Oologah Lake Management Plan

Oklahoma Department of Wildlife Conservation
2008

Background

Introduction

When the Flood Control Act was passed on June 28, 1938 the Oologah Lake dam project was approved. The conservation pool was filled in 1972, and construction completed on all structures in 1974 by the Tulsa District of the United States Army Corps of Engineers (USACE). Although flood control is its main purpose, others include; water supply, recreation, navigation, and fish and wildlife propagation (Watershed Study 2001). Oologah Lake dam impounds the Verdigris River at river mile 90.2, which is two miles southeast of Oologah, Oklahoma and 22 miles northeast of Tulsa, Oklahoma in Rogers and Nowata counties (USACE). The Verdigris River originates in the flint hills of Chase County, Kansas, and flows generally southeast from Madison to Neodosha, Kansas. It is impounded above Oologah Lake near the town of Toronto, Kansas to form Toronto Lake. Oologah Lake is located below Toronto Lake just below the Oklahoma and Kansas state line.

Oologah Lake has 209 miles of shoreline, covers 31,040 surface acres (12,562 ha), and stores 552,210 acre-feet of water on average (Watershed study 2001). All storages are based on a drainage area of 4,339 square miles for this project, which includes all upstream projects (USACE). The streambed elevation is 550 feet above mean sea level (msl) and the top of the dam is at 687 feet msl. The elevation at the top of the flood control pool is 661 feet msl. The normal elevation at the top of the conservation pool is 638 feet msl (USACE). The length of the dam is approximately 4000 feet of a rolled earth embankment with state highway 88 at the top and is protected by approximately 24 inches of rip-rap (Watershed Study 2001). Oologah Lake has a mean depth of 17.8 feet and a maximum depth of 88.0 feet. The water exchange rate is 3.161. Secchi disk readings are highly variable (1-90cm) but average 36 cm (Watershed Study 2001).

The Verdigris River enters the lake from the north northwest (Figure 1). The Verdigris River watershed is defined by an undulating plain that is bordered on the west by the flint hills in Kansas and the Osage hills in Oklahoma. In the relative middle (from north to south) of the lake is the Winganon Bridge (Figure 1). This bridge is to blame for a drastic difference in depth from above bridge portions of the lake to below bridge portions. The difference in depth is cause for differing water quality (temperature, dissolved oxygen, etc.) parameters between the two areas of the lake. The main pool of the lake is wide which allows for wind exposure from all directions. The surrounding terrain provides little wind protection on the leeward banks.

Shoreline Development

The USACE does not have a shoreline management plan specific to Oologah Lake and no proposed plans were found. Although there is not a plan specific to the lake, the USACE does set minimum design standards for shoreline development in the Tulsa District, which can be viewed at: http://www.swt.usace.army.mil/LIBRARY/ShorelineManagementPlan/specs.pdf.

Watershed Development and Land Use Practices

The primary industry in the Verdigris River basin below the Kansas-Oklahoma state line is agriculture and related industries. Production of mineral commodities in the basin is also substantial, with petroleum, stone, natural gas, coal, cement, and clay among the most important.

Other industries found in the watershed include manufacture of zinc products, clothing, brick, tile, paint, and oil field equipment. The principal agricultural crops of the region are wheat, soybeans, sorghum, pecans, alfalfa, and the raising of beef cattle (USACE).

In 1905 the Oologah watershed was the site of intense oil and gas exploration. Some 15,000 oil wells were drilled on the Oklahoma side of the watershed (Oologah Watershed 2001). This shallow (400 to 750 ft.) oil field is known as the Bartlesville Sand formation (City of Tulsa). Prior to the completion of the Oologah Lake project (1955 to 1972) many of these wells were improperly plugged and abandoned (City of Tulsa). Reports have shown these wells periodically purging oil to surface soils and waters. The U.S. Environmental Protection Agency (EPA) and the Oklahoma Corporation Commission (OCC) have started a well-plugging effort on private lands with the majority of these wells being located on the middle of the eastern shore (City of Tulsa). These land use practices cause a need for water quality to constantly be monitored by all agencies with interest in the Oologah Lake Project.

Habitat

Oologah Lake's shoreline is made up of primarily rock or sand. Located in the cross timbers region of Oklahoma, Oologah Lake's shoreline is dominated by old growth post oak blackjack oak forests. During times of high water this timber provides extensive habitat. With the USACE approval shoreline tree falling is done by ODWC staff to provide additional fish habitat. The primary substrate is silt or clay which provides for highly variable turbidity. Vegetative growth is limited by highly variable water levels. Japanese millet is often seeded (water level permitting) to stabilize the soil, to provide waterfowl a forage, and to provide fish with additional habitat. With the USACE approval shoreline tree falling is done by ODWC staff to provide additional fish habitat. Each year, water levels permitting, local volunteers, ODWC staff and the USACE create brush piles in the lake (USACE, Figure 2). A map of the most recent brush pile locations can be seen at:
http://www.swt.usace.army.mil/recreat/oologah/webpageOologah/2008%20Brushpile%20Info/08BrushPiles.htm

Water Levels and Releases

The main purpose of Oologah Lake remains flood control. For this reason, high seasonal inflows from the Verdigris River and concern over downstream flooding have a direct affect on water levels of the reservoir (Figure 3). A proposed hydroelectric project at the dam will affect water levels and releases, but its extent is unclear at this time. The spillway, which is located two miles east of the actual dam, is at 640 feet msl, and consists of seven 40 X 21 foot high radial gates (USACE). The outlet devices at the dam location are two 19-foot conduits each served by 9 X 19 foot gates. One of these conduits could serve as a power penstock if desired, but this is not in the current plan for a hydroelectric project at the dam (PAD 2008). The capacity of each conduit is 15,000 cfs with a reservoir elevation at 638 feet, and 17,500 cfs with an elevation of 661.00 feet. A 48 inch low flow pipe is also used in the event that small releases are desirable (USACE). The USACE estimates the channel capacity below the dam site at 30,000 cfs. The peak flow of the watershed was recorded in 1943 at 138,000 cfs. The average annual flows into and out of the reservoir are shown in Figure 4.

