LAKE LAWTONKA

5-YEAR FISHERIES MANAGEMENT PLAN

SOUTHWEST REGION

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

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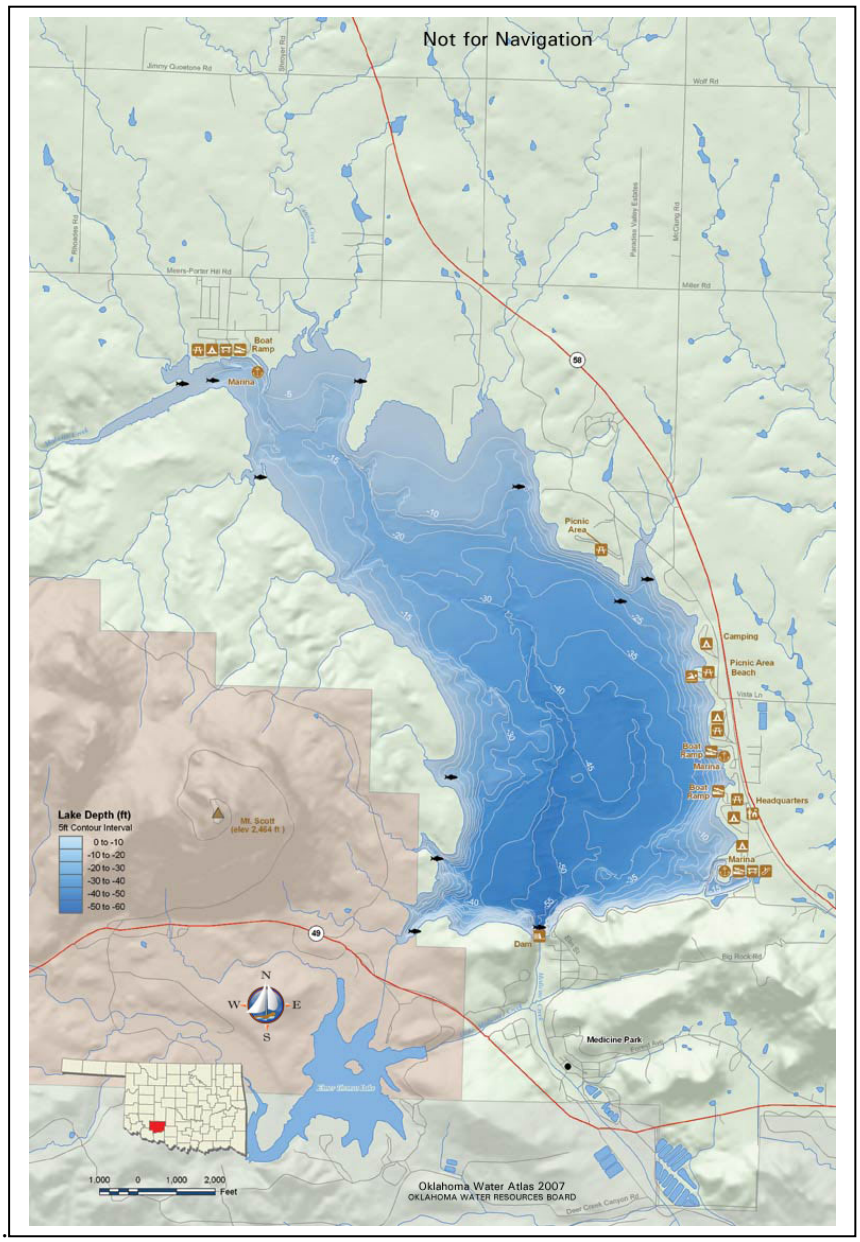
DECEMBER 31, 2008

Background

The oldest reservoir in Oklahoma, Lake Lawtonka was constructed in 1905 as a source of water for Lawton and Fort Sill. The dam was raised in 1909, 1918, and by the WPA in 1937, and finally the 10-foot gates were added in 1953

to bring the lake to its current size of 2400 surface acres and capacity of approximately 50,000 acre-feet (1). The lake and adjacent lands are owned solely by the City of Lawton, and the watershed includes private lands and the Wichita Mountains National Wildlife Refuge (Fig. 1).

Located approximately 15 miles northwest of Lawton in Comanche County on State Highway 58, Lawtonka is framed by the Wichita Mountains on the south and Mt. Scott to the west, and by the limestone “slick hills” to the north. The primary water supply reservoir for the City of Lawton and Fort Sill, Lawtonka is fed by runoff from Medicine Creek, Canyon Creek, other minor tributaries, by small springs emanating from the limestone hills, and supplemented by pumping via a 24-inch pipeline from Lake Ellsworth, 10 miles to the east.



Habitat

Lake Lawtonka has 21 miles of shoreline and measures approximately 4 miles from the dam to the first set of falls in Medicine Creek. The Shoreline Development Index for Lawtonka is 3.06, indicative of a reservoir with relatively few coves and arms. Primary winds and wave action in summer are from the south, and strong north winds are common after winter cold fronts. Much of the lake and primary fishing areas are therefore exposed to these winds which reduce the quality fishing and boating days on Lawtonka.

Lawtonka has a maximum depth of 60 feet at the dam with an average depth of 23 feet at full pool. Outflows through the dam gates are infrequent, primarily in the spring, and the average water exchange rate is low at 0.26 (water exchange rate = average annual inflow / lake storage volume).

Top of the dam at Lake Lawtonka is 1345.55 feet above mean sea level (amsl). The City of Lawton has a water level plan in effect that requires gates to be opened and water to be released when the level of Lake Lawtonka reaches 2.2 feet below the top of the gates, so normal pool at Lake Lawtonka is 1343.35 amsl. Water is pumped in from Lake Ellsworth to maintain water supply capacity when the level of Lawtonka drops below 5.55 feet from the top of the water storage gates. However, pumping capacity in summer is often exceeded by water use and evaporation.

The water level is reduced by five feet, on average in summer due to water used by Lawton and Fort Sill and from evaporation during periods of low inflow. Lawtonka reached a 25-year record low in 2006 after a relatively minor six-year drought. At that time, the lake was about 10 feet below the top of the storage gates, approximating its depth in the era before gates were added to the dam (~ 1937 – 1953).

Lawtonka normally has very little standing timber in the basin, but the 6-year drought beginning in 2001 allowed willows to encroach on the lake bottom, and that vegetation was flooded in 2007 and 2008. Lawtonka had only a few patches of aquatic vegetation until about 10 years ago, when water willows began to grow around the shoreline and pondweed beds (sago and American) became common, even in deep water areas. No studies have been conducted to determine the current or historic percent coverage of timber or aquatic vegetation.

The south half of the lake is bordered with native granite cobble and boulders. Sand is the primary substrate in most of the lake, and silt is common in tributary arms. Siltation from deposition is evident in the upper creek channels but has been limited because of the rocky terrain in the lake's watershed. A study in 1981 estimated that only 10% of Lawtonka's original volume had been lost to siltation over 75 years (1).

Water Chemistry

From sampling in 1983, calculations utilizing Carlson's chlorophyll-a-based trophic state index gave Lawtonka a TSI value of 67, indicating a eutrophic reservoir (1). Calculations in 2004 and 2007 yielded TSI values of 58 and 60, respectively, indicating a modest improvement in nutrient loading over 20 years (2). Algal blooms are common in Lawtonka and frequently reach nuisance levels for municipal water supply and occasionally hamper recreation. A study funded by the EPA was unable to pinpoint significant, controllable sources of nutrients, and known minor sources were addressed (3).

