0 - 10.0	411	34.5
5/10/2000	Saugeye	2.0	27,000	45
5/31/2000	Saugeye	1.5	56,525	59.5
6/1/2000	Saugeye	1.5	37,660	37.6
11/21/2000	Florida Largemouth bass	6.0 - 7.0	2,048	128
1/21/2000	Florida Largemouth bass	4.0 - 6.0	260	N/A
4/29/2002	Saugeye	1.5	51,500	51.5
5/6/2002	Saugeye	1.5	70,500	70.5
6/20/2002	Florida largemouth bass	3.0	18,000	120
5/5/2003	Saugeye	1.5	28,750	50
5/5/2003	Saugeye	1.5	33,280	52
5/6/2003	Saugeye	1.5	44,520	85
5/13/2003	Saugeye	1.5	20,000	22
10/16/2003	Florida largemouth bass	5.0	1,460	N/A
5/2/2005	Saugeye	1.5	64,200	85
5/3/2005	Saugeye	1.5	56,550	76

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<u>DATE</u>	<u>SPECIES</u>	<u>SIZE</u>	<u>NUMBER</u>	<u>WEIGHT</u> <u>LBS</u>
5/18/2005	Saugeye	2.0	20,100	33.5
5/8/2006	Saugeye	1.75	96,900	96
5/9/2006	Saugeye	1.75	24,000	48
5/8/2007	Saugeye	1.5	51,900	79.8
5/9/2007	Saugeye	1.5	45,500	65
5/5/2008	Saugeye	1.5	89,100	78
5/6/2008	Saugeye	1.5	33,760	32
Total			12,302,969	

Table 2. Largemouth bass total catch rate, catch rate by size group and mean relative weight (Wr) from Lake Thunderbird

<u>Year</u>	<u>Total C/f</u> <u>(≥ 40 is preferred)</u>	<u>(C/f) < 200mm</u>	<u>C/f ≥ 356 mm</u> <u>(≥ 10 is preferred)</u>	<u>Effort (hrs)</u>	<u>(Wr)</u>
1983	12.12	1.36	6.20	32.25	103
1984	N/A	N/A	N/A	N/A	N/A
1985	21.05	1.89	13.26	4.75	105
1986	24.43	2.43	9.43	7.00	93
1987	15.69	2.15	8.61	6.50	98
1988	22.69	7.23	6.00	13.00	95
1989	26.60	5.76	8.93	10.75	93
1990	56.33	17.33	6.66	3.00	94
1991	54.25	35.00	7.50	4.00	96
1992	35.16	10.16	10.16	6.00	97
1993	31.44	2.66	11.55	9.00	98
1994	28.91	2.40	14.85	8.75	99
1995	19.78	1.05	11.78	4.75	101
1996	8.16	0.08	5.00	6.00	95
1997	15.09	1.161	9.16	7.75	103
1998	N/A	N/A	N/A	N/A	N/A
1999	N/A	N/A	N/A	N/A	N/A
2000	N/A	N/A	N/A	N/A	N/A
2001	N/A	N/A	N/A	N/A	N/A
2002	36.18	14.54	10.18	5.50	100
2003	22.83	4.50	7.33	6.00	97
2004	12.42	1.68	6.74	4.75	112
2005	41.71	10.28	17.14	5.25	93
2006	41.55	4.22	20.00	4.50	103
2007	8.32	0.80	5.29	5.25	104
2008	16.22	3.33	9.33	4.50	98

Gear = Spring electrofishing

Table 3. White crappie total catch rate, catch rate by size group and mean relative weight (Wr) from Lake Thunderbird

<u>Year</u>	<u>(C/f)</u>	<u>(C/f) ≥ 250 mm</u>	<u>Effort</u>	<u>(Wr)</u>
1983	138.20	0.22	1147	91
1984	88.80	1.49	337	85
1985	135.48	1.87	549	84
1986	87.62	2.42	375	85
1987	54.62	2.11	490	85
1988	65.38	2.54	377	86
1989	29.59	0.74	774	86
1990	34.42	2.71	583	85
1991	50.88	1.70	407	83
1992	38.64	0.84	374	86
1993	31.75	2.14	572	87
1994	40.01	1.51	552	85
1995	24.60	0.86	551	84
1996	13.03	1.75	578	91
1997	9.14	1.90	569	90
1998	23.11	1.18	590	89
1999	50.16	1.06	542	86
2000	N/A	N/A	N/A	N/A
2001	19.54	3.82	560	86
2002	13.70	1.78	564	83
2003	18.60	1.90	542	90
2004	21.91	4.03	564	85
2005	62.40	4.56	510	81

Gear = Fall trapnetting

Table 4. Saugeye total catch rate, catch rate by size group and mean relative weight (Wr) from Lake Thunderbird

<u>Year</u>	<u>(C/f)</u>	<u>(C/f) ≥ 457 mm (> 10 preferred)</u>	<u>Effort</u>	<u>(Wr)</u>
1985*	N/A	0.00	N/A	N/A
1986	N/A	N/A	N/A	N/A
1987	15.56	5.33	4.50	100
1988	N/A	N/A	N/A	N/A
1989	N/A	N/A	N/A	N/A
1990	N/A	N/A	N/A	N/A
1991	N/A	N/A	N/A	N/A
1992	8.00	7.20	1.25	94
1993	8.21	7.16	4.75	106
1994	7.69	6.31	6.50	99
1995	N/A	N/A	N/A	N/A
1996	58.50	27.50	6.75	N/A
1997	25.88	20.70	4.25	105
1998	24.89	20.67	4.50	100
1999	46.00	16.40	2.50	89
2000	N/A	N/A	N/A	N/A
2001	13.91	11.24	5.25	94
2002	26.91	20.55	5.50	95
2003	14.67	13.60	3.75	108
2004	N/A	N/A	N/A	N/A
2005	22.00	14.00	4.50	93
2006	24.00	8.86	3.50	100
2007	N/A	N/A	N/A	N/A

**Gear = Fall day
electrofishing**

Table 5. Flathead catfish catch rate and mean relative weight (Wr) from Lake Thunderbird

<u>Year</u>	<u>(C/f)</u>	<u>Effort</u>	<u>(Wr)</u>
1983	N/A	N/A	N/A
1984	N/A	N/A	N/A
1985	N/A	N/A	N/A
1986	N/A	N/A	N/A
1987	N/A	N/A	N/A
1988	N/A	N/A	N/A
1989	N/A	N/A	N/A
1990	N/A	N/A	N/A
1991	15	2	112
1992	43.529	2	109
1993	14.762	2.1	113
1994	67.619	1.05	119
1995	33	1	124
1996	24	1	109
1997	N/A	N/A	N/A
1998	N/A	N/A	N/A
1999	N/A	N/A	N/A
2000	N/A	N/A	N/A
2001	N/A	N/A	N/A
2002	56	1	86
2003	N/A	N/A	N/A
2004	N/A	N/A	N/A
2005	N/A	N/A	N/A
2006	N/A	N/A	N/A
2007	N/A	N/A	N/A