A current water level management plan has been proposed and was implemented on January 15, 2008 (Figure 1). . This plan allows for ideal water level conditions to provide fish and wildlife habitat and conditions for the germination of moist soil plants. Located downstream from the Oologah Lake dam is the Mcclellan-Kerr Arkansas River Navigations System (MKARNS). Releases from Oologah Lake are responsible for keeping water in MKARNS at a minimum of 9 feet. This requirement, along with inflows, will affect how closely the water level plan will be followed.

Water Quality

Oologah Lake's water quality is monitored by the Oklahoma Water Resources Board as part of their Beneficial Use Monitoring Program (BUMP 2003). Oologah was classified as mesotrophic with moderate primary productivity. The report showed that the lake supported, partially supported, and did not support the beneficial use of fish and wildlife propagation based on pH, dissolved oxygen, and turbidity, respectively. The complete 2002-2003 BUMP report can be seen at: http://www.owrb.ok.gov/quality/monitoring/bump/pdf_bump/current/lakes/oologah.pdf

The BUMP report (2003) calculated a trophic state index (TSI), using Carlson's TSI (chlorophyll-a), of 48. This number was slightly lower than the 51 reported in 2000. Conductivity ranged from 263.1 mS/cm to 635 mS/cm, which shows a low to moderate level of dissolved salts. The pH in the lake was neutral to alkaline (7.07 to 8.22) during the study period (2003 BUMP). Oologah lake was also found to be moderately hard to hard (157 ppm as CaCo3) (Watershed Study 2001).

Thermal stratification in Oologah Lake is not prevalent during fall, winter, or spring. During these seasons the entire water column showed dissolved oxygen (DO) levels above 6 mg/L. During the summer however, anoxic conditions were present below the thermocline (BUMP 2003). The lake was found to be stratified with DO levels below 2 ppm from the thermocline to the bottom accounting for 10-50% if the entire water column (BUMP 2003).

A constant threat to the water quality at Oologah Lake is the thousands of improperly plugged oil wells mentioned earlier (City of Tulsa). It is hoped that the well plugging initiative by the EPA and the OCC will be a success but results are yet to be seen. This effort will be monitored closely by the fisheries biologists in the region.

History of the Fishery

The Fishery

The fishery located in Oologah Lake is an economic plus for the area surrounding the lake. The major sport species of Oologah Lake are flathead catfish, channel catfish, blue catfish, white bass, largemouth bass, striped bass hybrids, crappie and walleye. The primary forage species in Oologah Lake is gizzard shad. The lake was stocked with paddlefish (*Polyodon spathula)* in 1998 and since then the popularity of paddlefish snagging has been increasing in the area.

Fish consumption advisories

There are not currently any consumption advisories for Oologah Lake or its watershed. Fish consumption advisories are issued by the Oklahoma Department of Environmental Quality

(ODEQ). The ODEQ monitors compounds present in the waters of the state and issues advisories when these compounds reach minimum allowable levels. These advisories can be accessed through their website www.deq.state.us/mainlinks/press.htm.

Management history

Fish stocking to supplement sport fish populations can be found in table 2. When available, walleye have been stocked into Oologah Lake in an attempt to introduce a pelagic predator in the lake. Paddlefish were reintroduced to the reservoir in 1998. These paddlefish stockings have been done in hopes that a self sustaining population will be reestablished. Although all the standard statewide regulations apply some special regulations are set for the lake. A 14 inch length limit on black bass was made to protect them until they reach sexual maturity. Striped bass, white bass, and their hybrids have a 20 a day and 5 over 20 inch limit to protect these fish from over harvest.

Catch rate and body condition data (Wr)

Black Bass (Combined)

Largemouth bass (*Micropterus salmoides),* spotted bass (*M. punctulatus),* and smallmouth bass (*M. dolomieu)* are present in Oologah Lake. Catch rates (46.5) from the most recent electrofishing sample (2003) were above the minimum level to be considered a quality fishery (C/f = 40). The body condition of fish greater than 8 inches (Wr = 100) was well above the minimum level to be considered as a quality bass fishery (Wr > 90) however, data from previous samples indicated a relatively low bass population (Table 3). The black bass population is limited by poor recruitment and the lack of suitable nursery habitat. During years where sampling does not take place on Oologah a valuable tool to monitor populations of bass are tournament reports (Table 4).

Crappie (Combined)

Black (*Pomoxis nigromaculatus),* and white (*P. annularis)* crappie are both found in Oologah Lake with white crappie making up the vast majority of the fall gill-net samples. The abundance of crappie in 2004 (C/f = .145) was below the minimum acceptable level (C/f = .20) to be considered a quality fishery. Body condition was found to be acceptable (Wr > 90) for fish below 8 inches (Wr = 93) and above 10 inches (Wr = 90) but below acceptable for fish between 8 and 10 inches (Wr = 85). Therefore Oologah Lake is considered a quality fishery based on body condition for some size groups but not on abundance for any size groups (Table 5).