Lawtonka's turbidity is primarily from phytoplankton, and periods of elevated clay turbidity occur after infrequent runoff events, but are short-lived. Secchi disc visibility averaged 42 inches from October 2006 to July 2007. The lake-wide annual turbidity value was 8 NTU, and true color was 26 units, indicating good water clarity at Lake Lawtonka relative to other Oklahoma reservoirs (2).

Specific conductance at Lake Lawtonka ranges from 350 to 400 umhos, and total alkalinity ranges from 95 to 160 mg/l as $CaCo_3$. Dissolved oxygen values range from 6 in the summer to 12 in winter at the surface. Lawtonka is stratified in summer at a depth of approximately 15-20 feet and has an anoxic hypolimnion near the dam. Reservoir pH values ranged from 6.5 to 8.3 in the study, with an average of 7.5. Hardness is 162 ppm and average annual water temperature is 63 degrees (4).

Two fish kills in recent years were notable because

the precise causes were never determined. In the summer of 2003, several-hundred channel catfish and several-thousand drum died in episodes over 2 months during the peak public use period. The fish exhibited no obvious symptoms that would indicate disease or parasitism. Oxygen and temperature levels in the lake were normal. Since most mortality occurred along a line roughly from the pipeline outlet on the east shoreline to the dam where water was being withdrawn by an equal amount for water usage by the City of Lawton, the kills seemed to be related to the pumping operation from Lake Ellsworth, but this was never confirmed.

Some of the kills occurred after pumping had stopped for a few days and then resumed, leading the ODWC to recommend that the pipeline's flow not be interrupted. The kills abated before a thorough investigation into the kill could ensue. No similar kills have been noted since, even though pipeline flows have started and stopped many times since.

In a subsequent fish kill in the winter of 2004, an estimated 20,000 small drum and crappie died sporadically near the dam. The only symptoms were over-inflated swim bladders, resulting in fish floating to the surface, unable to re-suspend. In random upwellings near the dam, water appeared to suddenly rise from the bottom (indicated by sediment rising also) bringing fish up with it. Samples of this water indicated that it was no different from the surface water in terms of temperature, oxygen, or other parameters. The depths were uniform in water quality.

The affected fish were using the depths near the dam as a thermal refuge during the coldest part of winter. Anglers were catching crappie from deep water at the dam, even as other crappie rose to the surface. Hundreds of crappie and drum would surface over a period of about 5 minutes. Surfacing seemed to occur at regular intervals, but occurred randomly over the 5-acre zone in front of the dam. No direct cause was determined, but both kills occurred when Lake Lawtonka was low during the 6-year drought and as water usage was high, indicating that hydrological/ mechanical issues may have been to blame for the kills.

Habitat Implications on Fishery and Management Objectives

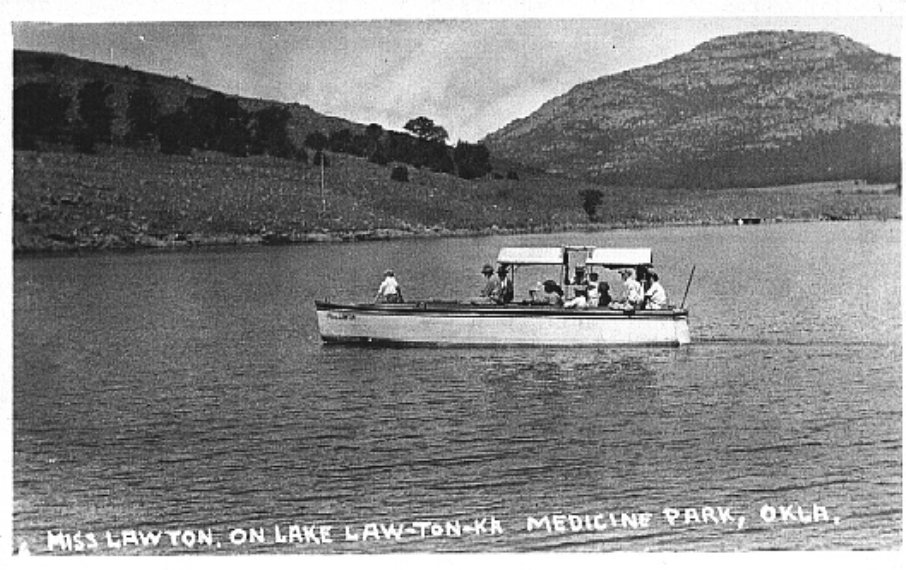
Some anglers have learned to use the wind to improve their success by fishing along windy banks for white bass, smallmouth bass and saugeye. Anglers that prefer fishing for largemouth bass and crappie in calmer waters are often discouraged by wind. Lawtonka's relatively clear, productive water makes fishing better-than-average compared to other, more turbid waters in western Oklahoma.

Despite average annual water level reductions of 5 feet and the recent mini-drought, bass fishing at Lawtonka has remained satisfactory because aquatic vegetation has become well-established. Reduced water levels may have even improved crappie fishing by "thinning" the population-- consolidating the normally over-abundant small crappie, and reducing crappie spawning success.

Because Lake Lawtonka was a chronically-poor producer for traditional favorite species like largemouth bass and crappie, the ODWC introduced walleye (then saugeye) and smallmouth bass. These new species took advantage of the clear-green water and rocky shorelines at Lawtonka and have helped to diversify fishing opportunities.

History of Fishery

Lake Lawtonka's fishery has been managed cooperatively by the City of Lawton and the Oklahoma Department of Wildlife's Southwest Fisheries Region (ODWC) to optimize its potential for fishing. Since the first scientific studies were conducted in the 1950s, Lawtonka's fishery has been hampered by high recruitment of prolific species like crappie, drum and white bass, and poor growth-to-maturity of those fish (5). Early management efforts focused



on partial fish population poisoning with rotenone to achieve better growth of the remaining fish, but those treatments had temporary results. Fish were stocked heavily from the nearby Medicine Park State Fish Hatchery (now J.A. Manning SFH), but standardized surveys were not conducted to determine stocking efficiency.

Recognizing the growth problem for predators, a biologist in 1960 recommended the stocking of threadfin shad as supplemental forage, and 1,000 were stocked later that year. No threadfin shad were sampled in the 1970s or 1980s, so the introduction was unsuccessful. Inland silversides were introduced as a new forage species to many Oklahoma reservoirs, including Lawtonka in the 1970s, but studies later determined that native predators seldom took advantage of the small minnows.

Brush piles have been constructed in key fishing spots for many years to improve fishing for crappie and bass (Fig. 1). Walleye were introduced in the 1970s and a popular fishery developed. As walleye fishing success declined, the ODWC began stocking saugeye in 1993 and the fishery improved significantly (6).

The first Florida largemouth bass introduction in Oklahoma was made in Lawtonka in 1970. In 1983, that program produced the state's first record bass in over three decades. Several trophy bass are caught or sampled at Lawtonka each year. While occasional stockings of Florida bass increase the genetic potential for trophy fish, they do not add to the overall population abundance of bass.

Bass management efforts relied on length limits in the 1980s, but bass fishing did not improve and poor spawning and recruitment were found to be the limiting factors. Reservoir- (or Tennessee-) strain smallmouth bass were added in 1990 to supplement the bass fishery, and they subsequently reproduced naturally (6). Anglers reported good catches of smallmouth bass for a decade and a popular trophy fishery developed. However, numbers of smallmouth have declined recently as an apparent result of a habitat shift favoring largemouth bass.

