# Draft Oologah Lake Master Plan

**Arkansas River Basin: Verdigris Watershed,**
**Rogers and Nowata Counties, Oklahoma**

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# EXECUTIVE SUMMARY

Oologah Lake Master Plan
U.S. Army Corps of Engineers
Prepared by the Southwestern Division
Regional Planning and Environmental Center (RPEC)
September 2021

## ES.1 PURPOSE

The revision of the 1977 *Oologah Lake Master Plan* (hereafter Plan or Master Plan) is a framework built collaboratively to guide appropriate stewardship of U.S. Army Corps of Engineers (USACE) administered resources at Oologah Lake over the next 25 years. The 1977 Master Plan for Oologah Lake was an update to the 1968 Master Plan. The 1977 Plan has served well past its intended 25-year planning horizon and does not reflect the growing population around the lake and regional recreation needs.

Oologah Lake was authorized in 1938 as a multipurpose project for flood control, municipal and industrial water supply, navigation, and hydroelectric power (deferred). The hydroelectric power purpose was later reassigned to municipal and industrial water supply. Later public laws added recreation and fish and wildlife to the project's purpose. Today, Oologah Lake is a multipurpose project for flood control, water supply, recreation, navigation, and fish and wildlife management. The project was designed to provide maximum flood protection on the Lower Verdigris and Arkansas Rivers when operated in conjunction with the Arkansas River Basin System. In addition to these primary missions, the USACE has an inherent mission for environmental stewardship of project lands while working closely with stakeholders and partners to provide regionally important outdoor recreation opportunities.

The Master Plan is primarily a land use and outdoor recreation strategic plan that does not address the specific authorized purposes of flood risk management or water supply. Although water management is addressed in the 1996 USACE Water Control Manual for Oologah Lake, the Master Plan acknowledges that fluctuating water level for flood risk management and water supply can have a dramatic effect on outdoor recreation, especially at boat ramps, swim beaches, and the marina.

The 1977 Master Plan included a total of 22,017 acres of USACE land and 28,133 acres of surface water at the normal or conservation pool elevation of 638.0 feet National Geodetic Vertical Datum of 1929 (NGVD29). The acres figure was derived using land measurement technology dating from the 1950s and has been used since 1977 to describe the size of the pool at the normal elevation. The mapping used for this Master Plan revision uses modern satellite imagery and Geographic Information System (GIS) mapping, resulting in different acreage calculations than that of the 1977 Master Plan. Oologah Lake has a water surface of 28,134 acres at the conservation pool of 638.0 NGVD29. Approximately 22,016 acres of federal land lie above the conservation pool with a shoreline of approximately 177 miles at the top of the conservation pool. Oologah Dam

and Lake Project (Oologah Lake hereafter) is part of an integral component the larger Arkansas River Basin System. Included in this system are completed projects in the Verdigris, Walnut, Canadian, North Canadian, Grand, Caney, Illinois, and Poteau River Basins. This Plan and supporting documentation provide an inventory and analysis, goals, objectives, and recommendations for USACE lands and waters at Oologah Lake, Oklahoma, with input from the public, stakeholders, and subject matter experts.

## ES.2 PUBLIC INPUT

To ensure a balance between operational, environmental, and recreational outcomes, the USACE obtained both public and agency input toward the Master Plan. An Environmental Assessment (EA) was completed in conjunction with the Master Plan to evaluate the impacts of alternatives and can be found in Appendix B.

Six (6) individuals, not including USACE personnel, attended the public scoping meeting held at the onset of the process on 27 February 2020 for the Oologah Lake Master Plan Revision. During the initial 30-day comment period, a total of two (2) separate written comments were received from 1 member of the public.

A virtual (online) public workshop to announce the final draft Master Plan with the EA was held beginning 29 September 2021 followed by a 30-day comment period. The virtual public involvement process is necessary due to the public meeting constraints resulting from the COVID-19 pandemic. A presentation explaining the virtual process and high points of the draft Master Plan was posted on the USACE Tulsa District Website. All comments received must be in writing, and all comments were considered when developing the final Master Plan. After reviewing all public and agency comments, a final Master Plan was published to the Tulsa District Website.

## ES.3 RECOMMENDATIONS

The following land and water classification changes (detailed in Chapter 8) were a result of the inventory, analysis, synthesis of data, documents, and public and agency input. In general, all USACE land at Oologah Lake was reclassified either by a change in nomenclature required by regulation or changes needed to identify actual and projected use. Changes to the acreage differentiates areas set aside for intensive recreation and sets aside acreage for Environmentally Sensitive Areas and Multiple Resource Management.

**Table ES.1 Change from Prior Land Classification to Proposed Land Classification**

| Prior Land Classifications (1977 Plan) | Acres | | Proposed Land Classifications | Acres |
|---|---|---|---|---|
| Operations and Maintenance | 329 | | Project Operations | 413 |
| Recreational Areas | 2,345 | | High Density Recreation | 1,699 |
| – | | | Environmentally Sensitive Areas | 7,587 |
| Wildlife Management USACE Managed | 4,090 | | Multiple Resource Management – Wildlife Management | 12,317 |
| Wildlife Management Oklahoma Managed | 15,253 | | – | – |
| **Total Land Acres** | **22,017** | | **Total Land Acres** | **22,016** |

* Total Acreage differences from the 1977 total to the 2020 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

**Table ES.2 Change from Prior Water Surface Classification to Proposed Water Surface Classification**

| Prior Water Surface Classifications (1977 Plan) | Acres | | Proposed Water Surface Classifications | Acres |
|---|---|---|---|---|
| Permanent Pool | 28,133 | | Permanent Pool | 28,134 |
| – | – | | – Restricted | 23 |
| – | – | | – Designated No Wake | 288 |
| – | – | | – Open Recreation | 27,823 |
| Flowage Easement | 15,119 | | Flowage Easement | 15,119 |

* Total Acreage differences from the 1977 total to the 2021 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

The acreages of the conservation pool and USACE land lying above the conservation pool was measured using satellite imagery and Geographical Information System (GIS) technology. The GIS software allows for more finely tuned measurements and, thus, stated acres may vary from official land acquisition records and acreage figures published in the 1977 Master Plan. Some changes may also be due to erosion and siltation. A more detailed summary of changes and rationale can be found in Chapter 8.

## ES.4 PLAN ORGANIZATION

Chapter 1 of the Master Plan presents an overall introduction to Oologah Lake. Chapter 2 consists of an inventory and analysis of Oologah Lake and associated land resources. Chapters 3 and 4 lay out management goals, resource objectives, and land

classifications. Chapter 5 is the resource management plan that identifies how project lands will be managed for each land use classification. This includes current and projected overall park facility needs, an analysis of existing and anticipated resource use, and anticipated influences on overall project operation and management. Chapter 6 details special topics that are unique to Oologah Lake. Chapter 7 identifies the public involvement efforts and stakeholder input gathered for the development of the Master Plan, and Chapter 8 gives a summary of the changes in land classification from the previous master plan to the present one. Finally, the appendices include information and supporting documents for this Master Plan revision, including Land Classification and Park Plate Maps (Appendix A).

An Environmental Assessment was developed with the Master Plan, which analyzed alternative management scenarios for Oologah Lake, in accordance federal regulations including the National Environmental Policy Act of 1969, as amended (NEPA); regulations of the Council on Environmental Quality; and USACE regulations, including Engineer Regulation 200-2-2: Procedures for Implementing NEPA. The EA is a separate document that informs this Master Plan and can be found in its entirety in Appendix B.

The EA evaluated two alternatives as follows: 1) No Action Alternative, which would continue the use of the 1977 Master Plan, and 2) Proposed Action. The EA analyzed the potential impact these alternatives would have on the natural, cultural, and human environments. The Master Plan is conceptual and broad in nature, and any action proposed in the Plan that would result in significant disturbance to natural resources or result in significant public interest would require additional NEPA documentation at the time the action takes place.

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# CHAPTER 1 – INTRODUCTION

## 1.1 GENERAL OVERVIEW

Oologah Dam and Lake (hereafter Oologah Lake) is located at river mile (RM) 90.2 on the Verdigris River, within the Arkansas River Basin. The damsite is in Rogers County, about 22 miles northeast of the Tulsa city limits and 45 miles northeast of downtown Tulsa (Figure 1.1), and the lake is partially within Nowata and Rogers Counties. Approximately 50,150 acres of fee simple were purchased for the project in addition to 15,119 acres of flowage easement. The construction of Oologah Lake was in two stages. The initial development began in July 1950 for the construction of the main embankment and outlet works, an uncontrolled saddle spillway, and an emergency overflow. The final stage of development was the construction of the gated spillway. Deliberate impoundment began for the initial development in May 1963 and reached conservation pool in April 1964. Deliberate impoundment for the final development began in January 1971 and reached conservation pool in July 1977.