White Bass

The white bass (*Morone chrysops)* population was last sampled by fall gillnet in 2004. The abundance of white bass (C/f = .109) decreased substantially from 1999 and was well below acceptable levels (C/f = .20). The body condition of white bass was also found to be below acceptable levels (Wr > 90) for fish smaller than 8 inches (Wr = 88) and acceptable for fish greater than 8 inches (Wr = 90). Based on the findings of the sampling that was done in 2004 Oologah Lake does not meet the qualifications to be considered a quality white bass fishery (Table 6).

Blue Catfish

Blue catfish (*Ictalurus furcatus)* were sampled in 2004 by fall gill net which showed that their abundance were above acceptable levels to be considered a quality fishery. Body condition was also found to be above minimum acceptable levels (Wr = 90) to consider Oologah Lake a quality blue catfish fishery. These were both up from previous year's findings. A current study being done at Oklahoma State University is looking at the effectiveness of electrofishing as a sampling method for blue catfish. The procedures prescribed by this study were used in 2006 (Figure 5).

Walleye

Walleye (*Sanger vitreus)* Body condition was found in 2004 (Wr = 98) to be well above minimum acceptable levels to be considered a quality fishery (Wr = 90). The abundance found (C/f = .127) was below minimum acceptable levels (C/f = .20) to consider Oologah lake a quality fishery (Table 7). Walleye abundance is low (C/f = 3.1/net), but body condition is generally acceptable (Wr = 98).

Shad

Gizzard shad (*Dorosoma cepedianum)* are the primary forage in Oologah Lake. In 2004 gizzard shad abundance was low (C/f = .064) compared with previous years samples, and is below the minimum acceptable level (C/f = .20) to indicate a quality forage base. These numbers show a dramatic decrease from previous samples in the forage base present in the lake during the 2004 sampling period (Table 8).

Threats to fishery

Proposed Hydroelectric Project

In January 2008 a pre-application document (PAD) was sent to recipients with management responsibilities at Oologah Lake and its watershed to propose a plan to install a hydroelectric facility at the dam (Pre-Application Document 2008). On March 3, 2008 Oologah Lake Hydro LLC filed an application to study the feasibility of this project. This project will affect the fishery in the reservoir and tailwaters.

No entrainment study has been proposed by controlling agencies. ODWC has requested that the controlling parties of this project carry out an entrainment study to look at possible fish kills associated with these turbines. ODWC has requested that the results be reviewed by fisheries biologists to allow for mitigation for fish losses or propose pass-through screens.

The PAD (2008) states that no deviations from current release regimes will be expected. Since water releases are required to generate electricity, it is unlikely that the USACE will stop releases as has been the case in the past. This may benefit the tailwater fishery located below the dam by increasing the level of DO during times it has historically been low. Although the fishery located in the tailwater may benefit, it could have the opposite effect on the fish in the reservoir. The effects that this project has on the fishery will be monitored by region biologists, and could have management implications in the future.

Water Quality

The abandoned oil field located at the upper end of Oologah Lake poses a constant threat of pollution into the lake. These improperly capped oil wells have been reported to purge oil to

surface waters and soils in the watershed (City of Tulsa). If a pollution event did ever occur in the lake it would decrease water quality, and be detrimental to fish and wildlife populations. The EPA and OCC are currently involved in an effort to properly cap these wells to eliminate this risk.

During the late summer and early fall the USACE has historically stopped releases completely resulting in low DO in the tailwaters causing fish kills. A cooperative effort between USACE and ODWC staff will have to take place to prevent future fish kills. Since fish and wildlife uses of the lake are a lower priority than other uses, this may be difficult during years where conditions do not allow for it.

Water Quantity

Total water storage under contract in Oologah Lake is 332,375 acre-feet. Tulsa metropolitan Water Authority contracts for 285,450 acre-feet and currently obtains 40-50% of its current water supply from the reservoir. The other entities and their contracted storage (acre-feet) are Public Service of Oklahoma (20,990), the city of Collinsville (6,670), Rogers County Rural Water Districts 3 (5,960), and 4 (1,590), Washington County Rural Water District 3 (4,170), the city of Chelsea (670), the city of Claremore (6,675), and Nowata County Rural Water District No.1 (200) (Watershed Study 2001) . Oologah Lake is responsible for holding water to ensure the minimum required 9 feet of water in the Mcclellan-Kerr Arkansas River Navigation System (MKARNS) at all times. The MKARNS is a major contributing factor that affects the water level and water releases at Oologah Lake. Because of these various uses of the reservoir's water, fish and wildlife resources are a low priority until these obligations are met.

Aquatic nuisance species (ANS)

In recent years the spread of aquatic nuisance species has become a concern. ANS have been transported well outside of their native ranges via commercial and recreational boat traffic. HAACP logs are kept on all equipment to ensure proper steps are taken by ODWC staff to prevent the spread of these species. The regional management biologist will work closely with the ANS biologist to conduct boater traffic surveys and ANS monitoring to help determine further actions to take to prevent further spread. They will also work with the ANS biologist to educate the public about the threats of ANS to help reduce the risk of spread by recreational boat users.

Currently the only ANS that have been found in Oologah Lake is the zebra mussel (*Dreissena polymorpha).* Zebra mussels are a freshwater mussel species that attaches itself to hard surfaces (rocks, boat motors, etc), reproduces quickly, clogs boat intakes and motors, clog inner workings of dams and intakes for municipalities' water supplies. The zebra mussel also seems to compete with forage fish for food which could account for the decrease in abundance in gizzard shad found by sampling in 2004, in Oologah Lake shortly after zebra mussels were found there. This will have detrimental effects on the fishery and populations will be monitored these effects through its annual sampling.