James Porter displays his 12 pound state record bass in 1983, a product of the Florida largemouth bass stocking program begun in 1970 at Lawtonka.

Channel catfish recruitment was chronically poor and regular stockings of catfish in the 3 to 5 inch range prior to 1992 failed to improve fishing (Table 1). Channel catfish stocked semi-annually at 7 inches since 1994 successfully supplemented poor natural recruitment and anglers enjoy better-than-average catfishing now.

Blue catfish were stocked in Lawtonka by the ODWC in 1960, and the pipeline from Lake Ellsworth probably introduces more each year. Natural spawning and recruitment of blue catfish is not evident at Lawtonka, but anglers catch some trophy blue catfish there each year. Low shad production in some years at Lawtonka may limit blue catfish success. Juglining and trotlining accounts for some harvest of blue catfish from Lawtonka, but rod-and-reel anglers seldom catch them.

Flathead catfish are moderately abundant at Lawtonka and noodling is popular during summer in the boulder habitat. Jugline and trotline anglers occasionally catch flatheads.

The primary forage fish species in Lake Lawtonka are gizzard shad, sunfish, inland silversides and minnows (primarily *Notropis venustus*). Shad catch rates have been sporadic in samples, presumably due to infrequent inflows. Sunfish numbers have probably increased with the increase in vegetation at Lawtonka, but sampling has not been conducted to confirm this. Small predators may rely mostly on minnows and silversides for much of the year. Recruitment to harvestable (or desirable) sizes of sport fish was a recurrent problem at Lawtonka in official surveys in the 1950s (5) and in 1971 (7).

In 1992, adult threadfin shad (5,000) were transferred from Lake Texoma to supplement the forage base, but they failed to survive or spawn in following years. During the recent drought when water and threadfin shad were pumped for the first time from Lake Waurika, to Lake Ellsworth and then to Lake Lawtonka, threadfin shad were common for the first time in Lake Lawtonka. In the winter of 2005, however, a confirmed threadfin shad die-off occurred and the species hasn't been reported since.

Because habitat has improved, and following years of standardized sampling efforts and fine-tuning of the fishery, anglers may arguably enjoy some of the best fishing in Lake Lawtonka's 103-year-history. Largemouth bass habitat and numbers have improved, quality-sized smallmouth bass can be caught, saugeye and channel catfish are abundant due to prudent stockings, and white bass and crappie are still caught routinely.

Current Status of the Major Fish Species

Bass

Electrofishing catch rates for largemouth bass were chronically below the state average (< 40 per hour) until habitat improved in the 1990s. Since aquatic vegetation increased, the abundance of largemouth bass over 14 inches and the total catch rate have been consistently above the state average and in the ODWC's "High Quality Bass Lake" category. The most recent sample in spring, 2008, yielded the highest catch rate for largemouth bass since standardized sampling began in 1977 (Fig. 2, Table 2).

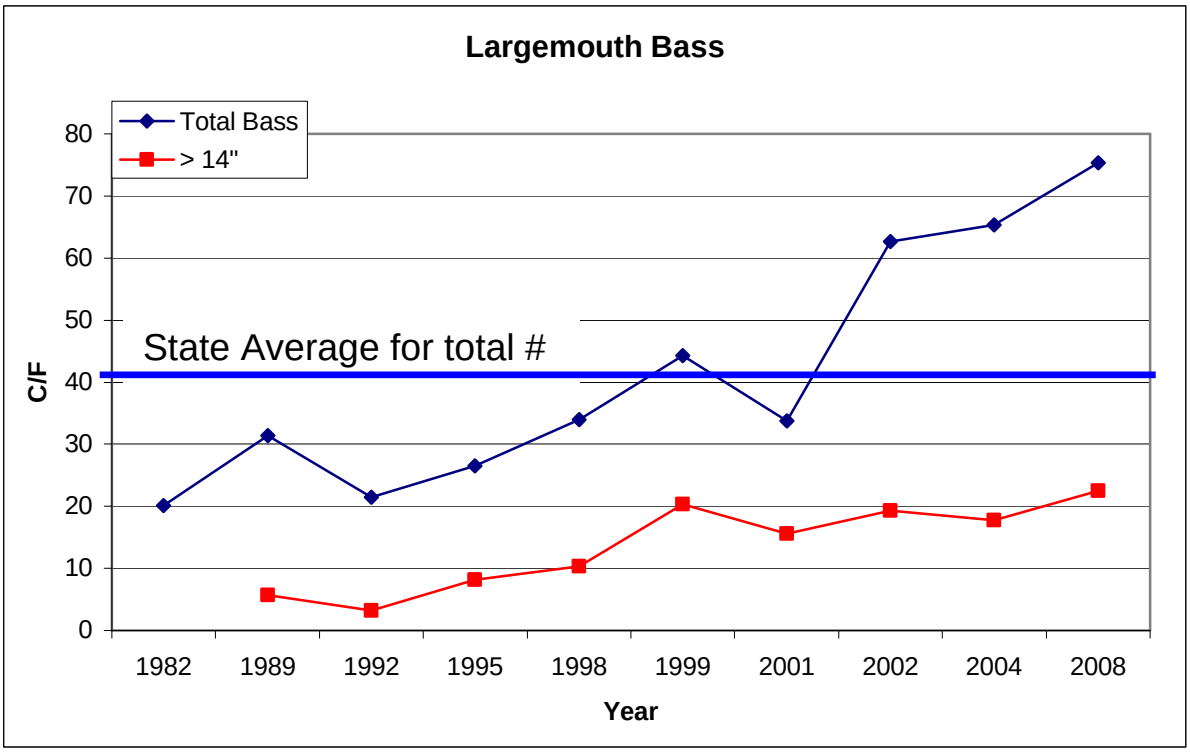


Figure 2. Largemouth bass catch rates per hour from standardized spring electrofishing samples at Lake Lawtonka, 1982-2008 (total catch rate in dark blue, catch rate of bass over 14" in red). The state average catch rate is 40 per hour of electrofishing.

Confirming sampling results, bass tournaments now report better-than-average success at Lawtonka (8). The average size of bass caught has remained level at 2.25 pounds, but the average number of bass caught by tournament anglers per 8 hour day has tripled in the last three years over the prior decade (Fig. 3). The percent of successful bass tournament anglers has improved as well (Fig. 4).