Gear = Roving electrofishing

Table 6. Bass tournament averages at Lake Thunderbird from 1994 to 2007

<u>Year</u>	<u>Num / Day</u>	<u>% Success</u>	<u>Hrs / 5-lb</u>
1994	0.85	51.35	N/A
1995	0.99	64.96	164
1996	0.67	35.30	190
1997	0.73	37.32	88
1998	0.95	42.77	100
1999	0.91	43.09	54
2000	0.91	40.96	72
2001	0.79	35.55	127
2002	0.69	35.08	206
2003	1.03	42.75	199
2004	1.88	52.78	175
2005	1.58	37.88	153
2006	3.35	61.18	102
2007	1.88	39.91	53

Table 7. Harvest and angler pressure values for largemouth bass at Lake Thunderbird from 1985 to 1995

<u>Year</u>	<u>Pressure (Hrs / A)</u>	<u>C/f (N / hr)</u>	<u>Total harvest (Fish / A)</u>
1985	18.81	0.04	0.68
1986	23.68	0.06	0.66
1987	13.94	0.03	0.30
1988	18.13	0.05	0.14
1989	20.55	0.04	0.22
1990	22.28	0.08	0.32
1991	22.00	0.09	0.15
1992	21.52	0.09	0.27
1993	14.83	0.12	0.24
1994	15.49	0.13	0.22
1995	19.03	0.12	0.35

Table 8. Harvest and angler pressure values for crappie at Lake Thunderbird from 1985 to 1995

<u>Year</u>	<u>Pressure (Hrs / A)</u>	<u>C/f (N / hr)</u>	<u>Total harvest (Fish / A)</u>
1985	18.81	0.21	0.92
1986	23.69	0.50	4.72
1987	14.14	0.58	3.10
1988	18.13	0.33	2.00
1989	20.55	0.57	4.12
1990	22.28	0.28	4.31
1991	22.00	0.44	4.60
1992	21.52	0.33	2.85
1993	14.83	0.62	2.90
1994	15.49	1.08	7.52
1995	19.03	0.71	5.11

Table 9. Harvest and angler pressure for saugeye at Lake Thunderbird from 1985 to 1995

<u>Year</u>	<u>Pressure (Hrs / A)</u>	<u>C/f (N / hr)</u>	<u>Total harvest (Fish / A)</u>
1985	N/A	N/A	N/A
1986	23.68	0.006	0.11
1987	13.94	0.007	0.10
1988	18.13	0.016	0.17
1989	20.55	0.009	0.14
1990	22.28	0.003	0.06
1991	20.38	0.017	0.14
1992	21.52	0.012	0.19
1993	14.83	0.022	0.09
1994	15.49	0.033	0.08
1995	19.03	0.033	0.16

N/A = First year of saugeye introductions

Table 10. Harvest and angler pressure values for blue and channel catfish at Lake Thunderbird from 1985 to 1995

<u>Year</u>	<u>Pressure (Hrs / A)</u>	<u>C/f (N / hr)</u>	<u>Total harvest (Fish / A)</u>
1985	18.81	0.108	1.17
1986	23.68	0.129	1.50
1987*	13.94	0.004	0.04
1988	18.13	0.090	0.82
1989	20.55	0.046	0.67
1990	22.28	0.085	1.82
1991	20.38	0.074	1.39
1992	21.52	0.062	0.87
1993	14.83	0.038	0.57
1994	15.49	0.058	0.84
1995	19.03	0.044	0.61

* - Channel catfish only

Table 11. Marked “Fishing Areas” and descriptions

ID #	Habitat Type	Area Name	Marked	Bank Access	Date Installed	Depth (ft)	Latitude	Longitude
1	Brush Row	South Dam Cove	No	Yes	2002	6 to 8	35° 12' 59"	97° 13' 31"
2	Brush Pile	Five Finger Cove	Yes	No	2006	12 to 15	35° 14' 27"	97° 13' 18"
3	Brush Row	Willow Branch Cove	Yes	No	2006	10 to 15	35° 15' 47"	97° 14' 04"
4	Brush Pile	New House Cove	Yes	No	2005	8 to 12	35° 13' 29"	97° 16' 18"
5	Brush Pile	Snake Pit Cove	Yes	No	2005	12 to 15	35° 13' 02"	97° 16' 34"
6	Brush Row	Clear Bay East	Yes	No	2005	12 to 15	35° 12' 06"	97° 15' 23"
7	Brush Pile	Sullivan's Cove	Yes	No	2005	8 to 10	35° 13' 42"	97° 17' 18"
8	Brush Pile	Hog Creek (East)	Yes	No	2006	8 to 12	35° 14' 51"	97° 13' 44"
9	Brush Pile	Denver Corner Ramp	No	Yes	2005	5 to 10	35° 13' 35"	97° 16' 51"
10	Brush Pile	Indian Point	No	No	2004	8 to 12	35° 15' 03"	97° 14' 34"
11	Brush Pile	Fisherman's Pt. Pier	No	Yes	2005	5 to 8	35° 13' 46"	97° 14' 46"
12	Gravel Piles	Clear Bay West	No	No	2007	5 to 20	35° 12' 45"	97° 15' 25"
13	Gravel Piles	Little Axe Campground	No	Yes	2006	5 to 10	35° 13' 59"	97° 13' 24"