White perch (*Morone americana)* and largemouth bass virus (LMV) have both been located in Keystone Lake. The close proximity of Keystone Lake to Oologah Lake and high boater traffic

between the two is cause for the concern that these ANS could be introduced into Oologah. Biologists will continue to work with the aquatic nuisance biologist to educate the public on this threat in an effort to slow, if not stop the introductions into the Oologah Lake watershed. A complete list of ANS located in Oklahoma can be seen on the Department's website at http://www.wildlifedepartment.com/nuisancespecies.htm

Management objectives

Five year management objectives include

- Monitoring trend data for major sport species (black bass, crappie, paddlefish, channel/blue catfish, walleye and hybrid striped bass)
- Spring electrofishing baseline data will have to be acquired using the new 7.5 GPP. Sampling will take place each of the next five years to gather these data so that trends will be able to be looked at in the future.
- Monitor catfish populations for age and growth trends.
- Monitor water quality before the proposed hydroelectric project is completed to have baseline data for possible mitigation.
- Fall gillnetting will be done annually or at least bi annually, water conditions permitting, to monitor fish populations and forage availability.
- The biologist will work closely with the aquatic nuisance biologist to monitor and possibly prevent the spread of aquatic nuisance species into the lake.
- The biologist will work with the paddlefish biologist to monitor the size of the paddlefish population in Oologah Lake as its popularity as a paddlefish fishery increases.
- Stocking will continue as needed to keep current populations at desirable levels.
- Conduct meetings with constituents to solicit feedback about fisheries management within the lake.

Sampling goals by species

Paddlefish

Paddlefish were stocked in 1998 by ODWC in cooperation with the U.S. Fish and Wildlife Service. Joint sampling of this reestablished population is done by the two agencies annually to monitor the success of the reintroduction. If a need is identified by this sampling a more extensive study may be done on the paddlefish population in Oologah Lake. The Oologah Lake biologist will work with state and federal paddlefish managers to monitor the paddlefish population as the lake's popularity as a paddlefish fishery increases.

Black Bass

The black bass population will be evaluated using the electrofishing procedures outlined in ODWC's Standardized Sampling Procedures (SSP) annually and no less than bi annually. Otoliths will be taken every third sample to assess the age structure and growth rates of black bass in the lake. Five tournament weigh-ins will be attended by ODWC staff annually. If less than five tournaments take place on Oologah (as was the case in 2007), all tournament weigh-ins will be attended.

Crappie

Crappie population structures will be monitored using SSP fall gillnetting procedures. Every five years, starting in 2009, trap netting will be done and otoliths taken for aging. If data from fall gillnetting samples show that a problem may exist, trap netting may be done more frequently.

White Bass

The white bass population will be monitored using SSP gillnetting procedures annually and no less than bi annually.

Blue Catfish

Blue catfish electrofishing will be scheduled pending the results of the current OSU research project to determine optimum sample size and time for sampling blue catfish populations. Until the results from this project are finalized, sampling of the population will be done annually, during the summer using the guidelines used by OSU to monitor population trends.

Walleye

Walleye populations will be sampled using the SSP fall gillnetting annually and no less than bi annually. Otoliths will be taken from individuals that die due to capture myopothy to determine the age structure and growth rates of the walleye population.

Strategies to achieve sampling goals

Sampling will take place according to procedures laid out in the ODWC's Standardized Sampling Procedures (SSP) for Lake and Reservoir Management Recommendations. Depending on water level and temperature, schedules will be followed as closely as conditions allow. Prior to sampling, all equipment (boats, nets, etc.) will be inspected to solve any issues that could disrupt sampling efforts. All equipment will be treated according to HACCP guidelines and logs be kept up with.

Water Quality sampling will begin in the summer of 2009 to get baseline data before the hydroelectric project is operational. These data will be a valuable tool to address mitigation issues once the project is completed. Water quality will be taken once a week throughout the summer from both above and below the dam, and will be compared with data taken after the project is completed to monitor effects the project has on the reservoir's water quality.

Regulations

- Black bass: 14-inch minimum, six (6) daily creel.
- Striped bass hybrid and white bass: 20 combined, five (5) larger than 20 inches or larger.
- Blue catfish: 15 daily creel, no length limit
- Flathead catfish: 10 daily creel, 20 inch minimum
- Paddlefish: One (1) daily creel, no length limit
- Crappie: 37 daily creel, no length limit
- Walleye: Five (5) daily creel, 18 inch minimum

Habitat improvements

Changing water levels due to seasonal inflows have caused a problem for fisheries managers by causing habitat deficiencies. Erosion of shoreline and flooding of existing vegetation inhibit new

growth. This has caused a need for supplemental habitat to be introduced in the lake. Cooperative events between ODWC and various agencies have taken place when conditions permit. These efforts have gone a long way to improve existing brush piles and other artificial structures. When brush piles are added they are laid perpendicular to the shoreline to allow the fish to move along them as water levels change. With the US Army Corps of Engineers approval shoreline tree falling has occurred, and will continue where it does not interfere with other lake activities to provide fish supplemental habitat.

Japanese millet has been planted in the lake's mud flats annually. These plantings are done to first and foremost stabilize the soil to reduce further erosion. These plantings do however create additional fish habitat, and provide waterfowl with a winter food source on the lake.

A proposed water level fluctuation plan for Oologah Lake was set to be implemented on January 15, 2008 (Figure 5). As construction proceeds with the proposed hydroelectric project, habitat improvement strategies may be forced to adapt. The proposed hydroelectric project does not call for any changes to the present flow regime out of the reservoir (PAD 2008). It is highly unlikely that this will be the case. Historically the USACE has shut the releases down in the late summer and early fall months this seems unfeasible given the need to release water for the production of electricity. If a change to the current regime does occur vegetative plantings may be made impossible due to undesirable water levels. This issue will have to be monitored closely by ODWC staff, and habitat improvement strategies will be adapted to prevailing lake levels.