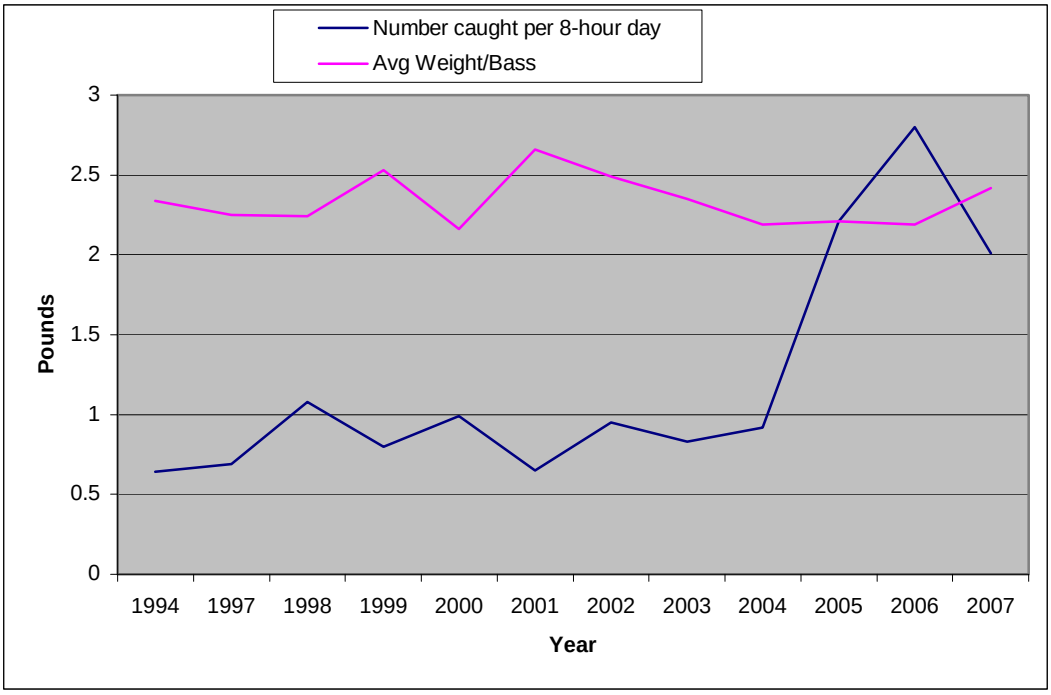


Figure 3. Bass tournament success at Lake Lawtonka, 1994-2007.

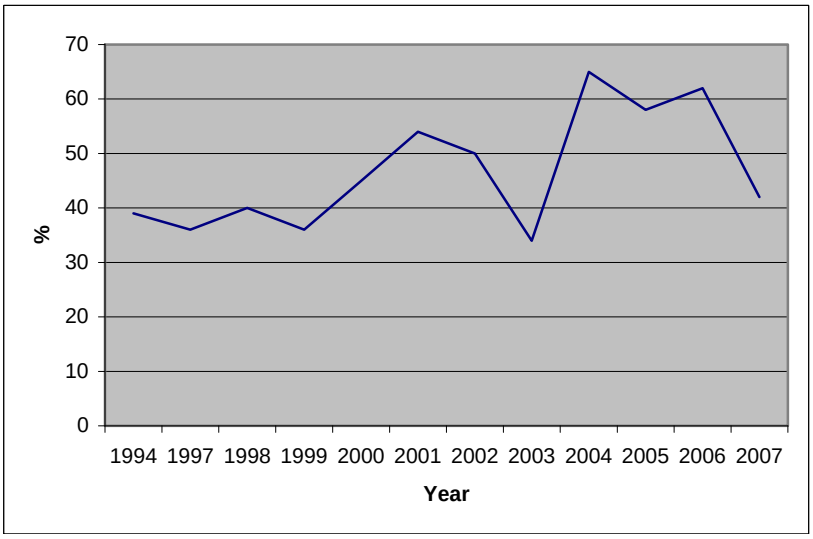


Figure 4. Percent of successful bass tournament anglers at Lake Lawtonka, 1994-2007 (anglers who caught at least one fish per tournament).

In the latest genetic test of bass from Lake Lawtonka, 40% of the young bass had the potential to become trophy bass. A test in 2004 showed that one-third of young bass were either pure Florida-strain or first-generation (F1) crosses (unpublished data, Oklahoma Fisheries Research Lab, Norman).

Smallmouth bass added in 1990 have made Lawtonka a destination fishery for bass anglers. A trophy length limit on smallmouth bass of 23 inches (minimum) insures that the fishery is sustained. However, an increase recently in largemouth bass habitat and abundance has apparently resulted in a reduced number of smallmouth bass. Sampling catch rates for young smallmouth bass are roughly 20% of early estimates (Tables 3, 4), and anglers report catching fewer smallmouth bass now than a decade ago. Still, several quality-sized smallmouth bass are caught each year.

Bass tournament anglers have expressed dissatisfaction because they are not allowed to weigh-in smallmouth bass under 23 inches. The ODWC has opposed reducing the length limit or exemptions for tournament anglers due to concerns about the declining number of smallmouth bass, and the likelihood of significant handling stress and mortality.

Spotted bass have declined significantly in samples at Lawtonka since smallmouth bass were introduced and presumably out-competed them for similar habitat (Table 5). Spotted bass are now rare at Lawtonka.

Crappie

Crappie were once chronically overabundant and slow-growing at Lawtonka, but the number of crappie has decreased significantly since 2006 and growth rates have improved. Gillnet catch rates were lower than normal in the last two sample years (Table 6) and catch rates for crappie in trap nets were very low in 2008 (Table 7).

Growth rates for young crappie (Age 0-3) were average in trapnet samples in the 1998, but far below-average for adults (Table 8). Crappie were able to recruit and grow to about 9 inches, but growth leveled-off at about 9 inches for fish beyond age 3, presumably due to low shad production at Lawtonka.

In the 2008 trapnet sample, few crappie were caught but growth rates were much better. Age 1 crappie now average 9 inches, and age 2 crappie average 11 inches in length. While anglers can expect to catch fewer crappie, they should catch crappie with better average size and body weights.

Walleye and Saugeye

Walleye were a popular addition in the 1970s, but numbers and recruitment fell in samples taken from 1990 through 1993, despite stockings of fry and fingerlings to supplement spawning (Tables 9, 10). Saugeye stockings began in 1993 and increased sampling and fishing catch rates in the mid 1990s (Tables 11, 12).

The statewide 18-inch walleye/saugeye limit that began in 1994 resulted in poor fishing at Lawtonka due to slow growth and crowding of small saugeye. A survey in 2000 revealed that less than 10% of the saugeye in Lawtonka were harvestable (> 18 inches). Diet analysis revealed that silversides were the primary food source for saugeye. Stomachs in adult saugeye were often empty and they were subsisting on small drum. As in past surveys, a low population of shad was therefore blamed for slow growth.

The length limit was changed to a 14-inch minimum at Lawtonka in 2001, and sampling and fishing results for harvestable-sized saugeye have been satisfactory since. In fact, the sampling catch rate for saugeye in 2006 was the highest ever recorded in Lawtonka for either walleye or saugeye (Fig. 5).