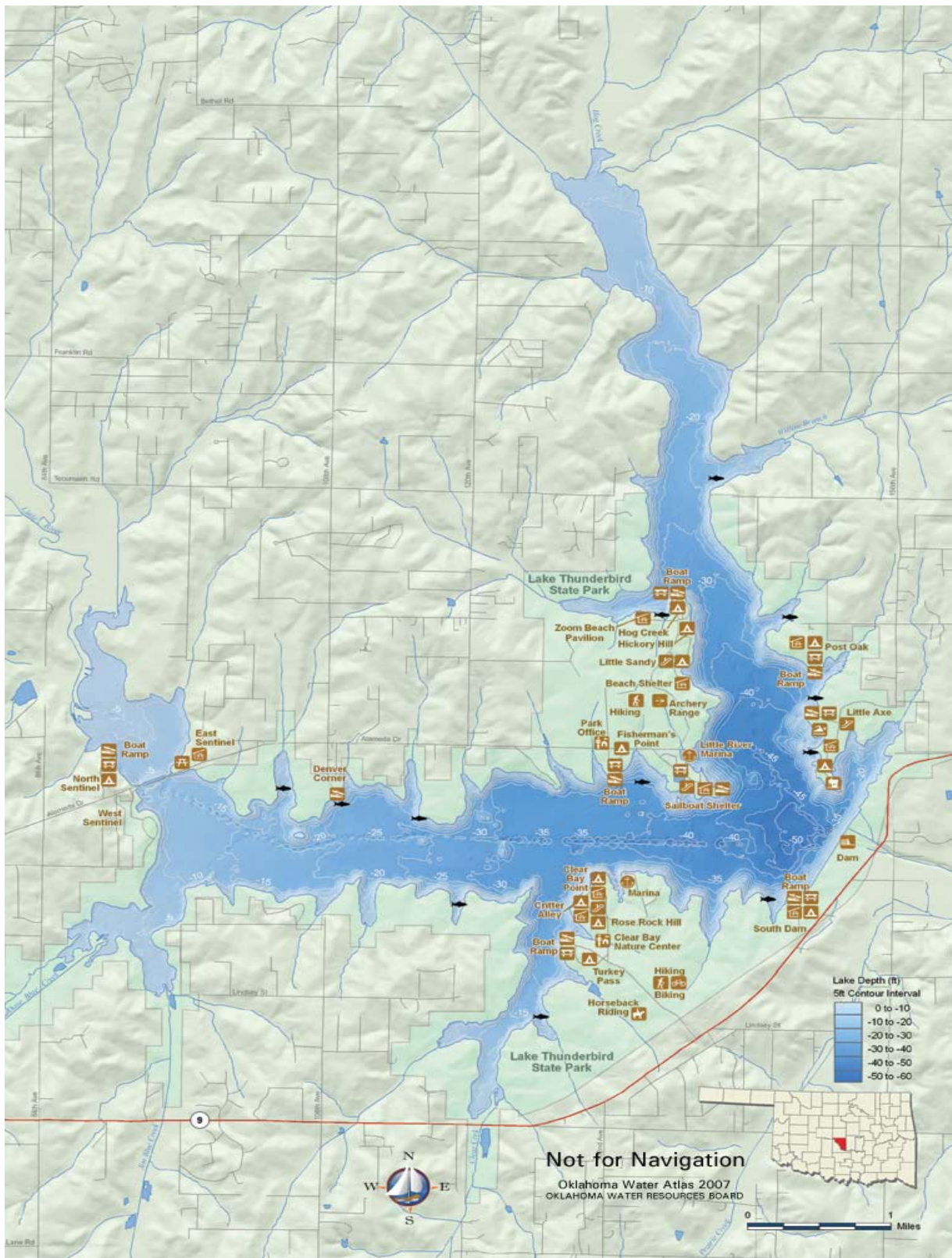


Figure 1. ODWC “Fish attractor” locations

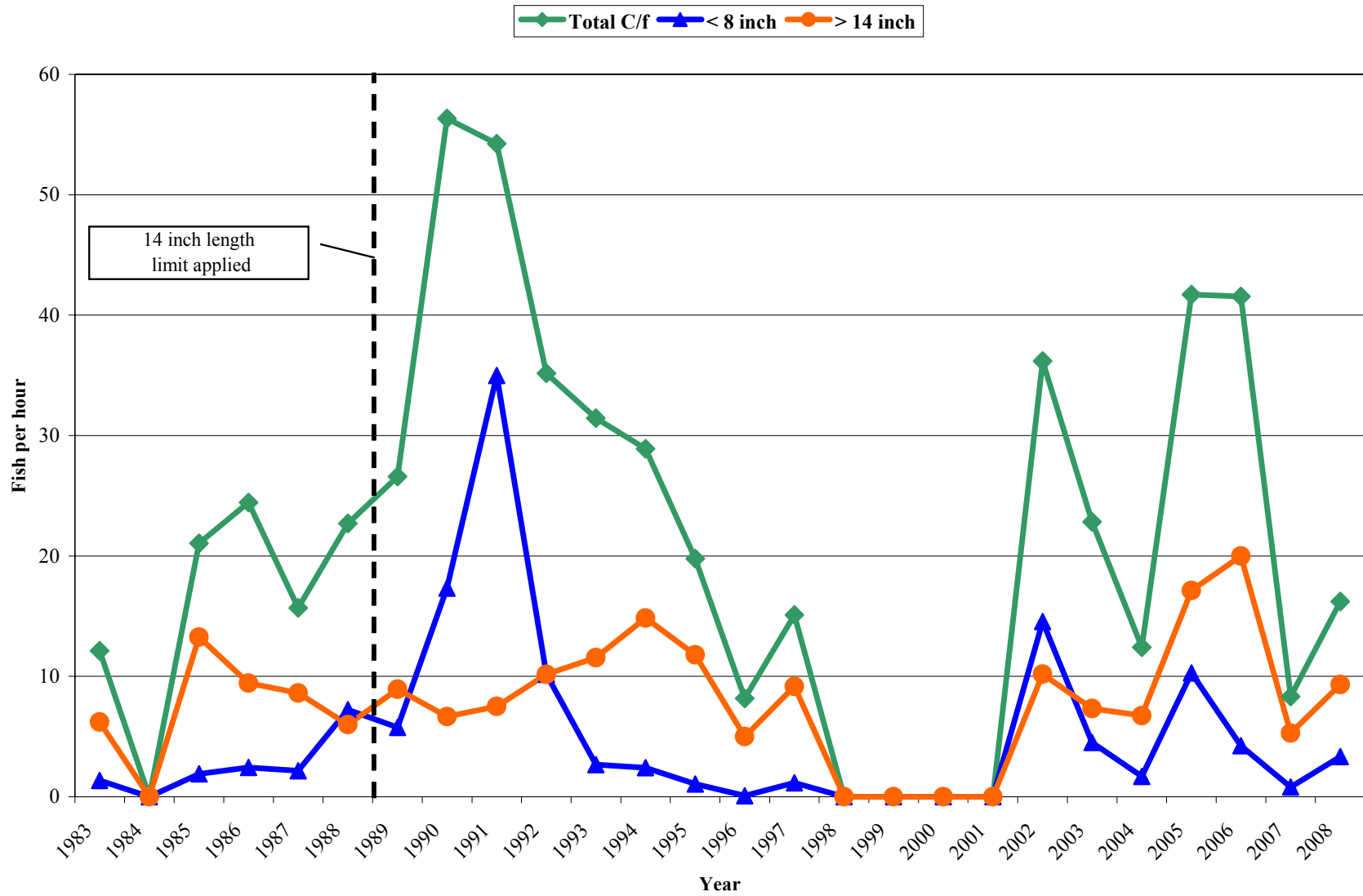


Figure 2. Electrofishing catch rates for largemouth bass at Lake Thunderbird 1983 - 2008