Angler Satisfaction

Creel surveys, angler opinion surveys

Oologah Lake is known as a quality walleye and striped bass hybrid fishery in the northeast region of Oklahoma. Since its reintroduction in 1998, paddlefish snagging in Oologah Lake and its watershed has been increasing. An angler opinion survey will be done in the next three years to prioritize management decisions. Angler opinion surveys will also be done in the event trend data present a need for a regulation change. These opinion surveys will be used to determine the angler's concern with the possible regulation change. These surveys will also show if whether or not creel surveys are needed.

Boating and fishing access needs

Currently there are no boater/fisher access projects foreseen at this time. Area fisheries biologists will maintain a close relationship with constituents to monitor access needs.

Meeting with angler groups

Meeting with anglers and angler groups provide valuable information about the fisheries in the state, and the expectations that anglers have of us as resource managers. Meetings with these groups will occur whenever requested to build a stronger relationship with these highly valuable resources. Public meetings will be held annually to share the years' survey results, to solicit feedback from the public about current management practices and to possibly learn of other management needs.

Literature Cited

Oologah Lake Dam Hydroelectric Project FERC No. 12538. Pre Application Document. Symbiotics LLC. 2008.

Southwestern division, Army Corp of Engineers. Monthly Charts for Oologah lake. Retrieved June 18, 2008, from http://www.swt-wc.usace.army.mil/OOLOcharts.html.

Oklahoma Department of Wildlife Conservation. 2002-2006. Oklahoma Bass Tournaments Annual Reports. Retrieved June 19, 2008, from http://www.wildlifedepartment.com/bassreports.htm

Beneficial Use Monitoring Program- Oologah Lake sampling, 2002-2003. Oklahoma Water Resources Board. 2003

Oklahoma Department of Environmental Quality, Fish Consumption Advisories, Retrieved August 7, 2008 from www.deq.state.us/mainlinks/press.htm.

Oklahoma Department of Wildlife Conservation. Largemouth Bass Electrofishing Results 2003. Retrieved June 19, 2008, from http://www.wildlifedepartment.com/electrofishing2003.htm

Oklahoma Department of Wildlife Conservation. Special Restrictions 2008. retrieved on June 19, 2008, from http://www.wildlifedepartment.com/fishregs/specialrestrict.htm.

Southwestern division, Army Corp of Engineers. (2001) Oologah Lake, Oklahoma, Watershed Study. Interim Report of Findings, April-September 2000.

U.S. Army Corps of Engineers, Oologah Lake Project Information, Retrieved August 9, 2008, from

USGS. (2000). Estimated freshwater surface-water withdrawals in Oklahoma, 2000, by basin and use. Retrieved on June 18, 2008, from http://ok.water.usgs.gov/wateruse/huc4-00.html