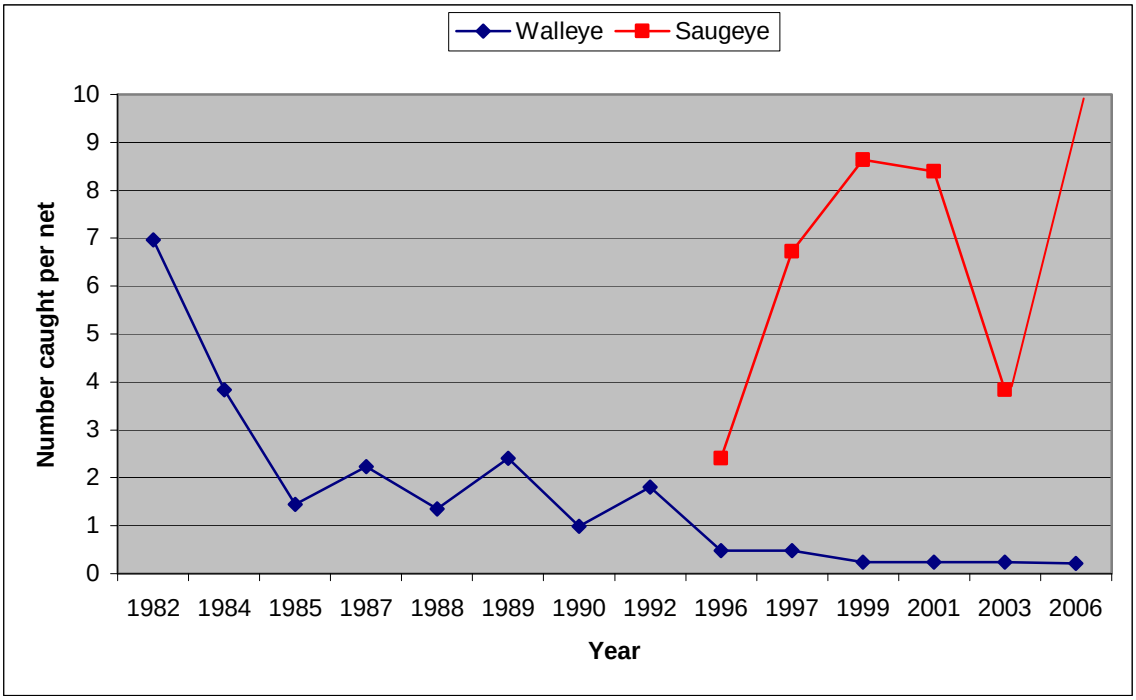


Figure. 5. Historic gill net catch rates for walleye and saugeye from sampling by the ODWC at Lake Lawtonka.

White bass

Total catch rates for white bass (all sizes) at Lake Lawtonka have always exceeded the state average goal, and numbers collected in the 2001 and 2003 gillnet samples were exceptional (Table 13). Although catch rates of adult, harvestable white bass usually exceed the state average goal, fishing for larger white bass is often unsatisfactory.

White bass probably suffer from the same difficulty faced by crappie in finding a sufficient year-round supply of edible-sized gizzard shad to improve their growth. Relative weight values for white bass over 12 inches were notably low in the 2003 and 2006 samples (Table 13).

Years with high sampling catches of sub-adult white bass are often *not* followed by good fishing for adults in subsequent years. Nevertheless, white bass are a mainstay of the Lawtonka fishery, often providing opportunity for anglers when other species are not cooperating.

Channel Catfish

Gillnet catch rates for channel catfish were below average in standardized samples at Lake Lawtonka from 1977 to 1992, despite frequent stockings of 3-5 inch fingerlings. Catch rates of adult channel catfish were also below the state average goal until 1996 (Table 14).

Beginning in 1994, the ODWC experimented with stocking fewer, but larger channel catfish in several lakes like Lawtonka. The 7-inch stocking program succeeded in boosting the sampling catch rate to the above-average range for the first time in 1996, and continued stockings of larger fish sustain the Lawtonka fishery at a high level today (Fig. 6).

Predictably, relative weight values for channel catfish have declined as competition within the population increased (Table 14), but growth to harvestable size has not been a problem to date. Recent sampling catch rates for channel

catfish over 16 inches have been double the state average goal rate. Anglers report good fishing for channel catfish, particularly in summer when fishing for other species declines.

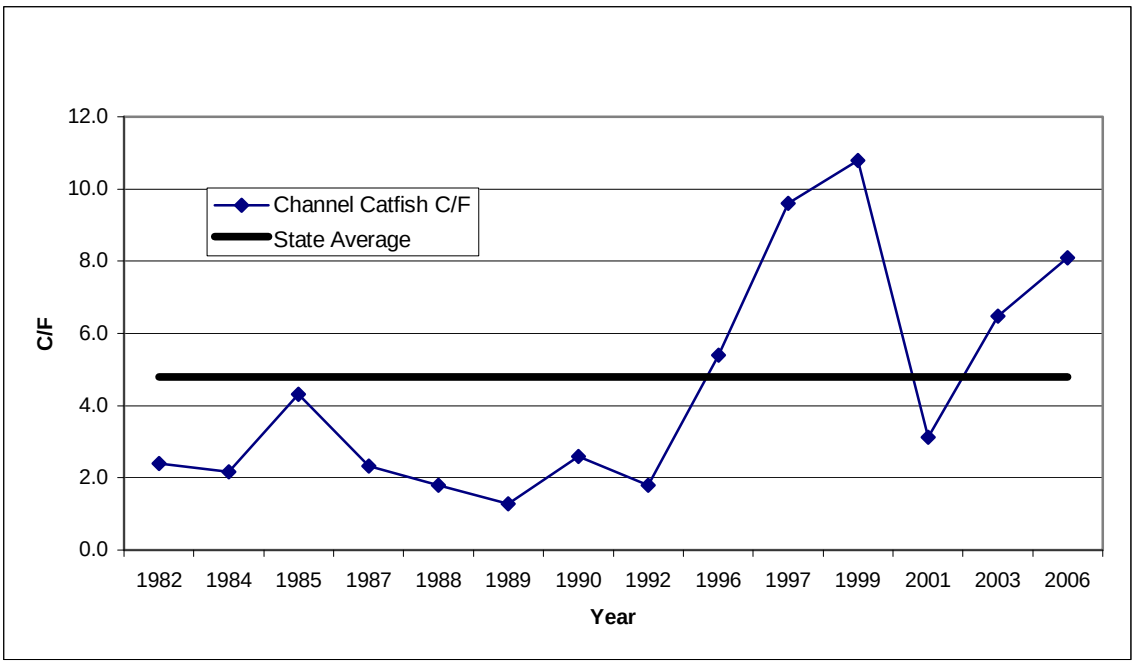


Figure 6. Historic gillnet catch rates for channel catfish from Lake Lawtonka, 1982- 2006.

Gizzard Shad

Gillnet and electrofishing catch rates for large gizzard shad have been above-average historically. However, young gizzard shad less than 8 inches (the size that should provide the bulk of prey for sport fish) are chronically low in abundance at Lawtonka (Table 15). In fact, in gillnet surveys in 1996 and 1997, no young gizzard shad (< 8 inches) were collected in the fall. Even after shad-specific smaller meshes were added to the gill nets post-1999, small shad were low in abundance at Lawtonka.

In 2006, shad abundance improved temporarily when threadfin shad were collected for the first time in gill nets at Lawtonka. Relative weights for adult crappie (> 8 inches), middle-sized saugeye (12-16 inches), and adult channel catfish (>16 inches) were better than previous years, indicating that threadfin shad were being consumed by some predators. Relative weights for large saugeye (>16 inches) and white bass were not improved, however. The threadfin shad winter-kill in 2006-2007 probably returned Lawtonka's shad population to lower background levels, but the refill of the lake in 2007 may have stimulated gizzard shad production recently.

Threats to the Fishery

According to data collected by the Oklahoma Water Resources Board, water quality has been stable at Lake Lawtonka since 1982. Development in the watershed is increasing, however, and measures should be taken to minimize water quality impacts from further development. Domestic waste effluent is a growing concern and should be monitored from new development near the northeast shore, including long-term campers and some large homes. Effluent from campers and the restrooms constructed at Robinson's Landing and Schoolhouse Slough has been controlled and pumped to a DEQ-permitted lagoon on City of Lawton property on the north side of the lake.

Water *quantity* in Lawtonka is threatened by an effort pending to utilize spring water and groundwater in the area north of Lake Lawtonka by the Rural Water District in northern Comanche County. Fresh spring water is vital to the health of Lawtonka's fishery, particularly during droughts and summers. The City of Lawton has indicated an interest in attracting industry, and selling more water, but policy-makers should realize that water level reductions at the City lakes will result in reduced fishery values and lower quality-of-life for lake users.