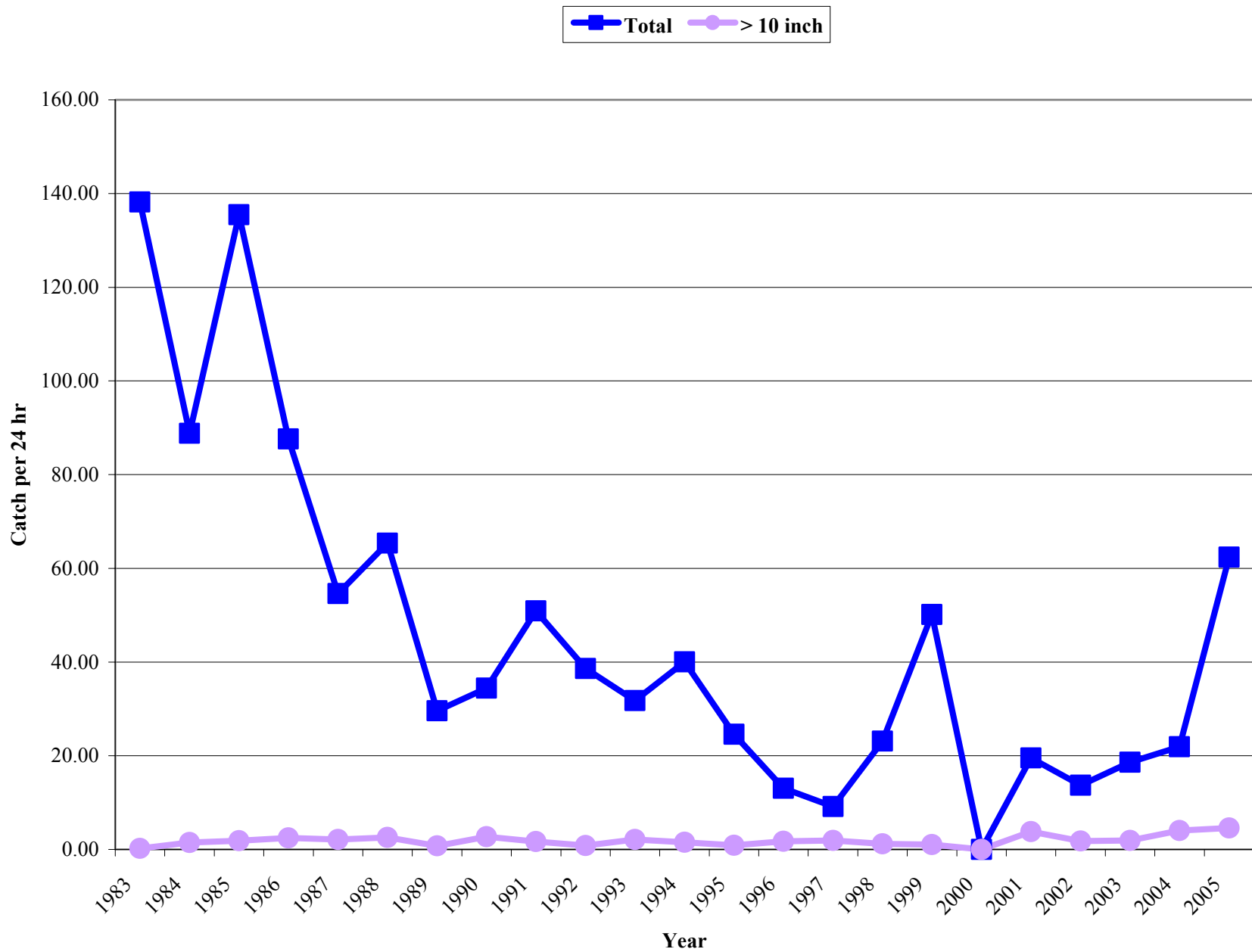


Figure 3. Trapnetting catch rates for crappie at Lake Thunderbird 1983 - 2005.

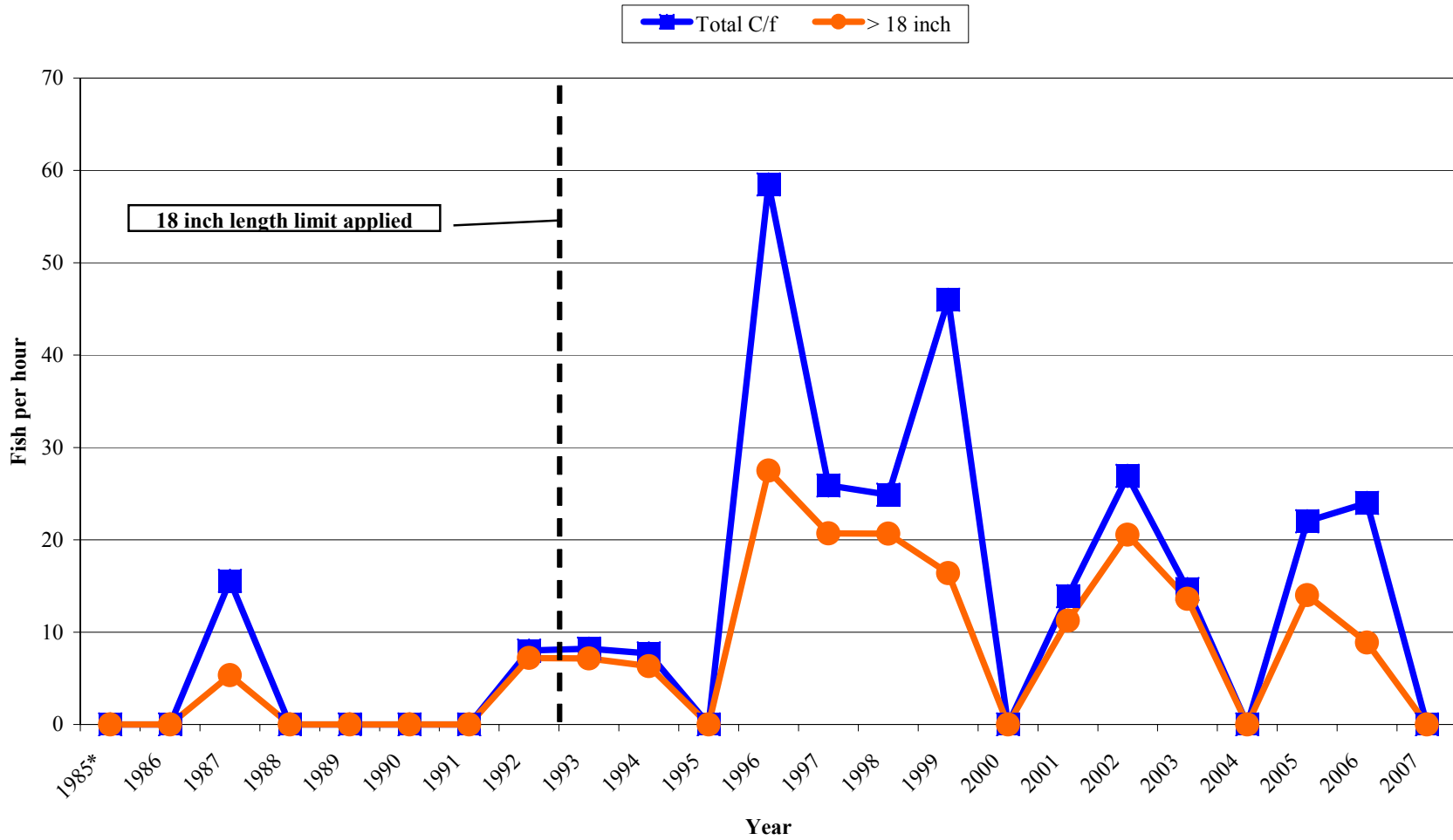


Figure 4. Electrofishing catch rates for saugeye at Lake Thunderbird 1985 to 2007