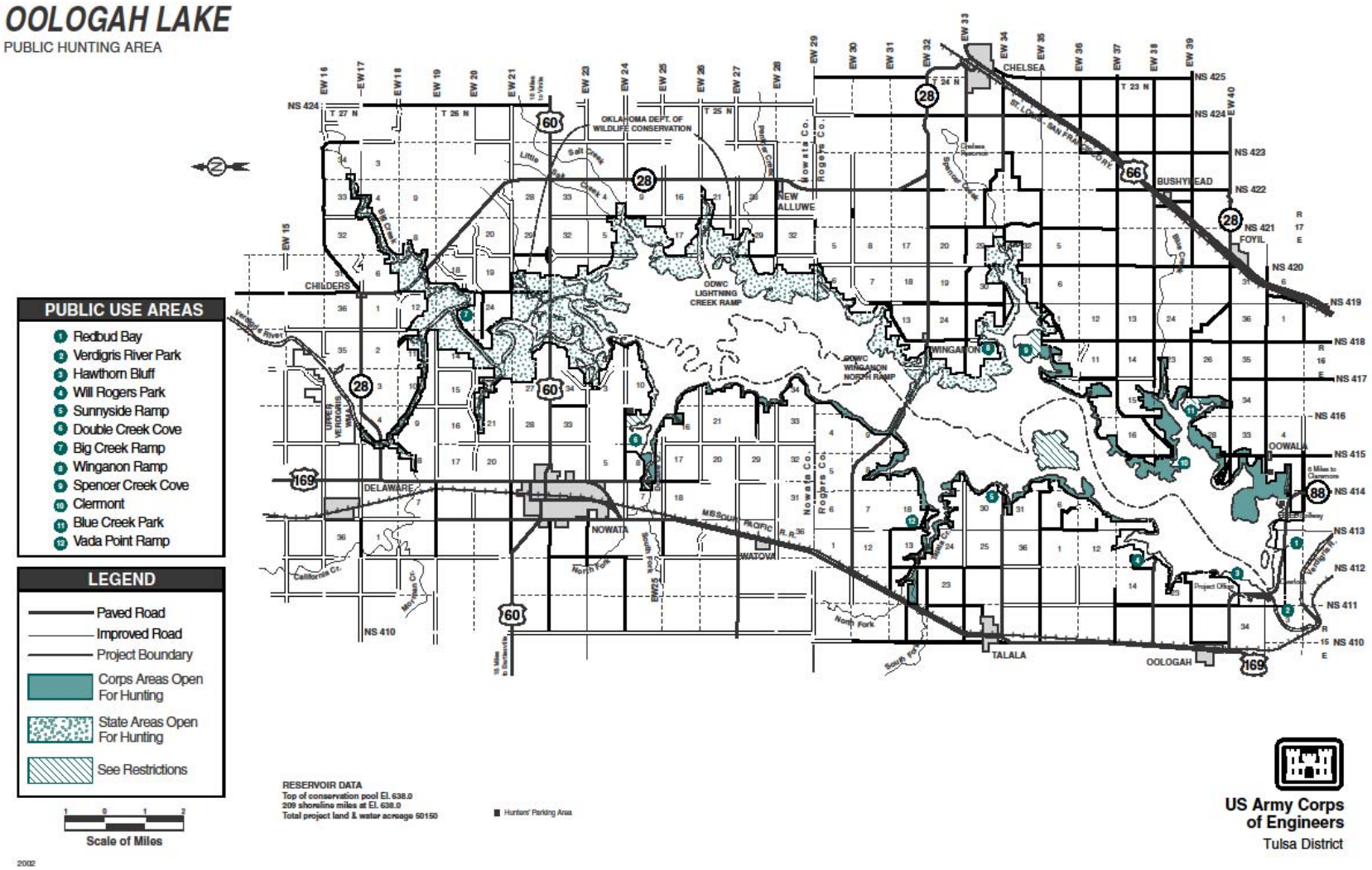

Figure 1. Map of Oologah Lake

Figure 2. Map of 2006 brush piles.