Lake Lawtonka is probably not threatened by fish kills from golden algae blooms due to its low salt content, but it is vulnerable to zebra mussels that are moving westward from northeastern Oklahoma. The City of Lawton has posted warning signs for boaters regarding transport and control of aquatic nuisance species. Siltation and the resulting loss-of-volume is less of a problem at Lawtonka than most Oklahoma lakes due to its rocky watershed and sandy tributaries. No lake-specific fish advisories have been posted for Lake Lawtonka.

Angler Access

The City of Lawton has entered into several cooperative agreements with the ODWC over the years using Federal Aid funds to improve access for boaters and anglers at Lake Lawtonka. At Schoolhouse Slough, a dock was constructed in 1988, but replaced due to inferior materials and construction. A seawall on each side of the boat ramp was also added to reduce erosion. In 2006, a public restroom and lift station were built for boaters at Schoolhouse Slough, the area's most-used boating access facility.

A courtesy dock was installed in 1988 at the boat ramp at Robinson's Landing. In 1995, public restrooms were built for boaters and anglers, and a lift station and wastewater lagoon were added to provide safe disposal of waste from the near-shore restroom site. Jetties were also constructed to the east and west of Robinson's Landing to provide wind protection for the boat ramp and dock. By contract, these facilities must be maintained by the City of Lawton and are inspected annually by the ODWC.

Anglers have expressed interest in increasing fishing access at Lake Lawtonka with fishing docks and a crappie house, but few protected areas exist for such facilities. Schoolhouse Slough would be a good location due to its protection and depth, but private boat houses dominate the area and boat traffic is often heavy. Elmer Thomas Slough in the southwest corner of Lawtonka is deep enough for a crappie house and boat ramp, but access is currently limiting.

Anglers have also expressed concern over the lack of shoreline access at Lawtonka. Several conflicting activities and use restrictions have limited the fishing possibilities for anglers through much of the fishing season (March – October). Popular camping areas along much of the east side of the lake restrict vehicle access in summer, and access to the Jackson Creek area has been limited by nighttime gate closure. The west shoreline is open only to walk-in traffic and anglers are reluctant to leave their vehicles unattended due to threat of vandalism and theft. The south shoreline usually supports good fishing, but parking spaces are limited due to the steep slope.

Recommendations

Fish Habitat

- Aquatic vegetation has flourished in Lake Lawtonka in the last decade, and high water levels will maintain this important habitat for bass and sunfish. The City of Lawton should encourage water conservation to minimize water level reductions in the critical summer period.

- The City should also realize that the recruitment of water-hungry industries and additional sales of water will have negative impacts on fishing and overall recreational quality at Lake Lawtonka.

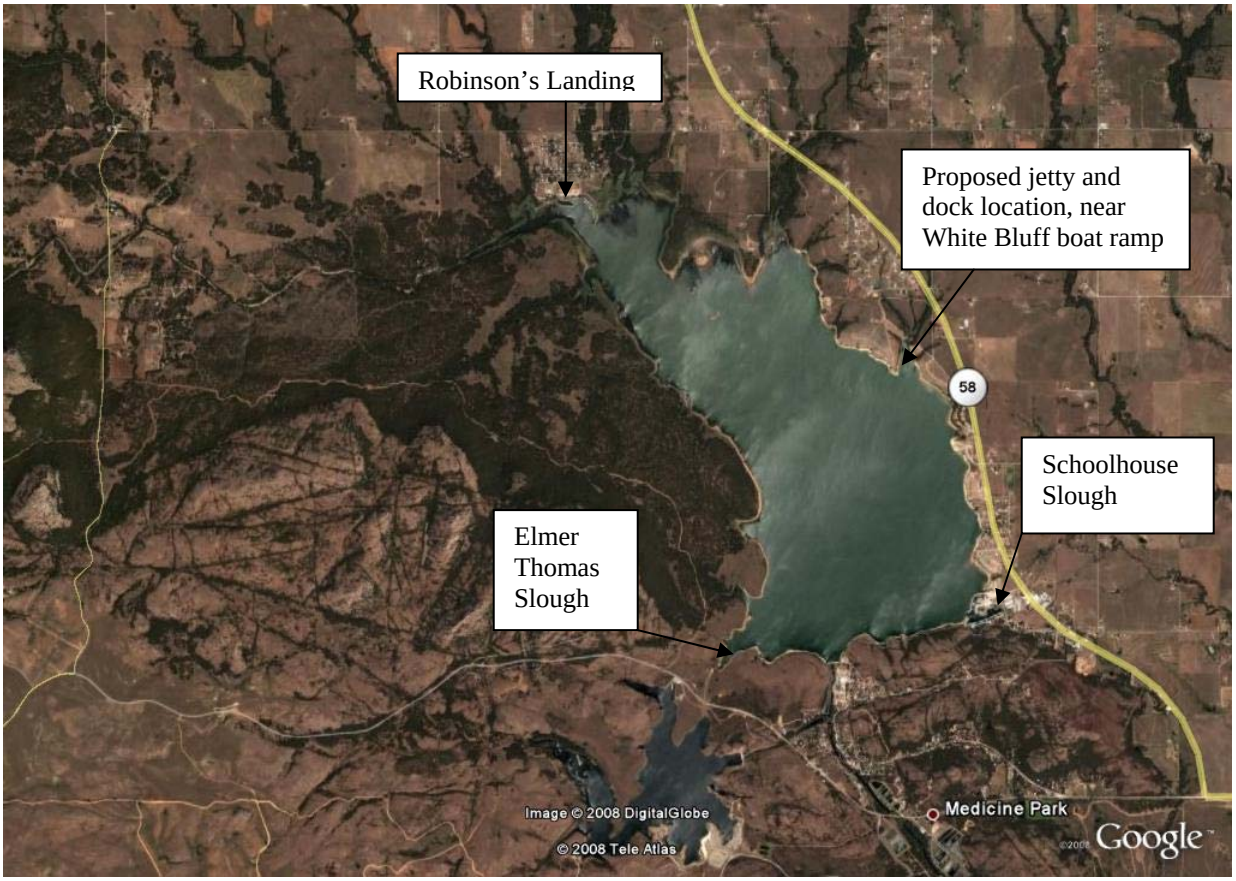
- Brush piles should be refurbished at least every 5 years to maintain fishing for crappie.

Boating and Fishing Access

- Using Federal Aid matching funds for boating access, a jetty should be constructed at the Day Use Area (White Bluff Point) to provide protection for a new boat dock to service users of the new boat ramp there (Fig. 7). The jetty would protect the dock from prevailing south winds and waves.

- Access should be expanded to the Southwest portion of Lawtonka for bank anglers and boaters in the Elmer Thomas Slough area. Conflicting uses like camping and private boathouses should be restricted. Additional parking spaces should be considered along the south shore road.

- Restrooms at Robinson's Landing and Schoolhouse Slough should be maintained per the Cooperative Agreement between the City and the ODWC. The 20-year-old dock at Robinson's Landing should be replaced soon.



Fishing Regulations

- The 14-inch limit on black bass and saugeye, and the 23-inch minimum length limit on smallmouth bass should be retained indefinitely.
- A length limit on crappie is not warranted due to chronic slow growth at Lawtonka.

Fish Stockings

- Channel catfish should be stocked with a minimum size of 7 inches at 2.5 per acre annually (6,000).
- Saugeye should be stocked every-other-year at 10/acre (24,000).
- Florida Largemouth Bass should be stocked as available to improve anglers' chances of catching a trophy bass.
- Hybrid striped bass should not be stocked due to frequent shortages of shad.