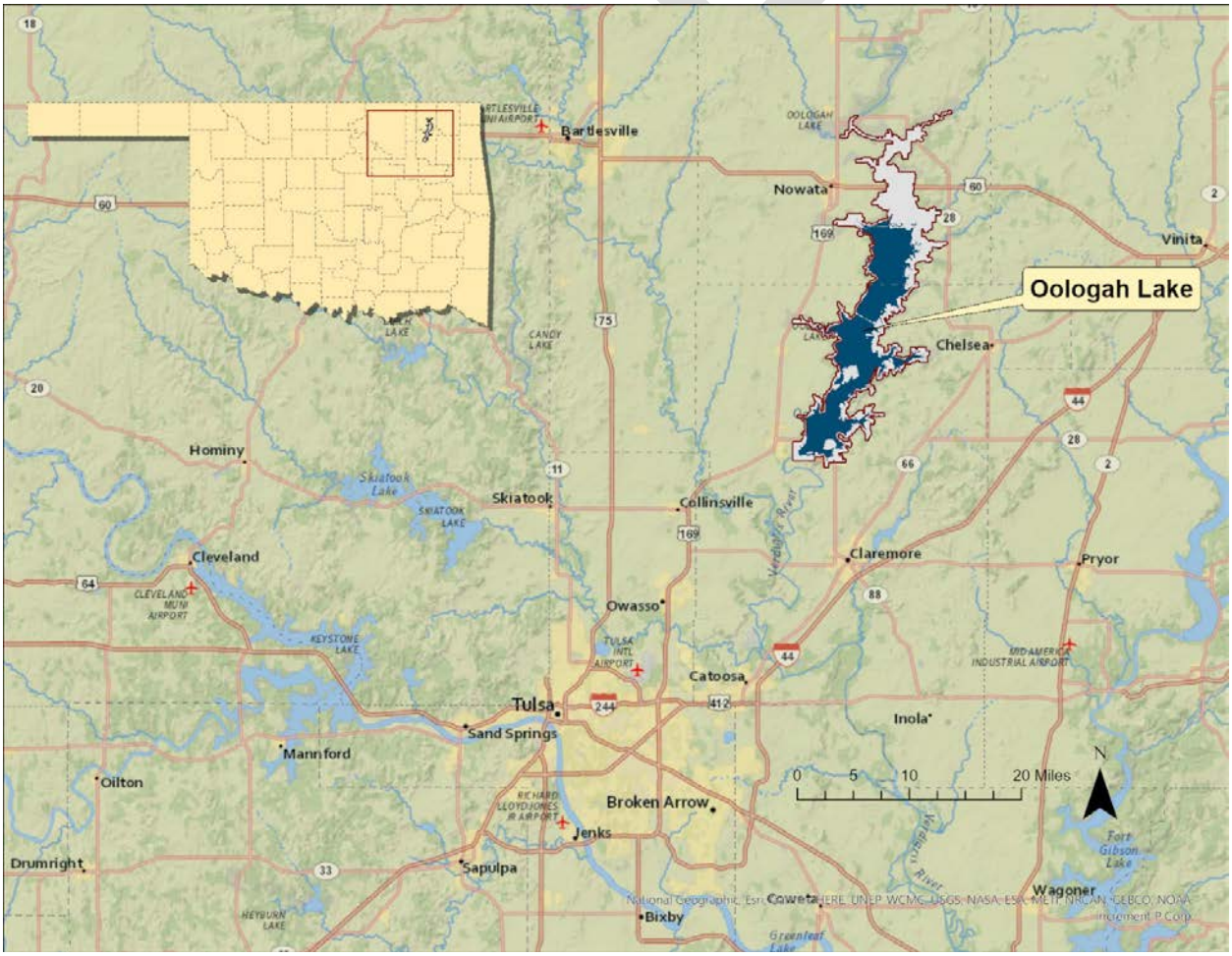


**Figure 1.1.1 – Vicinity Map of Oologah Lake and Dam**

Oologah Lake is an integral part of the U.S. Army Corps of Engineers (USACE) regional plan for flood control and water supply in the Arkansas River Basin System. Included in this system are completed projects in the Verdigris, Walnut, Canadian, North Canadian, Grand, Caney, Illinois, and Poteau River Basins. The total drainage area upstream of Oologah Dam is 4,339 square miles, 1,986 square miles of which are controlled by upstream reservoirs. The USACE operates and maintains the dam and associated facilities and administers the Federal lands and flowage easements comprising the project through a combination of direct management and leases for park and recreation purposes and through consultation with local Tribal Nations.

The Master Plan is intended to serve as a comprehensive land and recreation management guide with an effective life of approximately 25 years. The focus of the Plan is to guide the stewardship of natural and cultural resources and make provision for outdoor recreation facilities and opportunities on federal land associated with Oologah Lake. The Master Plan identifies conceptual types and levels of activities, but does not include designs, project sites, or estimated costs. All actions carried out by the USACE, other agencies, and individuals granted leases to USACE lands must be consistent with the Master Plan. The Plan does not address the flood risk management or water supply purposes of Oologah Lake. The Oologah Lake Master Plan was last updated as Design Memorandum No. 15B in 1977 which is well past the intended planning horizon of 25 years. In 1999, USACE discontinued use of the Design Memorandum system as a means of organizing the many phases of civil works projects, therefore, the term “Design Memorandum” is not used in the title of this Master Plan revision.

National USACE missions associated with water resource development projects may include flood risk management, water supply, water quality, navigation, recreation, fish and wildlife, and hydroelectric power generation. Most of these missions serve to protect the built environment and natural resources of a region from the climate extremes of drought and floods. This helps to create a more resilient and sustainable region for the health, welfare, and energy security of its citizens. Mitigation, while not a formal mission at USACE lakes, may be implemented to achieve the fish and wildlife and recreation missions. Maintaining a healthy vegetative cover and including a native prairie or tree cover where ecologically appropriate on Federal lands within the constraints imposed by primary project purposes helps reduce stormwater runoff and soil erosion, mitigates air pollution, and moderates temperatures. To this end, the USACE has developed the following statements.

The USACE Sustainability Policy and Strategic Plan states that:

> *“The U.S. Army Corps of Engineers strives to protect, sustain, and improve the natural and man-made environment of our Nation, and is committed to compliance with applicable environmental and energy statutes, regulations, and Executive Orders. Sustainability is not only a natural part of the Corps' decision processes; it is part of the culture.*

*Sustainability is an umbrella concept that encompasses energy, climate change and the environment to ensure today's actions do not negatively impact tomorrow. The Corps of Engineers is a steward for some of the Nation's most valuable natural resources and must ensure customers receive products and services that provide sustainable solutions that address short and long-term environmental, social, and economic considerations."*

The USACE mission for the Responses to Climate Change Program is:

*"To develop, implement, and assess adjustments or changes in operations and decision environments to enhance resilience or reduce vulnerability of USACE projects, systems, and programs to observed or expected changes in climate."*

## 1.2 PROJECT AUTHORIZATION

Oologah Lake was authorized on June 28, 1938 with the primary missions of flood control and navigation as contained in the Flood Control Act of 1938 (Public Law [PL] 761, 76th Congress, 3d Session), and development was later authorized by the Rivers and Harbor Act of 24 July 1946 (PL 525, 79th Congress, 2d Session). Construction was performed in two stages. The first stage began in July 1950 on the main embankment and outlet works, an uncontrolled saddle spillway at the site of the final gated spillway, and an emergency overflow area at the site of the final dike embankment. Construction was placed on standby in October 1951 and resumed December 1955 on the gated spillway and dike embankment. The conservation pool was filled 29 July 1972.

## 1.3 PROJECT PURPOSE

Oologah Lake is a multipurpose water resource project constructed and operated by the USACE. The project was designed to provide maximum flood protection on the Lower Verdigris and Arkansas Rivers when operated in conjunction with the larger Arkansas River Basin System. When originally authorized in 1938, hydroelectric power generation was designated as one of the project's purposes, but plans for power generation were deferred, and the power storage was later reassigned to municipal and industrial water supply by Public Law 93-251, dated 7 March 1974. Oologah Lake has the following primary purposes authorized by the laws listed above:

- Flood risk management
- Water supply
- Recreation
- Navigation
- Fish and wildlife

In addition to these primary missions, the USACE has an inherent mission for environmental stewardship of project lands while working closely with stakeholders and partners to provide regionally important outdoor recreation opportunities. Other laws,

including but not limited to Public Law 91-190, National Environmental Policy Act of 1969 (NEPA) and Public Law 86-717, Forest Cover Act, place emphasis on the environmental stewardship of Federal lands and USACE-administered Federal lands, respectively.

## 1.4 MASTER PLAN PURPOSE AND SCOPE

In accordance with Engineering Regulation (*ER) 1130-2-550 Change 07, dated 30 January 2013 and Engineering Pamphlet (EP) 1130-2-550 Change 05, dated 30 January 2013*, master plans are required for most USACE water resources development projects having a federally owned land base. The master plan works in tandem with the Operational Management Plan (OMP), which is the task-oriented implementation tool for the resource objectives and development needs identified in the master plan. This revision of the Master Plan is intended to bring the master plan up to date to reflect current ecological, socio-demographic, and outdoor recreation trends that are impacting the lake, as well as those anticipated to occur within the next 25 years.