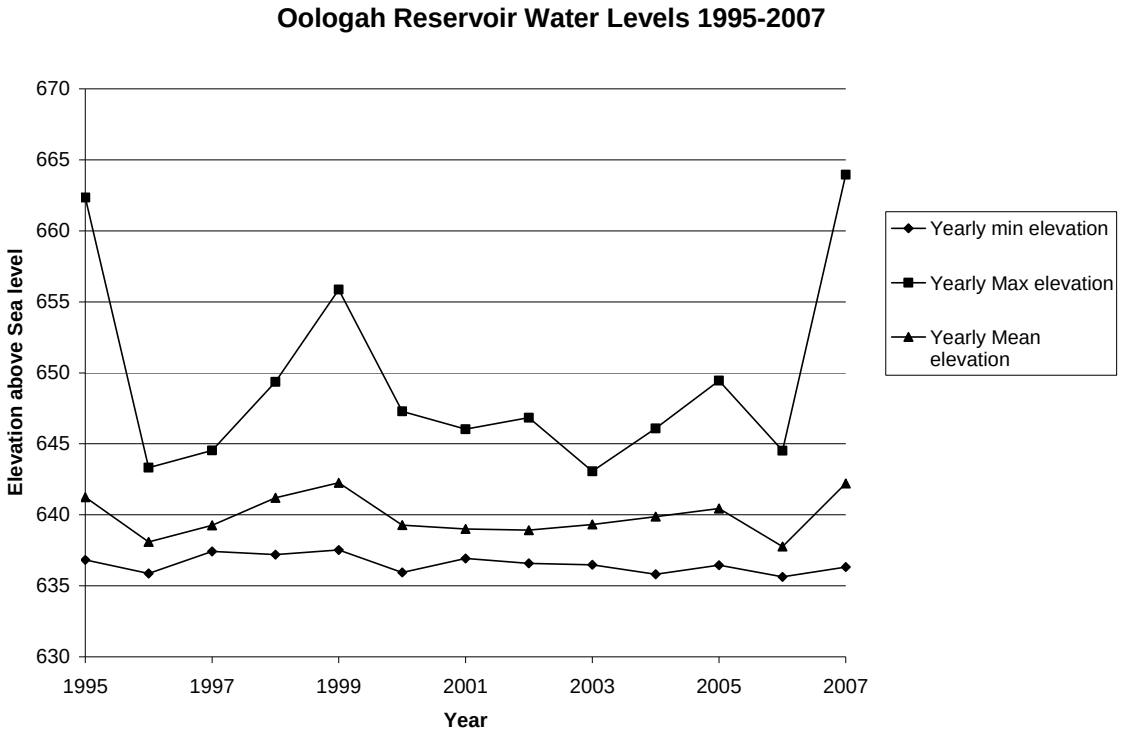

Figure 3. Oologah Lake Water Releases 1995-2007

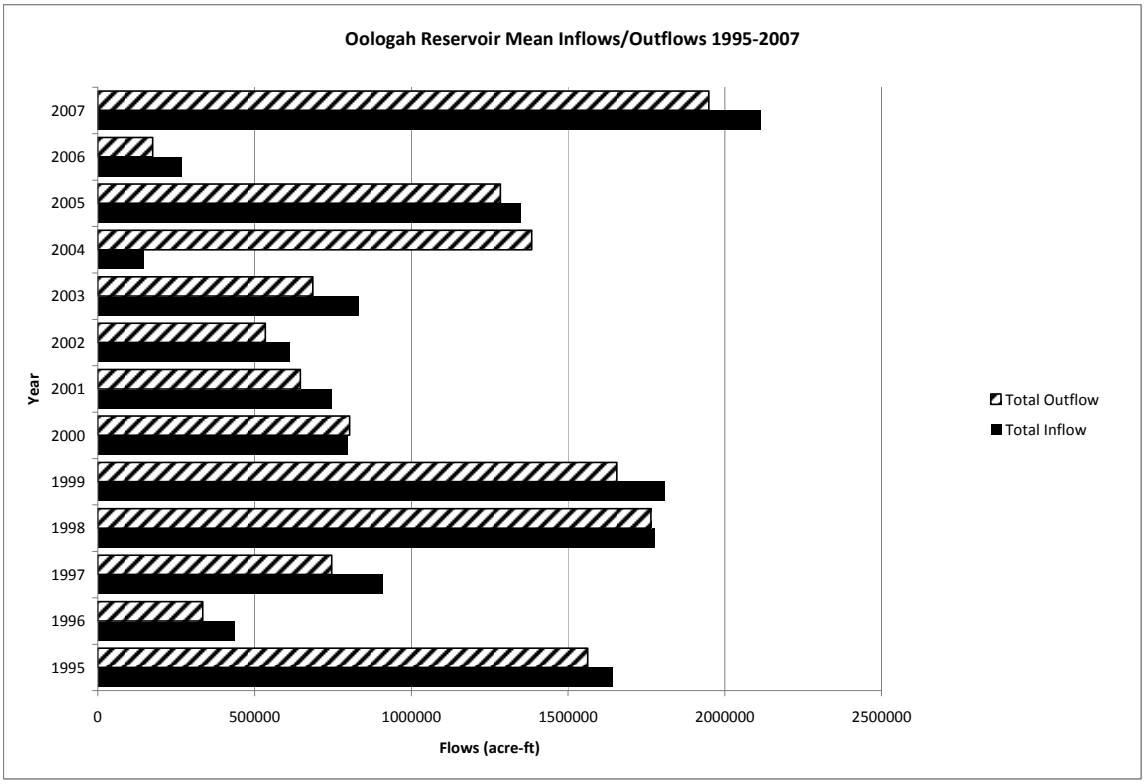

Figure 4. Oologah lake inflows and outflows 1995-2007

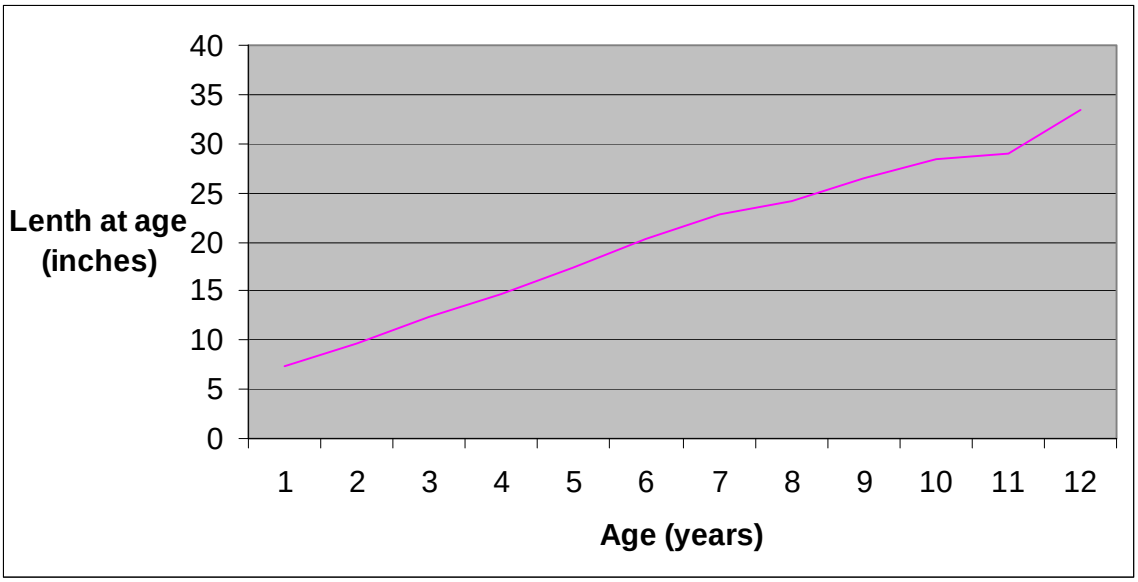

Figure 5. Age growth curve for blue catfish sampled on Oologah Lake in 2006. X axis = age of blue cat sampled and Y axis = length of blue catfish.

Table 1. Water level fluctuation plan for Oologah Lake (Implementation date, January 15, 2008)

Dates	Activity	Purpose
Jun 1-Nov 1	Maintain Lake level at **638** ft.	Maintain fish spawning and rearing habitat
Nov 1-Jan 1	Increase Lake level from **638** to **640** ft.-	Flood terrestrial vegetation for use by migratory birds and waterfowl.
Jan 1-Jan 25	Maintain Lake level at **640** ft.	Flood terrestrial vegetation for use by migratory birds and waterfowl.
Jan 25-Feb 15	Reduce lake level from **640** to **636** ft.	Aerate mud flats and provide oppurtunity for germination of moist soil plants.
Feb 15-Mar 15	Maintain lake level at **636** ft.	Aerate mud flats and provide oppurtunity for germination of moist soil plants.
Mar 15-Apr 15	Increase Lake level from **636** to **638** ft.	Provide stable fish spawning and rearing habitat.
Apr 15-May31	Maintain lake level at **638** ft.	Maintain stable fish spawning and rearing habitat.
1-Jun		Repeat procudures n steps 1 - 7