Fish Sampling

- Black bass should be sampled approximately every 3 years by spring electrofishing with a goal of maintaining the "High Quality Bass Lake" status.
- Lawtonka should be gill netted every 5 years to assess changes in shad, saugeye and channel catfish abundance and growth rates, and to fine-tune stocking strategies.
- Crappie should be trap netted again in 2010 and every 5 years thereafter to follow trends in their abundance and growth.

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Note- This report was presented to anglers and City of Lawton officials at a public hearing in December, 2008. Comments from that meeting were considered in this final plan.

Note of Thanks

We would like to express our gratitude for the many years of effort in sampling and managing the fishery at Lake Lawtonka by Eugene Wheeler (retired), and the late Paul Watkins, who each spent many days on the lake to improve fishing. Their work provided the foundation for this report.

Table 1. Stocking History for Lake Lawtonka, 1980-2008.

DATE	SPECIES	NUMBER	SIZE
1980	Channel Catfish	23,080	Fingerling
1981			
	Largemouth Bass	242,896	Fingerling
	Channel Catfish	40,000	Fingerling
1982			
	Channel Catfish	35,000	Fingerling
1983			
	Channel Catfish	62,522	Fingerling
1984			
	Walleye	294,000	Fingerling
	Channel Catfish	36,842	Fingerling
1985			
	Walleye	231,830	Fry
	Channel Catfish	55,900	Fingerling
1986			
	Walleye	24,000	Fingerling
	Channel Catfish	48,000	Fingerling
1987			
	Florida LMB	25,121	Fingerling
	Walleye	34,000	Fingerling
	Channel Catfish	47,239	Fingerling
1988			
	Channel Catfish	14,436	Fingerling
	Walleye	24,000	Fingerling
	Largemouth Bass	1,000	Fingerling
1989			
	Integrated FLMB	24,000	Fingerling
	Channel Catfish	24,000	Fingerling
1990			
	Walleye	624,000	Fry
	Smallmouth Bass	20,048	Fingerling
	Integrated FLMB	36,300	Fingerling
	Certified FLMB	6,000	Fingerling
	Channel Catfish	24,000	Fingerling
1991			
	Channel Catfish	49,112	Fingerling
	Walleye	720,000	Fry
	Smallmouth Bass	24,000	Fingerling
1992	Smallmouth Bass	24,000	1.25
	Walleye	1,200,000	Fry
	Channel Catfish	10,995	6.20
	Threadfin Shad	5,000	5.50
	Certified FLMB	8,664	3.00
	Channel Catfish	40,685	4.50
1993			
	Saugeye	48,000	1.00
	Channel Catfish	48,000	5.00
1994			
	Saugeye	49,450	1.25

	Channel Catfish	24,000	7.00
1995			
	Saugeye	121,360	1.50
	Channel Catfish	11,187	7.00
	Channel Catfish	10,025	9.00
1996			
	Certified FLMB	40,000	1.75
	Channel Catfish	24,013	7.00
1997			
	Saugeye	50,000	1.50
	Channel Catfish	12,303	9.00
1998			
	Saugeye	48,000	1.25
	Channel Catfish	12,340	7.00
1999			
	Channel Catfish	12,050	7.00
2000			
	Saugeye	24,000	1.25
	Channel Catfish	12,005	7.00
2001			
	Saugeye	12,000	1.50
	Channel Catfish	6,300	4.00
2002			
	Saugeye	12,000	1.25
2003			
	Certified FLMB	49,000	2.75
	Channel Catfish	14,000	6.00
2004			
	Saugeye	31,200	1.30
	Channel Catfish	12,600	5.00
	Channel Catfish	2,250	7.30
2005			
	Saugeye	24,300	1.50
	Florida LMB	48,000	2.90
	Channel Catfish	12,000	7.00
2006			
	Saugeye	26,125	2.00
	Channel Catfish	11,985	7.00
2007			
	Saugeye	22,995	1.70
	Channel Catfish	12,023	7.00
2008			
	Saugeye	24,000	1.80

Table 2. Total number (No.), catch rates (C/f- number per hour), and relative weights (W_r) by size groups of **largemouth bass** collected by spring electrofishing from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥40)		<8 in (15-45)		8 -12 in (15-30)		≥ 12 in (≥15)		≥ 14 in (≥10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1982	362	20.1	-	-	-	-	-	-	-	-
1989	149	31.4	3.8	96	12.4	94	15.2	94	5.7	106
1992	129	21.5	14.7	93	1.5	97	5.3	98	3.2	100
1995	139	26.5	6.7	94	4.8	92	15.0	99	8.2	104
1998	136	34	13.0	93	5.3	86	15.8	99	10.3	105
1999	133	44.3	5.3	93	13.0	92	26.0	98	20.3	99
2001	93	33.8	9.4	97	5.1	95	19.2	95	15.6	96
2002	94	62.7	16.0	94	17.3	97	29.3	97	19.3	95
2004	147	65.3	14.7	112	9.8	103	41.3	96	17.8	95
2008	245	75.4	30.5	101	6.8	101	38.8	101	22.5	100

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

	Total (≥15)		≤ 8 in -		8 -12 in -		≥ 12 in -		≥ 14 in (≥2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	W_r	Wr
1995**	49	9.3	6.7	89	1.7	81	1.0	82	0.6	86
1998	41	10.3	7.5	93	1.3	81	1.5	81	0	-
1999*	8	2.7	*	*	*	*	*	*	*	*
2001	32	11.6	*	*	*	*	*	*	*	*
2004*	6	2.7	0.45	104	0.45	95	1.78	86	0.45	86
2008*	1	0.31	0	-	0.31	94	0	-	0	-

* Spring electrofishing not conducted in SMB habitat

** SMB introduced in Lawtonka in 1990

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

	Total (≥15)		< 8 in -		8 – 12 in -		> 12 in -		≥ 14 in (≥2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	W_r	W_r
1990	19	9.5	9	-	0.5	-	0	-	0	-
1991	55	36.7	18.7	-	16.0	-	2.0	-	0	-
1992	25	11.1	2.2	-	8.5	-	0.4	-	0.4	-
1993	13	10.4	2.4	-	6.4	87	1.6	88	0	-
1994	64	130.0	102.0	91	26.0	83	2.0	90	0	-
1995	116	58.0	15.5	87	41.0	88	1.5	89	0	-

** SMB introduced in Lawtonka in 1990

Table 5. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **spotted bass** collected by spring electrofishing from Lake Lawtonka. Acceptable W_r values are ≥90.