The *Oologah Lake Master Plan (*hereafter Plan or Master Plan) is the strategic land use management document that guides the efficient, cost-effective, comprehensive management, development, and use of recreation, natural resources, and cultural resources throughout the life of the Oologah Lake project. It is a vital tool for responsible stewardship and sustainability of the project's natural and cultural resources for the benefit of present and future generations. The Plan guides and articulates USACE responsibilities pursuant to federal laws to preserve, conserve, restore, maintain, manage, and develop the land, water, and associated resources. It is a dynamic and flexible tool designed to address changing conditions. The Plan focuses on carefully crafted resource-specific goals and objectives. It ensures that equal attention is given to the economy, quality, and needs in the management of Oologah Lake resources and facilities, and that goals and objectives are accomplished at an appropriate scale.

The master planning process encompasses a series of interrelated and overlapping tasks involving the examination and analysis of past, present, and future environmental, recreational and socioeconomic conditions and trends. With a generalized conceptual framework, the process focuses on four primary components:

- Regional and ecosystem needs
- Project resource capabilities and suitability
- Expressed public interests that are compatible with Oologah Lake's authorized purposes
- Environmental sustainability elements

It is important to note what the Master Plan does not address. Details of design, management and administration, and implementation are not addressed here but are covered in the Oologah Lake OMP. In addition, the Master Plan does not address the specifics of regional water quality, shoreline management (a term used to describe primarily vegetation modification or permits by neighboring landowners), or water level management, nor does it address the operation and maintenance of prime project operations facilities such as the dam embankment, gate control outlet, and spillway.

Additionally, the Plan does not address the flood risk management, navigation, water supply, or fish and wildlife purposes of Oologah Lake with respect to management of the water level in the lake.

The previous Plan was sufficient for prior land use planning and management, but changes in outdoor recreation trends, regional land use, population, current legislative requirements, and USACE management policy have occurred over the past decades. Additionally, increased urbanization and the proximity to Tulsa, increasing fragmentation of wildlife habitat, national policies related to land management, climate change, and growing demand for recreational access and protection of natural and cultural resources are all factors affecting Oologah Lake and the region in general. In response to these escalating pressures and trends, a full revision of the 1977 Master Plan is required as set forth in this Plan. The Master Plan revision will update land classifications and include new resource management goals and objectives.

## 1.5 BRIEF WATERSHED AND PROJECT DESCRIPTION

Oologah Lake is located in the Verdigris River watershed in the Arkansas River Basin. The Verdigris River originates in the Flint Hills of Chase County, Kansas, and flows generally southeast from the vicinity of Madison to Neodesha, Kansas, and then in a southerly direction to its confluence with the Arkansas River, about 5 miles northeast of Muskogee, Oklahoma. The river basin is roughly elliptical in shape, with a total area of 8,303 square miles, of which 4,339 square miles are above the Oologah Dam and is divided as follows: 3,354 square miles in Kansas and 985 square miles in Oklahoma. The principal tributaries are the Fall and Elk Rivers that enter from the right bank in Kansas and the Caney River and Bird Creeks that enter from the right bank in Oklahoma downstream from Oologah Dam.

Operational structures upstream of Oologah Dam are Elk City Lake in Kansas on the Elk River, Pearson-Skubitz Big Hill Lake in Kansas on Big Hill Creek, Fall River Lake in Kansas on the Fall River, and Toronto Lake in Kansas on the Verdigris River. Structures downstream of Oologah Lake in the Verdigris River Basin include Hulah and Copan Lakes on the Caney River, Skiatook and Birch Lakes on Bird Creek, and McClellan-Kerr Navigation System on the Verdigris and Arkansas Rivers.

Oologah Dam consists of a compacted earthfill embankment, dike, gated spillway, controlled saddle spillway, and a gated outlet works. Flows through the gated spillway are controlled by seven 40-foot by 21-foot tainter gates. The outlet works consist of two 19-foot diameter conduits, vertical lift gates, and low flow structures. The water supply intake structure consists of one 84-inch diameter conduit that transitions to a 66-inch diameter conduit, located in a wet well on the right side of the intake structure. The wet well has two intake gates. The total length of the dam is 4,000 feet long. The dike is located approximately one-half mile east of the spillway and is 3,330 feet long.

The real estate acquisition was based on contour elevation 655.0 feet NGVD29, which is approximately the 10-year frequency pool elevation. Flowage easements were acquired to a higher elevation of 664.0 NGVD29. In the upper reaches of the lake, the flowage easement is based on the projected elevation of a 50-year flood after 50 years

of sedimentation. A total of 50,150 fee simple acres and 15,119 flood flowage easement acres were acquired for the construction of Oologah Lake.

## 1.6 DESCRIPTION OF RESERVOIR

Oologah Lake covers approximately 28,134 surface acres of water when at the top of conservation pool (638.0 NGVD29). The deepest part of the lake is located directly upstream of the dam and is approximately 65 feet deep, while depth gradually decrease further north of the dam. The top of the flood control pool is elevation 661.0 feet NGVD29, and the top of the surge pool is 666.0 feet NGVD29. At the conservation pool, the lake was designed to accommodate 342,600 acre-feet for water supply and the accumulation of 34,700 acre-feet of sediment. The sediment inflow to the lake is lower than other reservoirs in the Verdigris basin due to almost 50 percent of the watershed being controlled by upstream reservoirs.

## 1.7 PROJECT ACCESS

Oologah Lake is easily accessed by several primary, secondary, and tertiary roads. U.S. Interstate Highway (I) 44 is the only interstate highway near Oologah Lake and is located southeast of the lake. U.S. Highway (US) 66 is also southeast of the lake but provides closer access to the lake than I 44. US 60 crosses the northern end of the lake and connects Nowata just northwest of the lake to Vinita approximately 20 miles east of Oologah Lake. US 169 is the main north-south access road and is located west of the lake; it passes through Tulsa to the southwest and continues northward towards Kansas. Oklahoma State Highway (OK) 88 connects Claremore south of the lake, across the dam, to US 169 in Oologah. To the east of the lake, OK 28 connects OK 66 in the town of Chelsea, turns northward to the town of New Alluwe, and continues past US 60 northeast of the lake. Although not a major road, E. 300 Road connects OK 28 east of the lake, bisecting across the middle of the lake, to US 169 west of the lake.