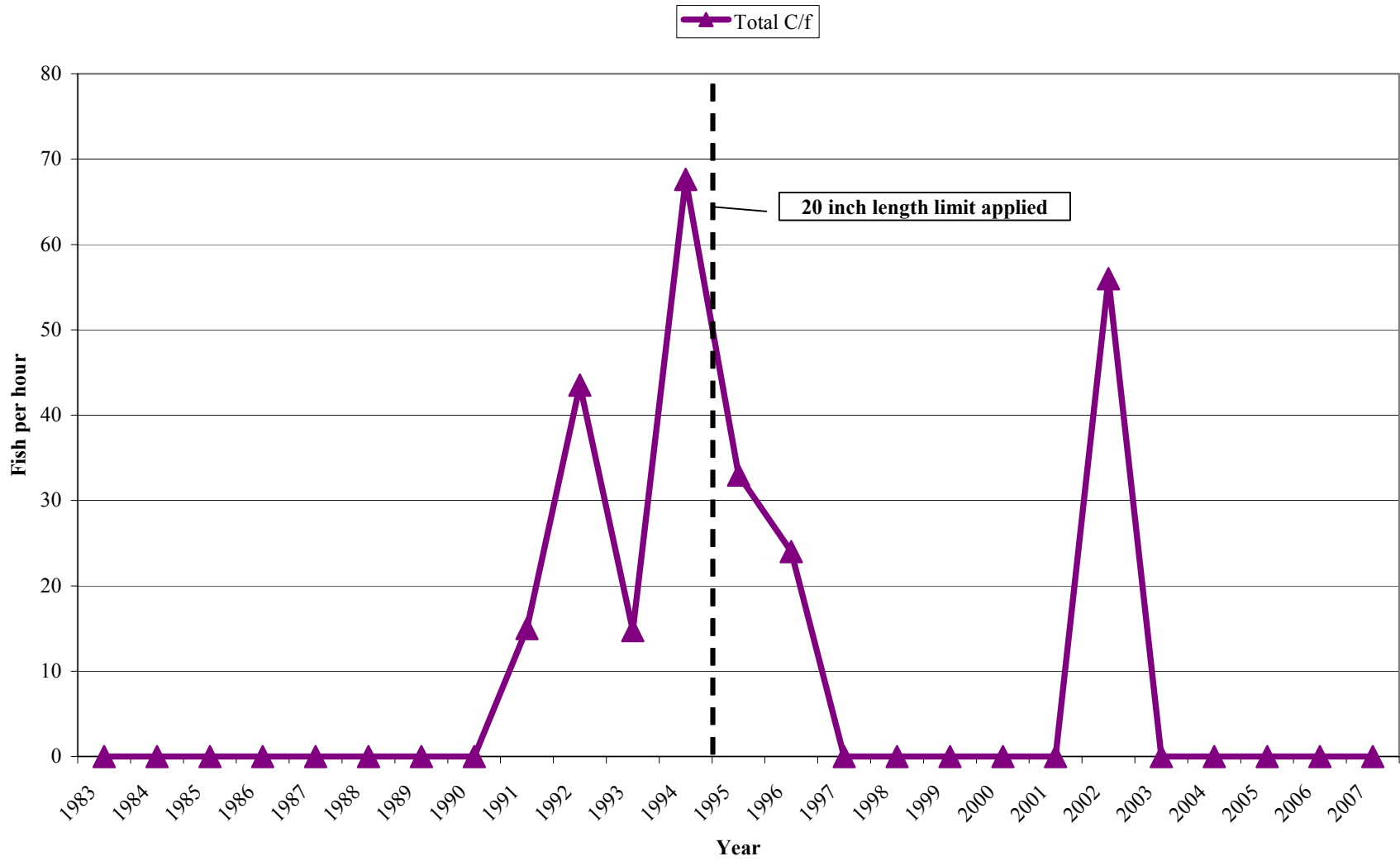


Figure 5. Electrofishing catch rates for flathead catfish at Lake Thunderbird 1983 to 2007