	Total		< 8 in		8 12 in		≥ 12 in		≥ 14 in	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1982	43	2.4	-	-	-	-	-	-	-	-
1989	42	8.8	4.2	88	4.2	100	0.4	99	0	-
1992	22	3.7	2.5	72	0.83	87	0.3	52	0	-
1995	16	3.0	1.5	78	1.5	79	0.0	-	0	-
1998	3	0.8	0	-	0.5	77	0.3	-	0	-
1999	3	1	-	-	-	-	-	-	-	-
2001	10	3.6	0.36	-	0.73	91	2.5	86	1.45	85
2002	3	2.0	0	-	0.67	96	1.3	66	1.3	66
2004	0	0	0	-	0	-	0	-	0	-
2008	0	0	0	-	0	-	0	-	0	-

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

	Total (≥4.8)		< 8 in (1.2 - 7.2)		≥ 8 in (≥1.9)		≥ 10 in (≥.96)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	3	0.7						
1984	10	1.9						
1985	59	7.2						
1987	50	5.3	0.6	>90	4.7	>100	1.0	>100
1988	43	4.8	1.4	92	3.5	>100	0.9	>100
1989	37	3.0	2.2	93	0.8	117	0.3	117
1990	10	1.0	0.5	110	0.4	112	0.1	92
1992	56	5.6	4.3	92	1.3	89	0.5	87
1996	43	3.6	1.2	98	2.6	88	0.2	86
1997	33	4.6	3.6	84	1.0	84	0.5	80
1999	34	5.0	2.2	93	3.1	89	1.0	88
2001	34	4.1	1.2	110	2.6	97	1.4	98
2003	17	3.8	1.7	111	1.9	93	0.5	89
2006	5	0.8	0.5	87	0.6	97	0.6	97

Table 7. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **crappie** collected by trap netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (>25)		< 5 in (≥5)		≥ 5 in (10-40)		≥ 8 in (≥10)		≥ 10 in (≥4)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1994	249	13.6	1.2	-	12.4	84	5.0	82	0.6	82
1998	153	11.0	1.9	74	9.0	86	6.7	84	0.9	80
2008	34	0.67								

Table 8. Mean length at age of **crappie** collected by fall trap netting from Lake Lawtonka. Numbers in parentheses represent values for acceptable growth rates.

	Age 1 (≥ 6 in)	Age 2 (≥ 8 in)	Age 3 (≥ 9 in)	Age 4 (≥ 10 in)	Age 5	Age 6	Age 7
Year							
1994	7.0 in	8.6	11.8				
1998	5.6	8.1	9.2	9.4	9.2	9.1	10.6
2008	8.7	10.8	12				

Table 9. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **walleye** collected by fall gill netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥2.4)		< 12 in (≥1.4)		12 – 16 in (≥.48)		≥ 16 in (≥.48)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	29	7.0	-	-	-	-	-	-
1984	19	3.8	-	-	-	-	-	-
1985	12	1.4	-	-	-	-	-	-
1987	21	2.2	1.1	>90	0.5	>90	0.6	>90
1988	12	1.3	0.9	>90	0.0	-	0.5	>90
1989	30	2.4	1.44	105	0.648	100	0.24	100
1990	10	0.98	0.096	95	0.6	92	0.24	101
1992	18	1.8	0.312	96	0	-	1.512	88
1996	5	0.48	0	-	0	-	0.48	94
1997	3	0.48	0	-	0	-	0.48	94
1999	1	0.24	0	-	24	76	0	-
2001	2	0.24	0	-	0	-	0.24	88
2003	1	0.24	0	-	0.24	86	0	-
2006	1	0.22	0	-	0	-	0.216	77

Table 10. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **walleye** collected by night electrofishing from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥15)		< 12 in (≥10)		12 – 16 in (≥3)		≥ 16 in (≥2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1990	25	6.7	1.6	-	2.4	-	2.7	-
1991	4	2.7	0.7	100	2.0	92	0.0	-
1992	2	0.9	0.4	-	0.0	-	0.4	-
1993	2	1.6	0.0	-	0.8	-	0.8	75

Table 11. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **saugeye** collected by fall gill netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥2.4)		< 12 in (≥1.4)		12 – 16 in (≥.48)		≥ 16 in (≥.48)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1996	29	2.4	0.2	100	1.9	84	0.5	82
1997	49	6.7	1.0	96	1.7	87	4.1	80
1999	58	8.6	0.0	-	3.1	84	5.8	84
2001	71	8.4	2.9	92	2.2	90	3.4	88
2003	17	3.8	0.0	-	0.7	91	3.1	86
2006	48	10	1.7	94	0.4	95	7.9	86

Table 12. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **saugeye** collected by night electrofishing from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥15)		< 12 in (≥10)		12 – 16 in (≥3)		≥ 16 in (≥2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1993	48	38.4	38.4	97	0.0	-	0.0	-
1994	30	60.0	56.0	86	4.0	78	0.0	-
1995	95	76.0	32.0	96	42.4	82	1.6	78
1999	239	23.3	0.8	-	7.4	-	14.8	-

* Saugeye were first introduced in 1993

Table 13. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **white bass** collected by fall gill netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥4.8)		< 8 in (≥1.2)		8 – 12 in (1.2 - 7.2)		≥ 12 in (>2.4)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	44	10.6	-	-	-	-	-	-
1984	83	16.3	-	-	-	-	-	-
1985	58	7.0	-	-	-	-	-	-
1987	100	10.6	3.3	>90	3.7	>90	3.6	100
1988	82	9.2	0.2	-	3.8	96	5.2	>90
1989	45	3.6	0.6	88	0.9	100+	2.1	100
1990	47	4.7	0.9	106	2.0	93	1.8	90
1992	18	1.8	0.6	94	0.7	83	0.5	82
1996	84	7.2	1.4	103	3.1	90	2.6	92
1997	67	9.1	0.7	78	3.8	86	4.6	82
1999	109	16.3	3.4	92	3.4	84	9.6	83
2001	351	41.0	7.7	88	16.3	96	17.0	98
2003	160	35.0	7.2	93	25.0	85	2.9	70
2006	76	15.9	15.9	81	12.3	83	3.3	75

Table 14. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **channel catfish** collected by fall gill netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥4.8)		< 12 in (≥2.4)		≥ 12 in (≥2.4)		≥ 16 in (≥1.2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	10	2.4	-	-	-	-	-	-
1984	11	2.2	-	-	-	-	-	-
1985	35	4.3	-	-	-	-	-	-
1987	22	2.3	1.0	>90	1.4	>90	1.1	>90
1988	16	1.8	0.8	90	1.0	>90	0.6	>100
1989	16	1.3	0.2	96	1.0	>90	0.4	>90
1990	26	2.6	0.6	113	2.0	97	0.4	99
1992	18	1.8	0.6	114	1.2	94	0.9	97
1996	63	5.4	1.4	89	3.8	86	1.9	90
1997	70	9.6	3.8	92	5.8	87	2.2	96
1999	72	10.8	2.2	85	8.6	82	4.6	84
2001	27	3.1	1.0	85	2.2	86	1.4	87
2003	-	6.5	1.7	93	4.8	86	4.1	86
2006	39	8.1	2.3	85	5.8	87	2.7	95

Table 15. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **gizzard shad** collected by spring electrofishing and fall gill netting from Lake Lawtonka. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total[1] (≥40)		< 8 in[1] (≥20)		Total[2] ??		< 8 in[2] ??		
Year	No.	C/f	C/f	W_r	No.	C/f	C/f	W_r	
1982					-	8.16	-	-	
1984					-	2.16	-	-	
1985					-	2.4	-	-	
1987					31	3.28	0.0	-	
1988					8	0.912	0	-	
1989	22	5.2	0.2	-	8	0.6	0.0	-	
1990					15	1.488	0.096	98	
1992	143	48	7.3	103	13	1.296	0.096	-	
1995	156	208	2.7	-	-	-	-	-	
1996					44	3.84	0	-	
1997					13	1.68	0	-	
1999					71	10.56	5.04	79	
2001					97	11.28	1.44	-	
2003					84	18.24	5.8	-	
2006					43	8.96	123*	-	(*Threadfin shad)

[1] Spring Electrofishing

[2] Fall Gill Netting