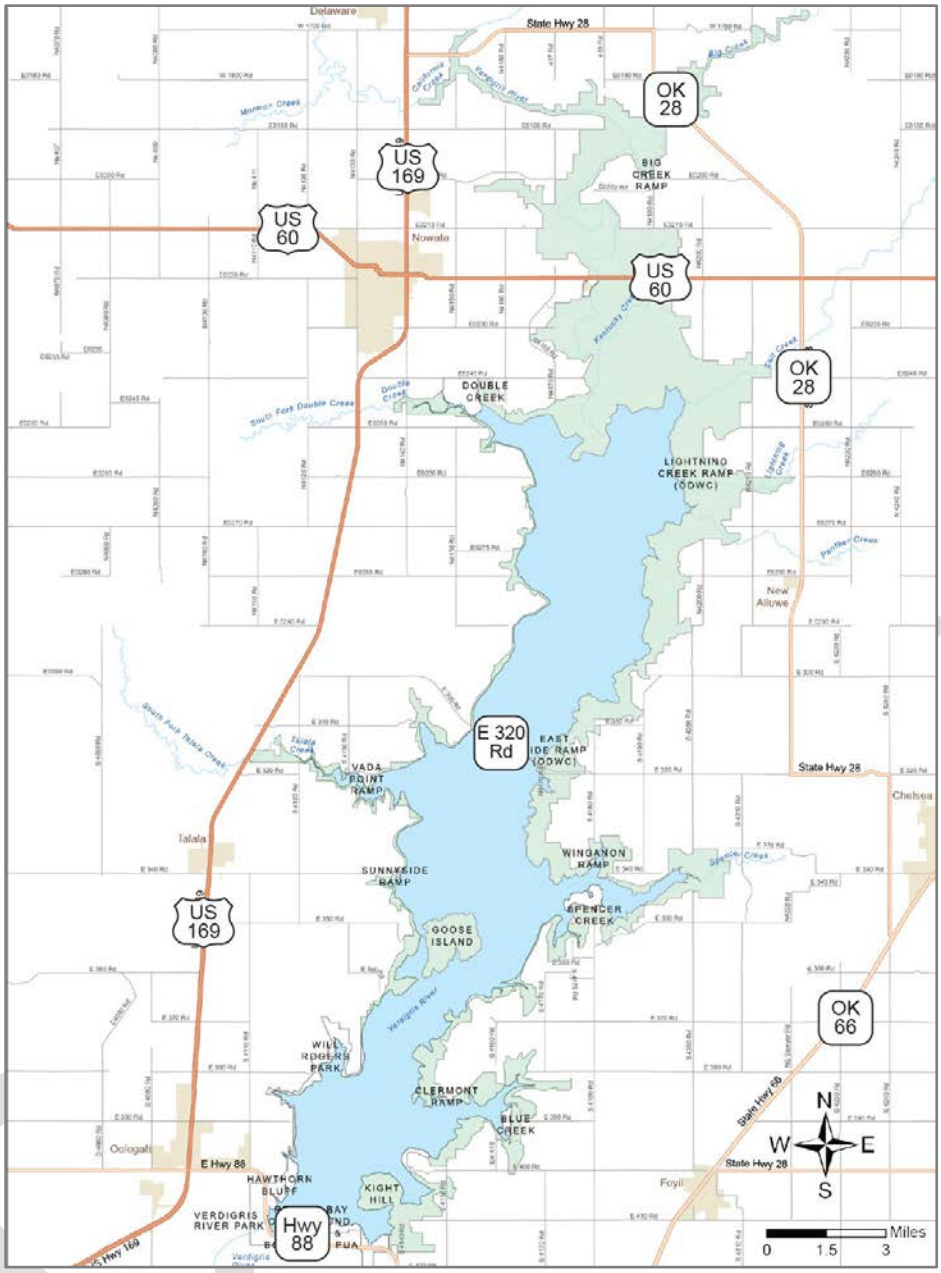


**Figure 1.2 – Major Road Networks Providing Access to Oologah Lake**

## 1.8 PRIOR DESIGN MEMORANDA AND PLANNING REPORTS

Design Memorandums (DM) and planning reports approve and set forth design and development plans for all aspects of the project including the prime flood risk management facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the master plan for recreation development and land management. The Master Plan, Oologah Lake, Oologah, Oklahoma, dated October 1977, presents a program for development and management of the area for recreation and other land and water uses. The following are DM's for Oologah Lake:

- Design Memorandum No. 1, Construction of First Stage Embankment and Outlet Works Excavation, dated 20 October 1955.
- Design Memorandum No. 2, Construction of Project Buildings, dated 29 November 1955.
- Design Memorandum No. 3-1, Real Estate Segment B, dated 9 December 1955.
- Design Memorandum No. 4, Construction of Access Road - Left Abutment, dated 11 January 1956.
- Design Memorandum No. 5, Spillway Excavation, dated 15 February 1956.
- Design Memorandum No. 6, Relocations Nowata Water Supply, dated June 1956, superseded by June 1956 version.
- Design Memorandum No. 7, Real Estate Segments C, D, E, F, G, and H, dated 27 July 1956.
- Design Memorandum No. 8, Hydrology, dated 7 August 1956.
- Design Memorandum No. 9, Relocation General, dated 9 November 1956.
- Design Memorandum No. 10, Relocations Shell Pipe Line Corporation Facilities, dated 29 October 1956.
- Design Memorandum No. 11, General Design, dated 23 November 1956.
- Design Memorandum No. 12, Construction of Spillway & Outlet Works & Completion of Embankment, dated 24 January 1957.
- Design Memorandom No. 13, Real Estate Portion of Segment R (ROW for Relocation, U.S. Highway 60), dated 5 April 1957.
- Design Memorandum No. 14, Relocation of Missouri-Pacific Railroad Facilities, dated 11 July 1957.
- Design Memorandum No. 15-1, Preliminary Master Plan for Reservoir Development and Management, dated 9 July 1957.
- Design Memorandum No. 15-2, Master Plan for Reservoir Development and Management, dated July 1959.
- Design Memorandum No. 15B, Master Plan, dated June 1967. Master Plan Update, dated 10 October 1977. Supplement No. 6, dated December 1989. Supplement No. 5, dated August 1988. Supplement No. 4, dated July 1987. Supplement No. 3, dated September 1986. Supplement No. 2, dated October 1985. Supplement No. 1, dated May 1978.
- Design Memorandum No. 16, Relocations of State & Federal Highways, dated October 1957. Amendment No. 1 dated September 1958. Supplement No. 2 approved June 1961. Supplement No. 1.
- Design Memorandum No. 17, Relocation of Rogers County Roads, dated 17 December 1957. Supplement No. 2, dated September 1960. Supplement No, 1 dated November 1959.

- Design Memorandum No. 18, Real Estate – Right-of-Way for Relocation of U.S. highway Nos. 60 and 169 and State Highway No. 28, dated 15 November 1957.
- Design Memorandum No. 19, Real Estate – Right-of-Way for Alternation of Missouri-Pacific Railroad, dated 17 December 1957.
- Design Memorandum No. 20, Relocation of Cemeteries, dated 22 January 1958.
- Design Memorandum No. 21, Real Estate – Right-of-Way for Relocation of County Roads, Rogers County, dated 17 December 1957.
- Design Memorandum No. 22, Real Estate segments K Through Y (Remainder of Reservoir Area), dated 22 January 1958.
- Design Memorandum No. 23, Relocations, Cities Service Gas Company, dated 2 April 1958.
- Design Memorandum No. 24, Construction of Spillway Bridge - State Highway No. 88, dated 27 March 1958.
- Design Memorandum No. 25, Clearing Reservoir, dated 14 May 1958.
- Design Memorandum No. 26, Relocation of Texaco-Cities Service Pipe Line Company Facilities, dated 19 August 1958
- Design Memorandum No. 27, Relocation of Service Pipe Line Facilities, dated 20 February 1959.
- Design Memorandum No. 28, Relocation of Nowata County Roads, dated 7 April 1959. Supplement No. 1, dated November 1959. Supplement No. 2, dated August 1960. Supplement No. 3, dated September 1960. Supplement No. 4, dated September 1961.
- Design Memorandum No. 29, Real Estate – Right-of-Way for Relocation of County Roads, Nowata County, Dated 13 April 1959.
- Design Memorandum No. 30, Relocation of Utilities, Verdigris Valley Electric Cooperative, Inc., dated 17 June 1959.
- Design Memorandum No. 31, Relocation of Public Service Company of Oklahoma, dated 22 June 1959.
- Design Memorandum No. 32, Plugging Oil and Gas Wells, 17 September 1959.
- Design Memorandum No. 33, Relocation of Southwestern Bell Telephone Company Facilities, dated 8 January 1960.
- Design Memorandum No. 34, Relocation of Consumers Gas Cooperative Association Facilities, dated 30 December 1959.
- Design Memorandum No. 35, Relocation of Oil Field Cooperative Electric Company Facilities, dated 22 January 1960. Supplement No. 1 dated September 1961. Supplement No. 2, dated October 1962.

- Design Memorandum No. 36, Relocation of Consumers Cooperative Electric Company Facilities, dated March 1960. Supplement No. 1 dated November 1962.
- Design Memorandum No. 37, Outlet Channel Slope Protection, dated 16 August 1961.
- Design Memorandum No. 38, Fallout Shelter, dated 30 November 1961.
- Design Memorandum No. 39, Ultimate Development of Spillway, dated 25 February 1966.
- Design Memorandum No. 40, Reservoir Clearing, dated June 1967.
- Design Memorandum No. 41, Real Estate – Minerals, dated June 1967.

## 1.9 PUBLIC LAWS

The following Public Laws (PL) are applicable to Oologah Lake. Additional information on Federal Statutes applicable to Oologah can be found in the Environmental Assessment for the Oologah Lake Master Plan revision in Appendix B of this Plan.

1. PL 59-209, Antiquities Act of 1906. This was the first federal law established to protect what are now known as "cultural resources" on public lands. It provides a permit procedure for investigating "antiquities" and consists of two parts: An act for the Preservation of American Antiquities, and Uniform Rules and Regulations.
2. PL 74-292, Historic Sites Act of 1935. This act declares it to be a national policy to preserve for (in contrast to protecting from) the public, historic (including prehistoric) sites, buildings, and objects of national significance. This act provides both authorization and a directive for the Secretary of the Interior, through the National Park Service, to assume a position of national leadership in the area of protecting, recovering, and interpreting national archeological historic resources. It also establishes an "Advisory Board on National Parks; Historic Sites, Buildings, and Monuments, a committee of eleven experts appointed by the Secretary to recommend policies to the Department of the Interior".
3. PL 75-761, Flood Control Act of 1938. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes including construction of Oologah Lake.
4. PL 78-534, Flood Control Act of 1944. Section 4 of this act as last amended in 1962 by Section 207 of Public Law 87-874 authorizes the USACE to construct, maintain, and operate public parks and recreational facilities in reservoir areas and to grant leases and licenses for lands, including facilities, preferably to federal, state or local governmental agencies. This law also authorized the creation of the Southwestern Power Administration (SWPA), then within the Dept. of the Interior and now within the Dept. of Energy, as the agency responsible for marketing and delivering the power generated at federal reservoir projects.