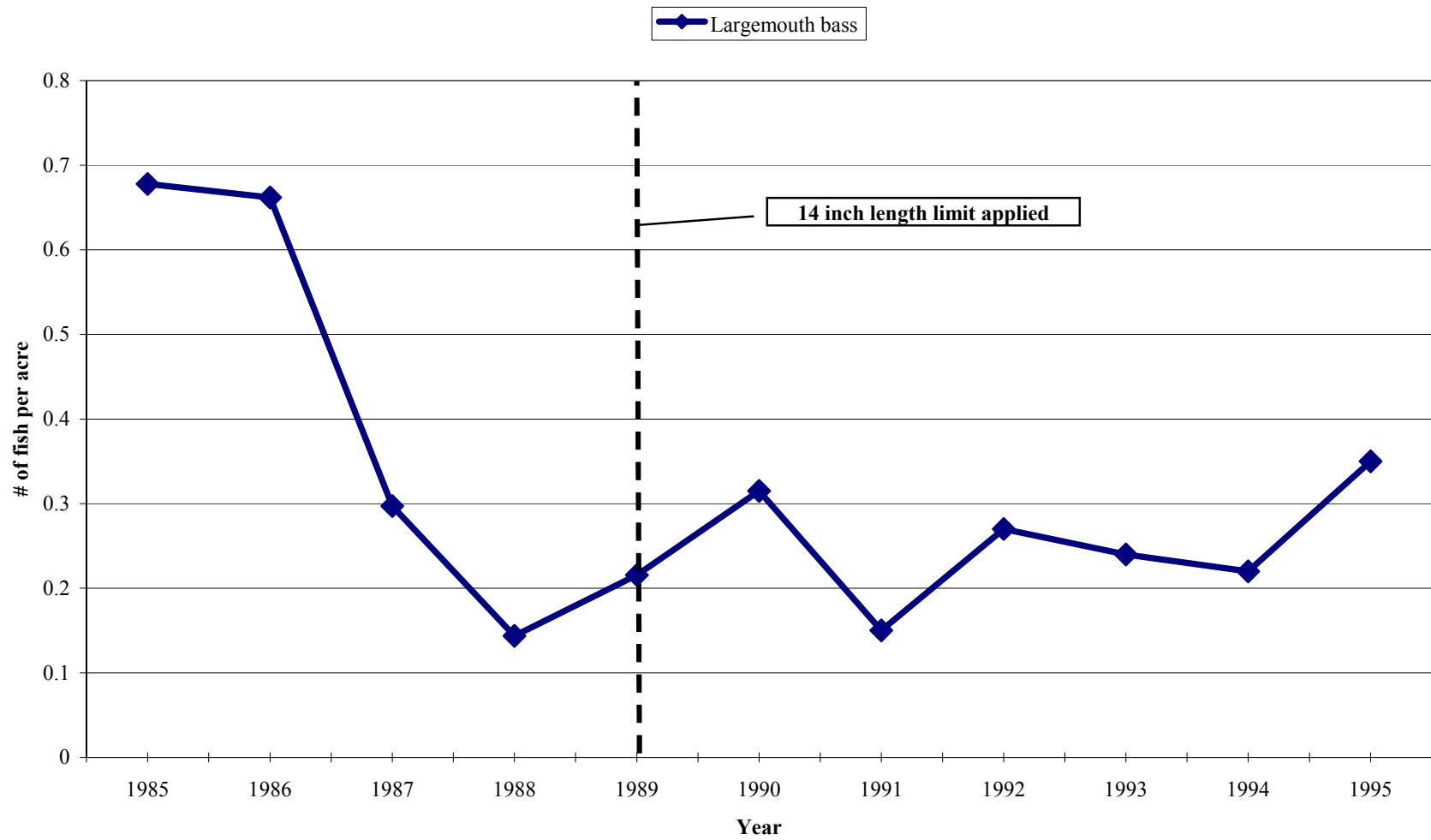


Figure 6. Largemouth bass harvest at Lake Thunderbird from 1985 through 1995

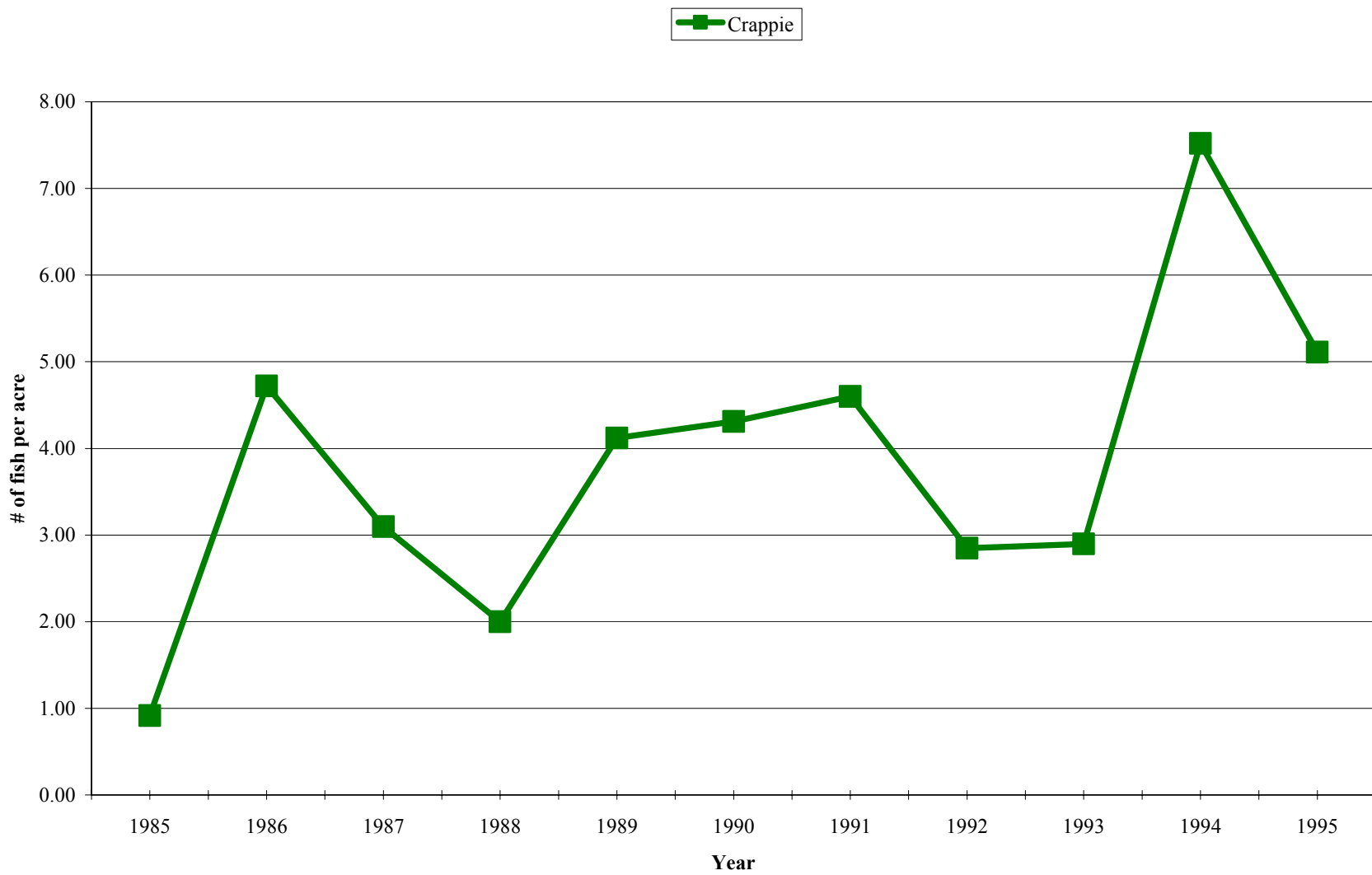


Figure 7. Crappie harvest at Lake Thunderbird from 1985 through 1995

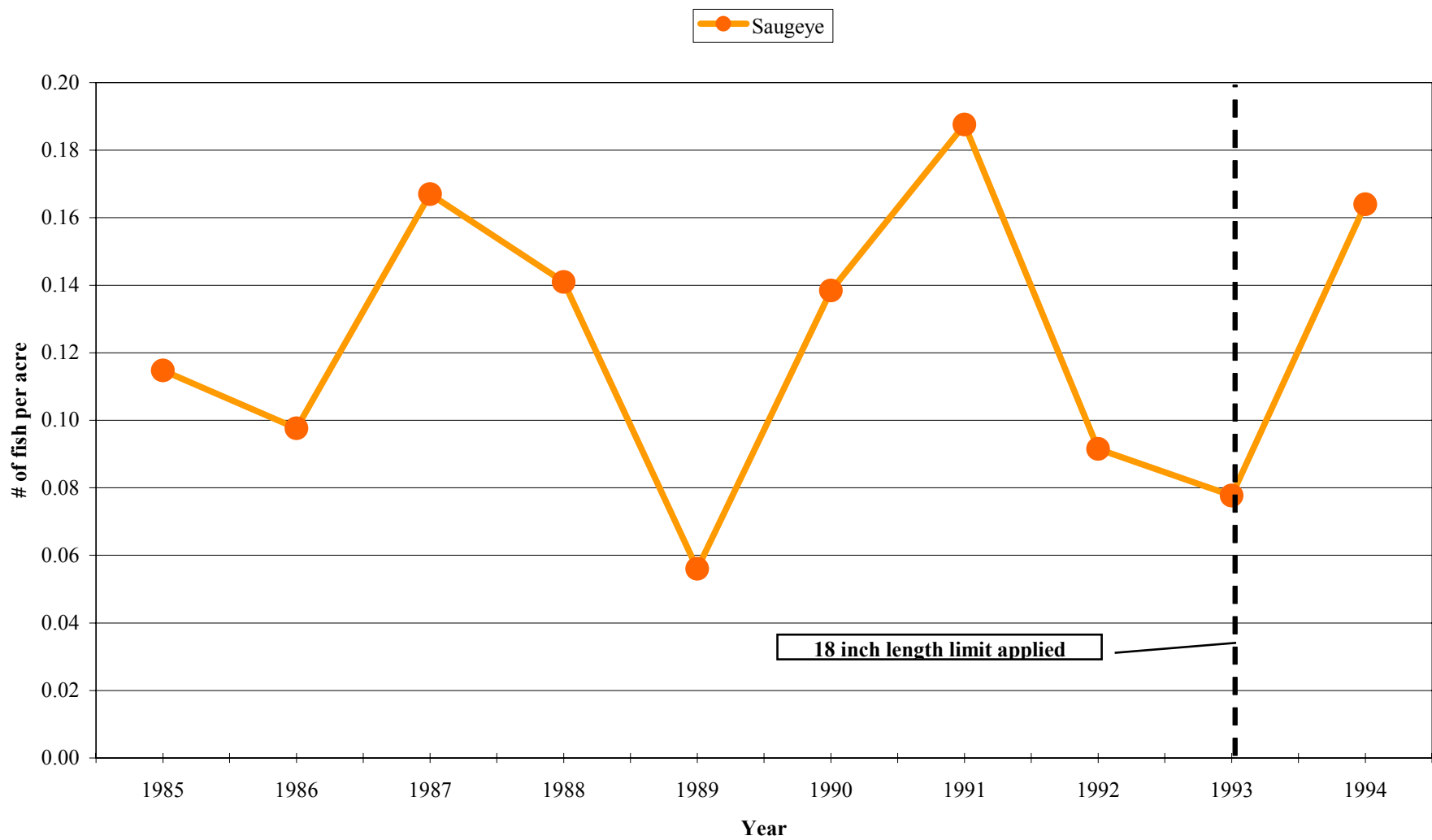