Table 2. Species, number and size of fish stocked in Oologah Lake, 1987-2008

Year	Species	Number stocked	Size (length)
1987	Norther LMB	50,150	Fingerling
	Walleye	134,920	Fingerling
	Florida LMB	99,795	Fingerling
1988	Northern LMB	263,380	Fingerling
	Walleye	284,930	Fingerling
	Rec. Hyb. STB	215,410	Fingerling
1989	Northern LMB	289,482	Fingerling
	Walleye	301,496	Fingerling
	Rec. Hyb. STB	270,745	Fingerling
1990	Walleye	208,100	Fingerling
	Hyb. STB	130,845	Fingerling
1991	Hyb. STB	69,338	Fingerling
1992	Hyb. STB	1,000,000	Fry
	Smallmouth Bass	149,865	Fingerling
1993	Hyb. STB	77,313	Fingerling
	Smallmouth Bass	43,625	Fingerling
1994	Hyb. STB	2,175,000	Fry
	STB	405,000	Fry
1996	Walleye	103,200	Fry
1997	Hyb. STB	115,800	Fingerling
	Paddlefish	600	12 inches
1998	Smallmouth Bass	5,400	Fingerling
	Paddlefish	1,060	9 inches
	Bluegill sunfish	2,040	3 inches
1999	Smallmouth Bass	11,000	4 inches
	Smallmouth Bass	35,567	3 inches
	Smallmouth Bass	26,538	3 inches
	Smallmouth Bass	34,069	3 inches
2000	Walleye	18,625	1.75 inches
	Smallmouth Bass	26,080	3 inches
	Paddlefish	83	10 inches
	Paddlefish	1,859	15 inches
	Walleye	72,000	1 inch
	Smallmouth Bass	55,750	3 inches
2001	Smallmouth Bass	27,400	*
	Smallmouth Bass	38,000	*
	Hybrid STB	17,940	2 inches
	Smallmouth Bass	19,673	*
2004	Walleye	158,900	1.25 inches
2005	Rec. Hyb. STB	150,000	Fry
2006	Walleye	88,000	1,25 inches
2007	Hybrid STB	49,256	2 inches
	Rec. Hyb. STB	6,573	1 inch
2008	Rec. Hyb. STB	66,492	2 inches

* Size of fish stocked was not available

Table 3. Total number (No.), number/hour (C/f), and relative weights (Wr) by size groups of largemouth bass collected by electrofishing from Oologah Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable Wr values are >90.

	Total (>40)		<8 inches (15-45)		8 – 12 inches (15-30)		> 12 inches (>15)		> 14 inches (>10)		> 16 inches (>2)	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr	C/f	Wr	C/f	Wr
1991	149	12.68	4.0	-	4.426	98	4.255	97	2.723	97	0.085	96
1996	210	56.0	7.733	-	9.867	105	38.40	104	31.467	103	-	-
1997	117	26.00	2.0	-	3.33	99	20.66	100	16.667	100	-	-
2000	116	33.29	7.714	-	23.6	-	52.25	114	58.7	114	-	-
2003	82	46.5	8.4	-	32.2	104	70.27	99	75.37	97		

Table 4. Oologah Lake bass tournament report data 2001-2007. Number of tournaments reported (No.), average number of boats per tournament (No. boats), number of fish per tournament that was greater than 5 pounds (No. >5lbs).

Year	No.	No. boats	Bass/tournament	Bass/angler	% Success	Weight/fish	No. > 5lbs.
2007	3	7	15	2.3	66	2.82	1
2006	26	12	14	0.3	61	2.63	0.1
2005	24	21	8	0.4	50	2.28	1
2004	34	17	10	1.23	62	2.36	2
2003	3	28	28	1.01	69	1.87	0
2002	2	27	27	0.95	27	2.22	0
2001	22	25	18	1.23	56	2.58	9

Table 5. Total number (No.), catch/net night (C/f), and relative weights (Wr) by size groups of crappie sampled by gill netting from Oologah Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable Wr values are >90.

		Total (>.20)	< 8 inches (.05-.30)		> 8 inches (>.08)		> 10 inches (>.04)	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1992	159	10.632	9.216	89	1.392	91	0.528	94
1994	243	18.576	-	-	5.736	98	3.744	100
1995	165	13.416	10.176	82	3.264	97	1.872	94
1996	166	12.288	5.712	80	6.6	101	4.512	102
1997	109	8.208	2.448	92	5.88	95	3.816	99
1998	26	1.944	0.888	76	1.056	100	0.888	99
1999	118	9.96	4.896	83	5.064	96	3.048	97
2004	287	3.48	2.424	93	4.008	85	4.176	90

Table 6. Total number (No.), catch/net night (C/f), and relative weights (Wr) by size groups of white bass sampled by gill netting from Oologah Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable Wr values are >90.

		Total (>.20)	< 8 inches (>.05)		8 – 12 inches (.05-.30)		>12 inches (>.10)	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1992	74	4.944	0.792	97	1.944	90	2.208	87
1994	242	18.504	1.824	98	6.576	98	10.08	100
1995	242	19.68	2.928	95	8.604	92	8.712	96
1996	200	14.808	2.232	91	4.968	96	7.632	97
1997	312	23.856	3.048	97	7.944	94	12.84	96
1998	17	1.272	0.216	104	0.672	94	0.384	96
1999	116	9.96	1.944	98	1.944	105	5.904	99
2004	213	2.616	0.96	88	3.168	90	3.6	90

Table 7. Total number (No.), catch/net night (C/f) and relative weights (Wr) by size groups of walleye collected by gill netting Oologah Lake. Acceptable Wr values are >90.

	Total		< 12 inches		12-16 inches		> 16 inches	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1992	10	0.672	-	-	-	-	0.672	114
1994	12	0.912	0.072	99	0.144	93	0.696	101
1995	6	0.48	-	-	-	-	0.48	95
1996	13	0.96	0.6	90	0.072	98	0.288	117
1997	4	0.312	0.072	109	0.312	105	0.24	104
1999	16	1.344	1.008	107	0.096	103	0.264	103
2004	22	3.048	0.528	94	-	-	0.432	101

Table 8. Total number (No.), catch/net night (C/f) by size group of gizzard shad sampled using gill nets at Oologah Lake. Gizzard shad < 8 inches are considered acceptable forage.

	Total	<8 inches
Year	No.	C/f
1992	40.056	38.784
1994	29.88	24.312
1995	82.344	75.576
1996	13.248	12.36
1997	31.344	27.6
1998	3.216	0.888
1999	79.008	60.936
2004	3.336	1.536