5. PL 79-525, River and Harbor Act of 1946. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.
6. PL 79-526, Flood Control Act of 1946 (24 July 1946). This law amends PL78-534 to include authority to grant leases to non-profit organizations at recreational facilities in reservoir areas at reduced or nominal fees.
7. PL 83-780, Flood Control Act of 1954. This act authorizes the construction, maintenance, and operation of public park and recreational facilities in reservoir areas under the control of the Department of the Army and authorizes the Secretary of the Army to grant leases of lands in reservoir areas deemed to be in the public interest.
8. PL 85-624, Fish and Wildlife Coordination Act 1958. This act as amended in 1965 sets down the general policy that fish and wildlife conservation shall receive equal consideration with other project purposes and be coordinated with other features of water resource development programs. Opportunities for improving fish and wildlife resources and adverse effects on these resources shall be examined along with other purposes which might be served by water resources development.
9. PL 86-523, Reservoir Salvage Act of 1960, as amended. This act provides for (1) the preservation of historical and archeological data that might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any Federal reservoir construction projects; (2) coordination with the Secretary of the Interior whenever activities may cause loss of scientific, prehistoric, or archeological data; and (3) expenditure of funds for recovery, protection, and data preservation. This Act was amended by Public Law 93-291.
10. PL 86-717, Forest Conservation. This act provides for the protection of forest and other vegetative cover for reservoir areas under the jurisdiction of the Secretary of the Army and the Chief of Engineers.
11. PL 87-88, Federal Water Pollution Control Act Amendments of 1961, as amended. Section 2(b)(1) of this act gives the USACE responsibility for water quality management of USACE reservoirs. This law was amended by the Federal Water Pollution Control Act Amendment of 1972, Public Law 92-500.
12. PL 87-874, Rivers and Harbors Act of 1962. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.
13. PL 88-578, Land and Water Conservation Fund Act of 1965. This act established a fund from which Congress can make appropriations for outdoor recreation. Section 2(2) makes entrance and user fees at reservoirs possible by deleting the words "without charge" from Section 4 of the 1944 Flood Control Act as amended.
14. PL 89-72, Federal Water Project Recreation Act of 1965. This act requires that not less than one-half the separable costs of developing recreational facilities and all operation and maintenance costs at Federal reservoir projects shall be borne by a non-Federal public body. A USACE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.

15. PL 89-90, Water Resources Planning Act (1965). This act established the Water Resources Council and gives it the responsibility to encourage the development, conservation, and use of the Nation's water and related land resources on a coordinated and comprehensive basis.
16. PL 89-272, Solid Waste Disposal Act, as amended by PL 94-580, dated October 21, 1976. This act authorized a research and development program with respect to solid-waste disposal. It proposes (1) to initiate and accelerate a national research and development program for new and improved methods of proper and economic solid-waste disposal, including studies directed toward the conservation of national resources by reducing the amount of waste and unsalvageable materials and by recovery and utilization of potential resources in solid waste; and (2) to provide technical and financial assistance to State and local governments and interstate agencies in the planning, development, and conduct of solid-waste disposal programs.
17. PL 89-665, Historic Preservation Act of 1966. This act provides for: (1) an expanded National Register of significant sites and objects; (2) matching grants to states undertaking historic and archeological resource inventories; and (3) a program of grants-in aid to the National Trust for Historic Preservation; and (4) the establishment of an Advisory Council on Historic Preservation. Section 106 requires that the President’s Advisory Council on Historic Preservation have an opportunity to comment on any undertaking which adversely affects properties listed, nominated, or considered important enough to be included on the National Register of Historic Places.
18. PL 89-665, Historic Preservation Act of 1966. This act provides for: (1) an expanded National Register of significant sites and objects; (2) matching grants to states undertaking historic and archeological resource inventories; and (3) a program of grants in aid to the National Trust for Historic Preservation; and (4) the establishment of an Advisory Council on Historic Preservation. Section 106 requires that the President's Advisory Council on Historic Preservation have an opportunity to comment on any undertaking which adversely affects properties listed, nominated, or considered important enough to be included on the National Register of Historic Places.
19. PL 90-483, River and Harbor and Flood Control Act of 1968, Mitigation of Shore Damages. Section 210 restricted collection of entrance fee at USACE lakes and reservoirs to users of highly developed facilities requiring continuous presence of personnel.
20. PL 91-190, National Environmental Policy Act of 1969 (NEPA). NEPA declared it a national policy to encourage productive and enjoyable harmony between man and his environment, and for other purposes. Specifically, it declared a "continuing policy of the Federal Government... to use all practicable means and measures...to foster and promote the general welfare, to create conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." Section 102 authorized and directed that, to the fullest extent possible, the policies, regulations,

and public law of the United States shall be interpreted and administered in accordance with the policies of the act. It is Section 102 that requires consideration of environmental impacts associated with Federal actions. Section 101 of NEPA requires the federal government to use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony.

21. PL 91-611, River and Harbor and Flood Control Act of 1970. Section 234 provides that persons designated by the Chief of Engineers shall have authority to issue a citation for violations of regulations and rules of the Secretary of the Army, published in the Code of Federal Regulations.
22. PL 92-347, Golden Eagle Passbook and Special Recreation User Fees. This act revises Public Law 88-578, the Public Land and Water Conservation Act of 1965, to require Federal agencies to collect special recreation user fees for the use of specialized sites developed at Federal expense and to prohibit the USACE from collecting entrance fees to projects.
23. PL 92-500, Federal Water Pollution Control Act Amendments of 1972. The Federal Water Pollution Control Act of 1948 (PL 845, 80th Congress), as amended in 1956, 1961, 1965 and 1970 (PL 91- 224), established the basic tenet of uniform State standards for water quality. Public Law 92-500 strongly affirms the Federal interest in this area. "The objective of this act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters."
24. PL 92-516, Federal Environmental Pesticide Control Act of 1972. This act completely revises the Federal Insecticide, Fungicide and Rodenticide Act. It provides for complete regulation of pesticides to include regulation, restrictions on use, actions within a single State, and strengthened enforcement.
25. PL 93-205, Conservation, Protection, and Propagation of Endangered Species Act of 1973, as amended. This law repeals the Endangered Species Conservation Act of 1969. It also directs all Federal departments/agencies to carry out programs to conserve endangered and threatened species of fish, wildlife, and plants and to preserve the habitat of these species in consultation with the Secretary of the Interior. This act establishes a procedure for coordination, assessment, and consultation. This act was amended by Public Law 96-159.
26. PL 93-251, Water Resources Development Act of 1974. Section 107 of this law establishes a broad Federal policy which makes it possible to participate with local governmental entities in the costs of sewage treatment plant installations.
27. PL 93-291, Archeological Conservation Act of 1974. The Secretary of the Interior shall coordinate all Federal survey and recovery activities authorized under this expansion of the 1960 act. The Federal Construction agency may transfer up to one percent of project funds to the Secretary with such transferred funds considered non-reimbursable project costs.
28. PL 93-303, Recreation Use Fees. This act amends Section 4 of the Land and Water Conservation Act of 1965, as amended, to establish less restricted criteria under which Federal agencies may charge fees for the use of campgrounds developed and operated at Federal areas under their control.

29. PL 93-523, Safe Drinking Water Act. The act assures that water supply systems serving the public meet minimum national standards for protection of public health. The act (1) authorizes the Environmental Protection Agency to establish Federal standards for protection from all harmful contaminants, which standards would be applicable to all public water systems, and (2) establishes a joint Federal-State system for assuring compliance with these standards and for protecting underground sources of drinking water.
30. PL 93-81, Collection of Fees for Use of Certain Outdoor Recreation Facilities. This act amends Section 4 of the Land and Water Conservation Act of 1965, as amended to require each Federal agency to collect special recreation use fees for the use of sites, facilities, equipment, or services furnished at Federal expense.
31. PL 94-422, Amendment of the Land and Water Conservation Fund Act of 1965. This act expands the role of the Advisory Council. Title 2 - Section 102a amends Section 106 of the Historical Preservation Act of 1966 to say that the Council can comment on activities which will have an adverse effect on sites either included in or eligible for inclusion in the National Register of Historic Places.
32. PL 95-217, Clean Water Act of 1977, as amended. This act amends the Federal Water Pollution Control Act of 1970 and extends the appropriations authorization. The Clean Water Act is a comprehensive Federal water pollution control program that has as its primary goal the reduction and control of the discharge of pollutants into the nation's navigable waters. The Clean Water Act of 1977 has been amended by the Water Quality Act of 1987, Public Law 100-4.
33. PL 95-341, American Indian Religious Freedom Act of 1978. The act protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objections, and the freedom to worship through ceremonials and traditional rites.
34. PL 95-632, Endangered Species Act Amendments of 1978. This law amends the Endangered Species Act Amendments of 1973. Section 7 directs agencies to conduct a biological assessment to identify threatened or endangered species that may be present in the area of any proposed project. This assessment is conducted as part of a Federal agency's compliance with the requirements of Section 102 of NEPA.
35. PL 96-95, Archeological Resources Protection Act of 1979. This act protects archeological resources and sites that are on public and tribal lands and fosters increased cooperation and exchange of information between governmental authorities, the professional archeological community, and private individuals. It also establishes requirements for issuance of permits by the Federal land managers to excavate or remove any archeological resource located on public or Indian lands.
36. PL 98-63, Supplemental Appropriations Act of 1983. This act authorized the USACE Volunteer Program. The United States Army Chief of Engineers may accept the services of volunteers and provide for their incidental expenses to carry

out any activity of the USACE, except policymaking or law or regulatory enforcement.