Figure 8. Total saugeye harvest at Lake Thunderbird from 1985 through 1995



Figure 9. Blue and channel catfish harvest at Lake Thunderbird from 1985 through 1995

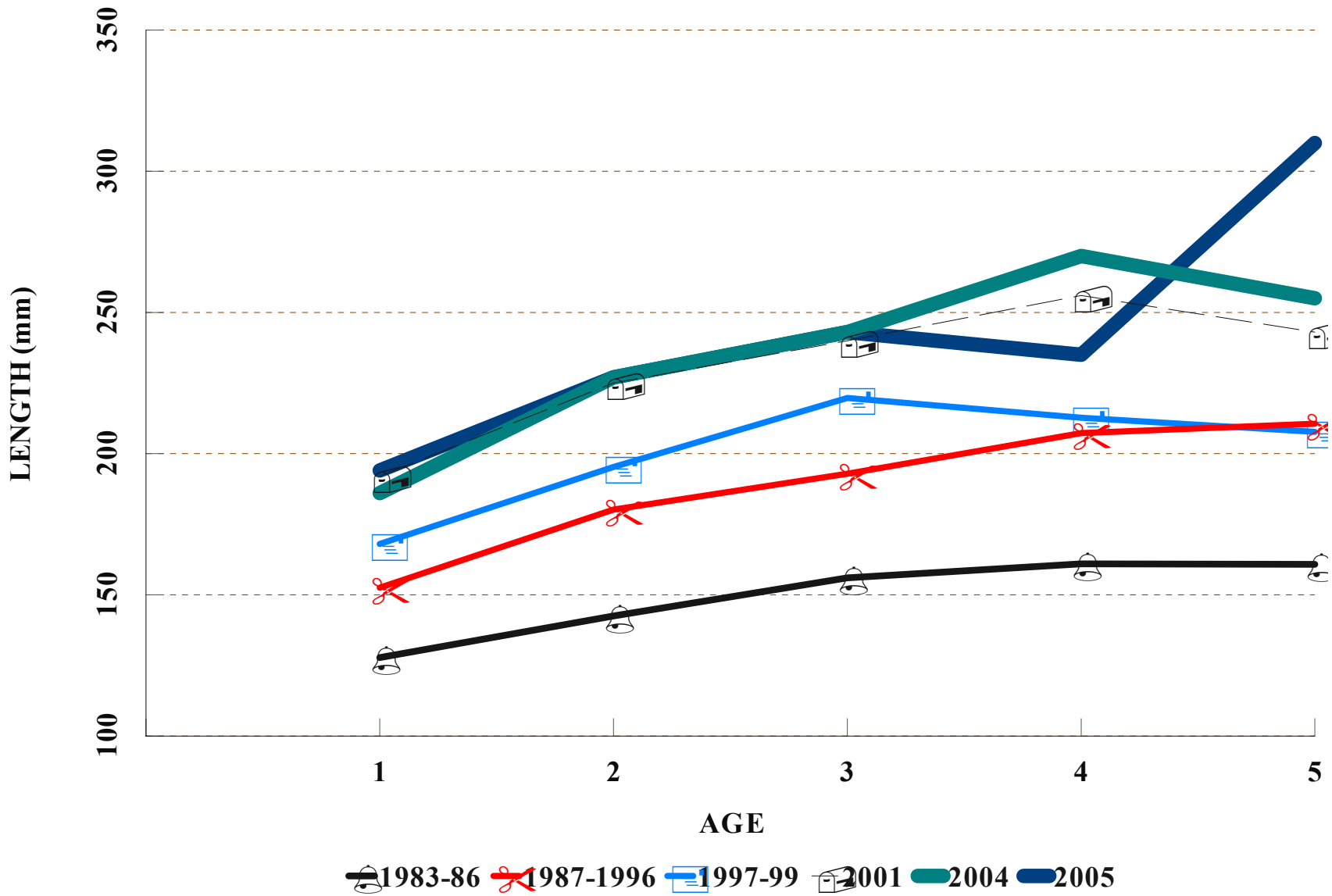


Figure 10. Mean Length at age for crappie at Lake Thunderbird.