37. PL 99-662, The Water Resources Development Act (WRDA) 1986. This act provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure and establishes new requirements for cost sharing.

38. PL101-233, North American Wetland Conservation Act (13 Dec 1989). This act directs the conservation of North American wetland ecosystems and requires agencies to manage their lands for wetland/waterfowl purposes to the extent consistent with missions.

39. PL101-336, Americans with Disabilities Act of 1990 (ADA), 26 July 1990, as amended by the ADA Amendments Act of 2008 (PL110-325). This law prohibits discrimination based on disabilities in, among others, the area of public accommodations and requires reasonable accommodations for persons with disabilities.

    Specifically, Section 101 of the National Environmental Policy Act declares:

    - Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
    - Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
    - Attain the widest range of beneficial uses of the environment without degradation risk to health or safety or other undesirable and unintended consequences;
    - Preserve important historic, cultural, and natural aspects of our national heritage and maintain wherever possible an environment which supports diversity and variety of individual choice;
    - Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities: and
    - Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

40. PL 101-601, Native American Graves Protection and Repatriation Act (16 Nov 1990). This act requires Federal agencies to return Native American human remains and cultural items, including funerary objects and sacred objects, to their respective peoples.

41. PL 102-580, Water Resources Development Act (WRDA) of 1992 (31 Oct 1992). This act authorizes the USACE to accept contributions of funds, materials and services from non-Federal public and private entities to be used for managing recreational sites and facilities and natural resources.

42. PL 103-66 Omnibus Reconciliation Act-Day use fees (10 Aug 1993), authorizes the USACE to collect fees for the use of developed recreational sites and facilities, including campsites, swimming beaches and boat ramps.
43. PL 104-303, WRDA 1996, authorizes recreation and fish and wildlife mitigation as purposes of a project, to the extent that the additional purposes do not adversely affect flood control, power generation, or other authorized purposes of a project.
44. PL 104-333, Omnibus Parks and Public Lands Management Act of 1996, (12 Nov 1996). This act created an advisory commission to review the current and anticipated demand for recreational opportunities at lakes or reservoirs managed by the Federal Government and to develop alternatives to enhance such opportunities for such use by the public.
45. PL106-147, Neo-tropical Migratory Bird Conservation Act (20 July 2000). This act promotes the conservation of habitat for neo-tropical migratory birds.
46. The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then. This act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."
47. Title 16 U.S. Code §§ 668-668a-d, 54 Stat. 250, Bald Eagle Protection Act of 1940, as amended. This act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The act provides criminal penalties for persons who take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or any manner, any bald eagle [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The act defines “take” as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.

## 1.10 PERTINENT PROJECT INFORMATION

The following table provides pertinent information regarding key reservoir elevations and storage capacity of Oologah Lake.

**Table 1.1 – Oologah Lake Pertinent Data**

| Feature | Elevation (feet NGVD29) | Area (acres) | Capacity (acre-feet) | Equivalent Runoff [1] (inches) |
|---|---|---|---|---|
| Top of Dam | 687.0 | – | – | – |
| Maximum Pool | 678.25 | 86,120 | 2,598,377 | 20.71 |
| Surcharge | 666.0 | 63,988 | 1,705,142 | 13.59 |
| Top of Flood Control Pool | 661.0 | 56,118 | 1,405,389 | 11.20 |
| Flood Control Storage | 638.0 – 661.0 | – | 948,229 | 7.56 |
| Spillway Crest | 640.0 | 30,714 | 516,857 | 4.12 |
| Top of Conservation Pool | 638.0 | 28,997 | 457,160 | 3.64 |
| Navigation, Municipal, and Industrial Water Supply [2] | 592.0 – 638.0 | – | 455,082 [2] | 3.63 |
| Top of Permanent Pool | 592.0 | 343 | 2,078 | 0.02 |

[1] From a 2,284-square-mile drainage area above the dam; 2,353 square miles are uncontrolled.
[2] Includes 67% for water supply, and 33% for navigation. Yield for water supply is 154 mgd after sedimentation.

Source: USACE Pertinent Data 2021

Acreages for the various land classifications at Oologah Lake from the 1977 Master Plan are shown in Table 1.2. These land classifications are standard throughout the USACE and are set forth in EP 1130-2-550 dated January 2013. Acreages have been revised and updated from the previous Master Plan to reflect current and projected land use and resource management objectives. These acreages were calculated using Geographic Information Systems (GIS).

**Table 1.2 – Previous Acreage by Land Classification from 1977 Master Plan**

| Classification | Acres |
|---|---|
| Project Operations | 329 |
| Recreational Areas | 2,345 |
| Wildlife Management – USACE Managed | 4,090 |
| Wildlife Management – Oklahoma Managed | 15,253 |
| | |
| Water Surface: | |
| Permanent Pool | 28,133 |
| **Total Acreage** | **50,150** |

# CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

## 2.1 PHYSIOGRAPHIC SETTING

### Ecoregion Overview

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. The Environmental Protection Agency (EPA) has developed a series of maps that categorizes these regions across the United States. Levels I and II divide the North American continent into 15 and 52 regions, respectively, while Level III ecoregions represent a subdivision of those into 104 unique regions and Level IV into a finer sub-classification of those. Oologah Lake and its watershed is located in the Level III Central Irregular Plains ecoregion and the Osage Cuestas Level IV ecoregion as seen in Figure 2.1.

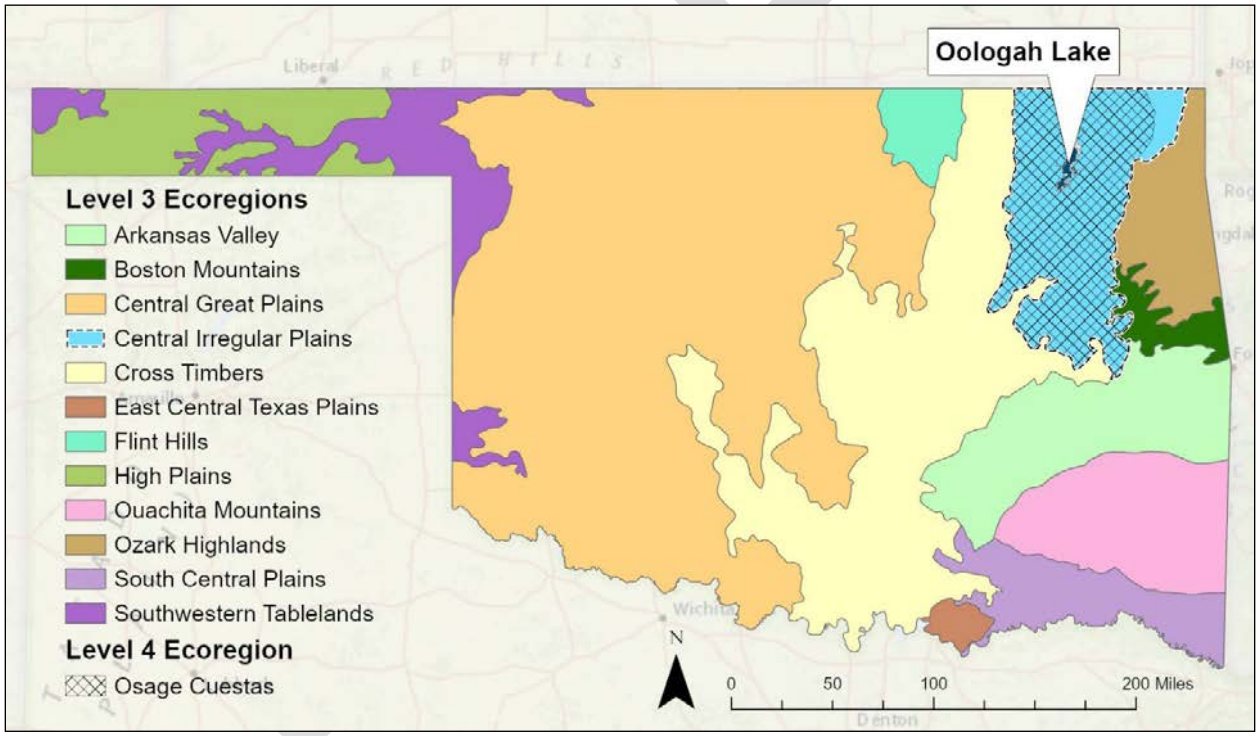


**Figure 2.1 – Oologah Lake within Oklahoma Ecoregions**
Source: EPA 2021

The ecoregion is historically known to be mostly tallgrass prairie and upland forests with riparian forests and floodplain wetlands along riparian corridors.

## 2.2 CLIMATE

Oologah Lake lies in the northeast part of the state of Oklahoma. The region is characterized by moderate winters and long summers with high temperatures. Rainfall usually occurs as high intensity, local thunderstorms occurring primarily in the late spring and early fall months. These storms are frequently accompanied by high winds, hail, and occasional tornadoes. The mean annual temperature in nearby Tulsa, Oklahoma is about 60.5 degrees Fahrenheit (°F) (NOAA, 2021C). January, the coldest month, has an average temperature of 38.9°F and an average minimum daily temperature of about 33.7°F. July, the warmest month, has an average daily temperature of 90.9°F and an average maximum daily temperature of 92.2°F. The average length of the growing season is 218 days (NOAA, 2021B). Oologah Lake spans two USDA Plant Hardiness Zones, with the northern half of the lake in zone 6b and the southern half of the lake in zone 7a. The plant hardiness zones are determined by the winter extreme low temperatures, with 6b having normal winter lows between -5°F and 0°F and 7a having normal winter lows between 0°F and 5°F (USDA, 2021).

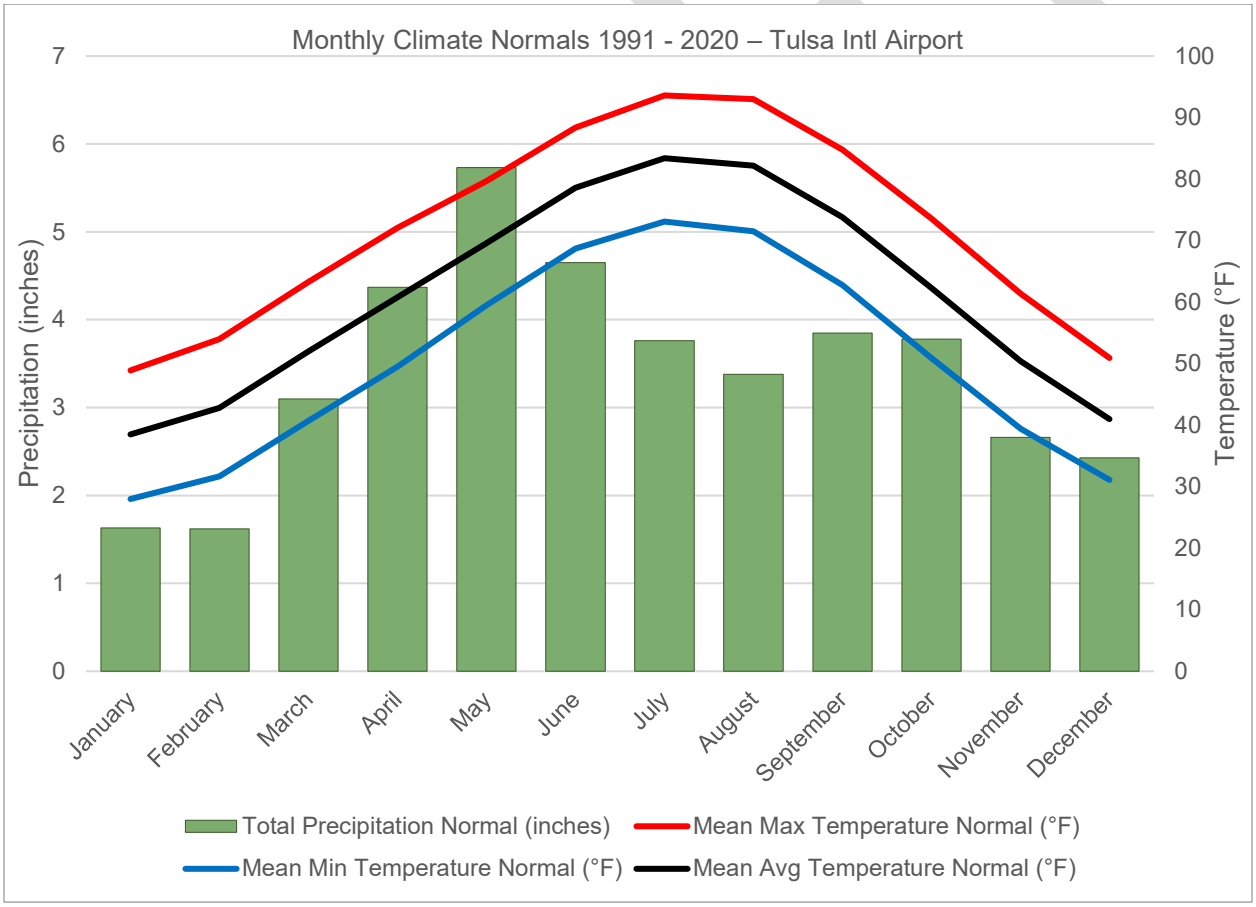


**Figure 2.2– Average Monthly Climate Tulsa, Oklahoma, 1991 – 2020**
Source: NOAA 2021

The normal annual precipitation is 40.97 inches with greater precipitation during spring and less precipitation during winter. The highest annual precipitation recorded in

the area was in 1973 at 69.9 inches, while the highest since 2000 was in 2015 at 61.8 inches. The lowest annual precipitation recorded in the area was in 1957 at 23.24 inches, while the lowest since 2000 was in 2016, one year after flooding in 2015, at 28.2 inches. Of the last 20 years, 7 have included either extreme drought or extreme flooding, with "extreme" being defined as the highest 10% or lowest 10% of precipitation totals occurring since 1900. The highest monthly rainfall was 12.94 inches in June 1969. The area receives an average of 8.7 inches of snowfall per year, with most years receiving fewer than 7 inches of snow. The highest annual snowfall recorded was 26.1 inches in the winter of 2010-2011. The highest monthly snowfall was recorded that same winter in February 2011 with 22.5 inches of snow (NOAA, 2021).

The average monthly humidity ranges between 60% and 70% over the course of a year, but localized weather patterns cause short term changes from below 10% up to 100%. The relatively humidity is lowest in the February – April timeframe and is highest between May and September (NOAA, 2014). The average annual evaporation rate at Oologah Lake, as calculated using the measured pan evaporation multiplied by the monthly pan coefficient, is about 73 inches with the lowest evaporations rates occurring during the winter and greatest evaporation occurring during the summer (USACE, 1996).

## 2.3 CLIMATE CHANGE

The U.S. Global Change Research Program (USGCRP) looks at potential impacts of climate change globally, nationally, regionally, and by resource (e.g., water resources, ecosystems, human health). Oologah Lake area lies within the Southern Great Plains region of analysis. The Southern Great Plains region has already seen evidence of climate change in the form of rising temperatures that are leading to increased demand for water and energy and impacts on agricultural practices. Over the last few decades, the Southern Great Plains has seen fewer cold days in winter and more hot days in summer, as well as an overall increase in total precipitation. The decrease in the cold days has resulted in an overall increase of the frost-free season. Within this region, there has been an increase in average temperatures 1° – 2° Fahrenheit (F) since 1901 (Kloesel et al., 2018). The increasing precipitation in the region has led to more frequent extreme droughts, storms, and flood events. If the current rate of greenhouse gas (GHG) emissions continues, the potential increase will be much higher by 2100. The USACE mission for the Responses to Climate Change Program is "to develop, implement, and assess adjustments or changes in operations and decision environments to enhance resilience or reduce vulnerability of USACE projects, systems, and programs to observed or expected changes in climate." The effects of climate change and mitigation efforts are evolving, and Oologah Lake and all federally owned property will be managed to comply with laws and executive orders to respond to the growing threat of climate change.

## 2.4 AIR QUALITY

The U.S. Environmental Protection Agency (EPA) established nationwide air quality standards to protect public health and welfare in 1971. The Air Quality Division of the Oklahoma Department of Environmental Quality has adopted the National Ambient Air Quality Standards (NAAQS) as the state's air quality criteria. NAAQS standards

specify maximum permissible short- and long-term concentrations of various air contaminants including primary and secondary standards for six criteria pollutants: Ozone ($O_3$), Carbon Monoxide (CO), Sulfur Dioxide ($SO_2$), Nitrogen Oxides ($NO_x$), particulate matter (PM10 and PM2.5), and Lead (Pb). If the concentrations of one or more criteria pollutants in a geographic area is found to exceed the regulated "threshold" level for one or more of the NAAQS, the area may be classified as a non-attainment area. Areas with concentrations that are below the established NAAQS levels are considered either attainment or unclassifiable area. There are currently no non-attainment areas for any monitored pollutants in the State of Oklahoma including the counties around Oologah Lake (DEQ, 2021).

## 2.5 TOPOGRAPHY, GEOLOGY, AND SOILS

### Geology

Oologah Lake lies in the Cherokee Platform geologic province. The bedrock strata consist of shale, sandstone, and limestone from the Pennsylvanian age, of which they occur in an intermix of bands formally known as Fort Scott Limestone, Oologah Formation, Labette Formation, Alluvium, Terrace Deposits, and Senora Formation. The area is known for its coal reserves. As of 2007, the Oklahoma State Department of Mines (SODM) (2021) lists Rogers county as having 360,000 short tons of Bituminous Coal while Nowata having 27,829 short tons of Bituminous Coal. Rogers County is one of five remaining counties in Oklahoma still producing coal. The Oklahoma Corporation Commission explains that oil production in the region is also active, with Rogers County producing up to 25,880 Barrels of Oil (BBL) per day with a total 55 active oil wells, while Nowata County producing up to 928,285 BBL per day with a total of 404 active oil wells.