Trapnet sites = Crappie sites T01 thru T08

Gill net sites = Exp. sites G01 thru G15

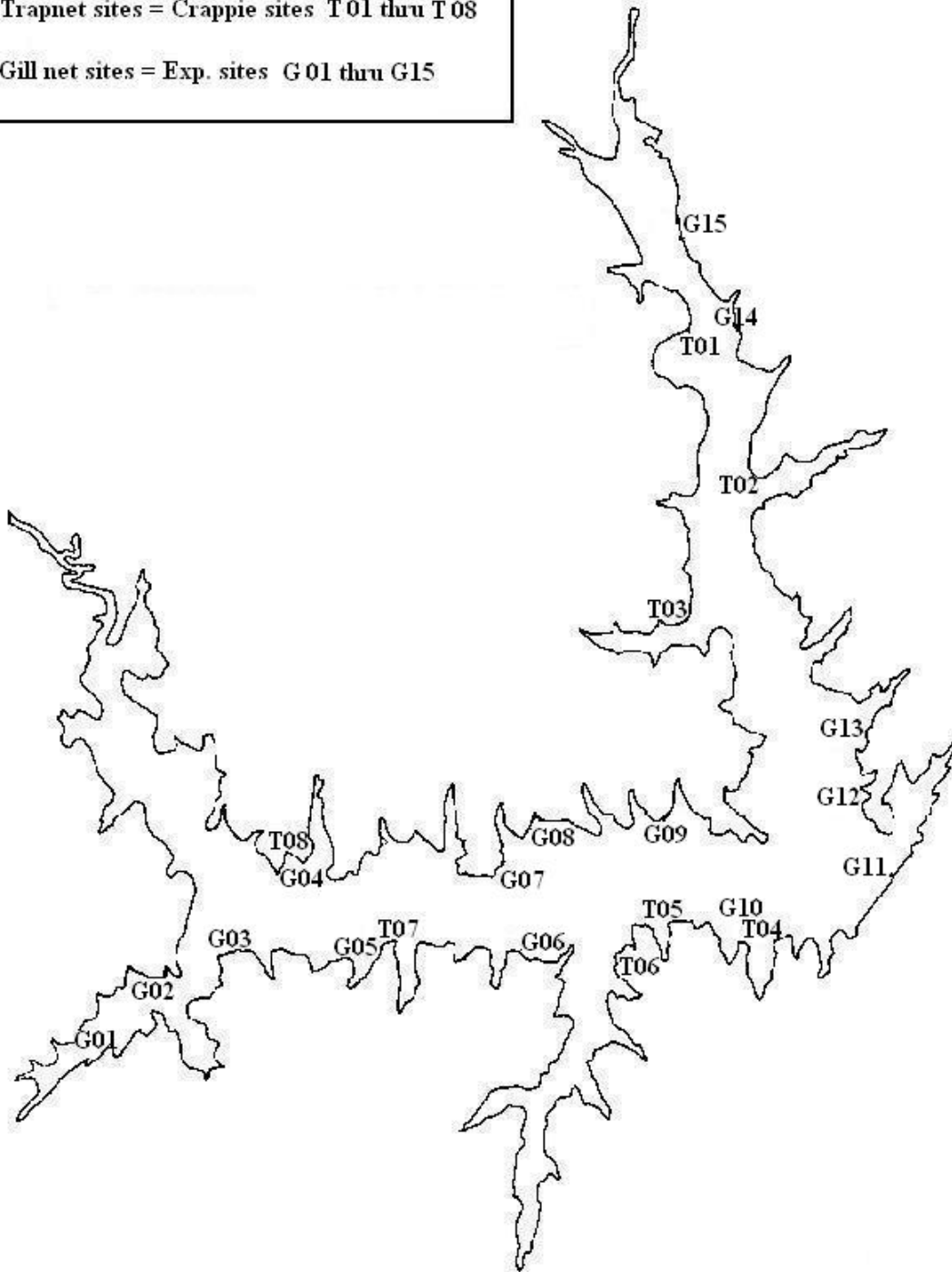


Figure 11. Trap net and experimental gill net sites at Lake Thunderbird

Bass sites = 18 sites (upper x 6, mid-lake x 6 and lower x 6)

Flathead = 23 sites (counter clockwise)

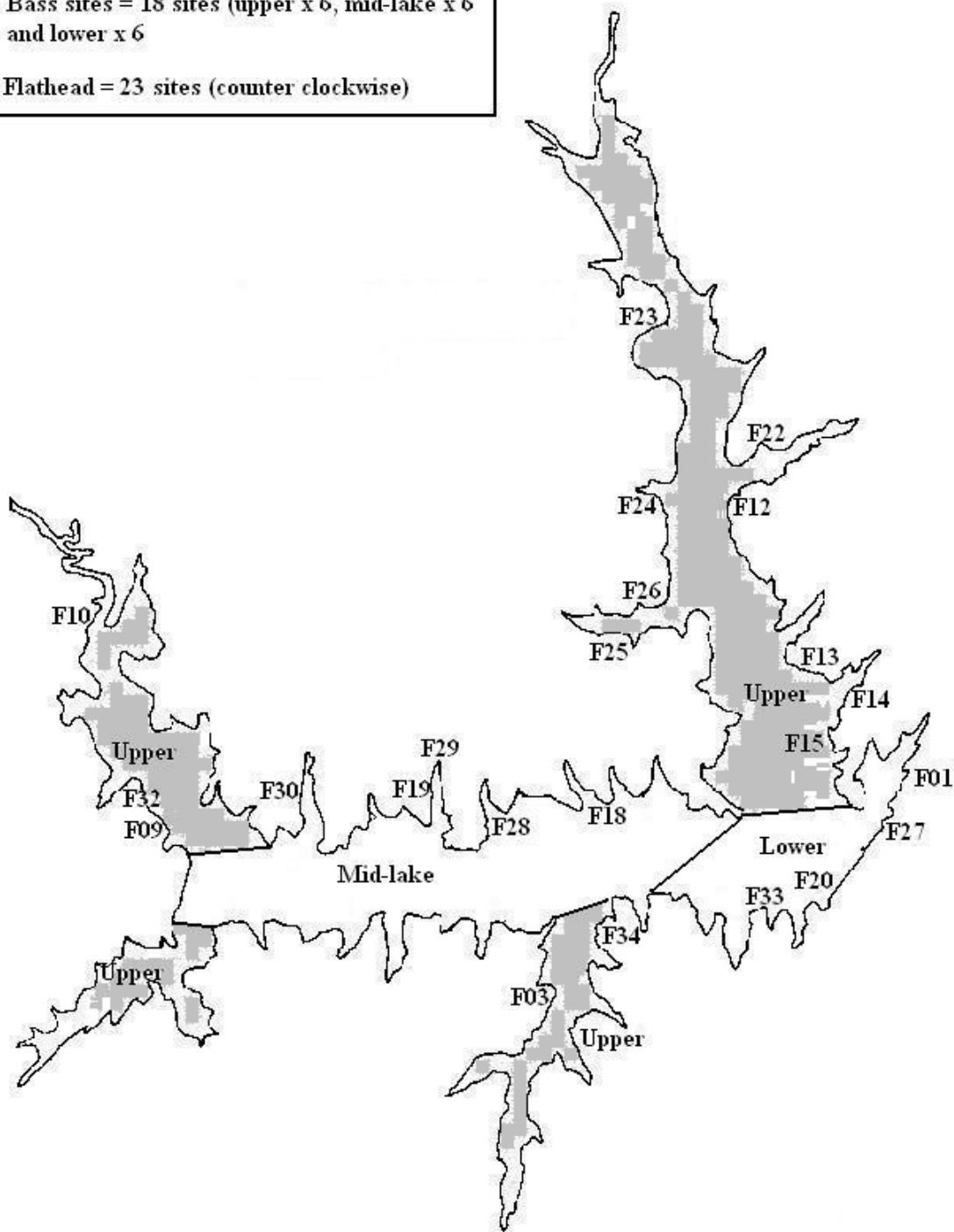


Figure 12. Electrofishing sites for largemouth bass and catfish at Lake Thunderbird

Table with GPS coordinates for “Fishing Area” sites