### Topography

The greater portion of the Verdigris River watershed is an undulating plain; however, the western boundary, formed by the Flint Hills in Kansas and the Osage Hills in Oklahoma, is rough and broken, with elevations rising to 1,600 feet, NGVD29. The valley side slopes are relatively steep, with most of the valley proper in cultivation or pasture land. Wooded areas are prevalent along the channel and in the river bottom in the lower reaches of the river. The channel is well defined, but winds and contains many sharp bends in its course through the valley.

### Soils

The main soil series within Oologah Lake Project Lands is the Wynona silty clay loam, 0 to 1 percent slopes, occasionally flooded. This soil makes up 19.7% of soils found within Oologah Lake project lands, occurs in more than 80 inches thick surface layers, normally found in flood plains, is somewhat poorly drained, contains silty clay loam derived from loamy and silty alluvium, and it is not a prime farmland soil. Typically, the pH ranges from 6 to 7 due to the calcareous origin of most soils.

Oologah Lake is in the Cherokee Plains subdivision of the Prairie Plains physiographic province. The bedrock strata are shale and limestone of Pennsylvanian age. The Verdigris River basin consists of silts and clays with scattered outcroppings of sandstone and limestone rock.

The NRCS Web Soil Survey (2021) reports 50 soil types occurring within Oologah Lake project lands. Table 2.1 shows the acreage and farmland status associated with each soil & surface type in the detention area. The vast size and the overall different number of soils makes it impossible to make a coherent visible map for this report.

**Table 2.1 – Acres of Surface Soil Types within Oologah Lake Project Lands**

| Soil Type | Number of Acres | Percent Total | Farmland Status |
|---|---|---|---|
| Apperson and Summit soils, 1 to 3 percent slopes | 315.3 | 1.52% | Prime Farmland |
| Apperson and Summit soils, 1 to 5 percent slopes, eroded | 45.7 | 0.22% | None |
| Apperson and Summit soils, 3 to 5 percent slopes | 825.3 | 3.99% | Prime Farmland |
| Apperson silty clay loam, 1 to 3 percent slopes | 466.1 | 2.25% | None |
| Bates and Dennis soils, 3 to 5 percent slopes, eroded | 196.7 | 0.95% | None |
| Bates-Collinsville complex, 3 to 8 percent slopes | 284.2 | 1.37% | Prime Farmland |
| Choteau silt loam, 1 to 3 percent slopes | 249.9 | 1.21% | Prime Farmland |
| Claremore silt loam, 0 to 3 percent slopes | 763.3 | 3.69% | Prime Farmland |
| Coalvale and Kanima soils, 0 to 20 percent slopes | 26.5 | 0.13% | None |
| Collinsville stony loam, 3 to 20 percent slopes | 40.1 | 0.19% | None |
| Coweta-Bates complex, 1 to 5 percent slopes | 0.3 | 0.00% | None |
| Coweta-Eram complex, 5 to 15 percent slopes | 1.8 | 0.01% | None |
| Dennis and Bucyrus soils, 2 to 8 percent slopes, severely eroded | 6.9 | 0.03% | Prime Farmland |
| Dennis silt loam, 1 to 3 percent slopes | 885.1 | 4.28% | Prime Farmland |
| Dennis silt loam, 3 to 5 percent slopes | 205.6 | 0.99% | Prime Farmland |
| Dennis-Bates complex, 3 to 5 percent slopes | 509.3 | 2.46% | Prime Farmland |
| Endsaw-Hector association, 5 to 20 percent slopes | 253.5 | 1.22% | None |
| Eram-Radley complex, 0 to 8 percent slopes | 23.5 | 0.11% | None |
| Eram-Verdigris complex, 0 to 12 percent slopes | 245.0 | 1.18% | None |
| Foyil and Talala soils, 0 to 12 percent slopes | 14.8 | 0.07% | None |
| Hector stony sandy loam, 3 to 30 percent slopes | 50.9 | 0.25% | None |

| Soil Type | Number of Acres | Percent Total | Farmland Status |
|---|---|---|---|
| Hector-Endsaw complex, 20 to 35 percent slopes | 846.5 | 4.09% | None |
| Hector-Linker complex, 1 to 5 percent slopes | 3.9 | 0.02% | None |
| Kanima channery clay loam, 1 to 50 percent slopes | 77.9 | 0.38% | None |
| Liberal-Hector association, 5 to 20 percent slopes | 204.9 | 0.99% | None |
| Mason silt loam, 0 to 1 percent slopes, rarely flooded | 108.4 | 0.52% | Prime Farmland |
| Nowata silt loam, 3 to 5 percent slopes | 2.8 | 0.01% | Prime Farmland |
| Okemah silt loam, 0 to 1 percent slopes | 156.1 | 0.75% | Prime Farmland |
| Okemah silty clay loam, 0 to 1 percent slopes | 69.4 | 0.34% | Prime Farmland |
| Okemah silty clay loam, 1 to 3 percent slopes | 581.9 | 2.81% | Prime Farmland |
| Okemah silty clay loam, 1 to 3 percent slopes, eroded | 56.3 | 0.27% | None |
| Osage clay, 0 to 1 percent slopes, occasionally flooded | 2,673.0 | 12.91% | None |
| Parsons silt loam, 0 to 1 percent slopes | 512.2 | 2.47% | Prime Farmland |
| Parsons silt loam, 1 to 3 percent slopes | 47.7 | 0.23% | Prime Farmland |
| Radley silt loam, 0 to 1 percent slopes, frequently flooded | 1,218.4 | 5.89% | None |
| Radley silt loam, 0 to 1 percent slopes, occasionally flooded | 765.7 | 3.70% | Prime Farmland |
| Riverton gravelly loam, 3 to 5 percent slopes | 230.4 | 1.11% | Prime Farmland |
| Riverton loam, 1 to 3 percent slopes | 248.3 | 1.20% | Prime Farmland |
| Shidler stony silty clay loam, 3 to 20 percent slopes | 1,246.5 | 6.02% | Prime Farmland |
| Shidler-Claremore complex, 1 to 3 percent slopes | 159.0 | 0.77% | None |
| Shidler-Kiti-Rock outcrop complex, 1 to 8 percent slopes | 381.4 | 1.84% | None |
| Summit silty clay loam, 3 to 5 percent slopes | 46.4 | 0.22% | Prime Farmland |
| Talala and Foyil soils, 0 to 12 percent slopes | 0.7 | 0.00% | None |
| Taloka silt loam, 0 to 1 percent slopes | 77.6 | 0.37% | Prime Farmland |
| Verdigris clay loam, 0 to 1 percent slopes, occasionally flooded | 231.6 | 1.12% | Prime Farmland |
| Verdigris silt loam, 0 to 1 percent slopes, occasionally flooded | 12.7 | 0.06% | None |
| Verdigris silty clay loam, 0 to 2 percent slopes, frequently flooded | 365.0 | 1.76% | None |
| Wagstaff silty clay loam, 1 to 3 percent slopes | 761.5 | 3.68% | Prime Farmland |

| Soil Type | Number of Acres | Percent Total | Farmland Status |
|---|---|---|---|
| Woodson and Apperson soils, 0 to 1 percent slopes | 127.5 | 0.62% | None |
| Wynona silty clay loam, 0 to 1 percent slopes, occasionally flooded | 4,078.3 | 19.70% | None |
| **Total Acres** | **20,701.8** | | |

Soil Classes (USACE OMBIL). Note: Because some areas were not included in OMBIL soil classificatoin, the total differs from total fee area.

### Prime Farmland

As required by Section 1541(b) of the Farmland Protection Policy Act (FPPA) of 1980 and 1995, 7 U.S.C. 4202(b), federal and state agencies, as well as projects funded with federal funds, are required to (a) use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) consider alternative actions, as appropriate, that could lessen adverse effects, and (c) ensure that their programs, to the extent practicable, are compatible with state and units of local government and private programs and policies to protect farmland.

There are several soil types in the study area that are considered prime farmland soils or soils associated with farmlands of state importance. However, the lands represented by these soil types have not been used for farming since the lands were acquired prior to the initiation of construction of Oologah Lake in July 1950.

## 2.6 WATER RESOURCES

### Surface Water

The Verdigris River originates in the Flint Hills of Chase County, Kansas, and flows generally southeast from the vicinity of Madison to Neodesha, Kansas, and then in a southerly direction to its confluence with the Arkansas River, about 5 miles northeast of Muskogee, Oklahoma. The river basin is roughly elliptical in shape, with a total area of 8,303 square miles, of which 4,339 square miles are above the Oologah Dam and is divided as follows: 3,354 square miles in Kansas and 985 square miles in Oklahoma. The principal tributaries are the Fall and Elk Rivers that enter from the right bank in Kansas.

### Wetlands

Waters of the United States are defined within the Clean Water Act (CWA), and jurisdiction is addressed by the USACE and EPA. Wetlands are a subset of the waters of the United States that may be subject to regulation under Section 404 of the CWA (40 CFR 230.3). Wetlands are those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, and under normal circumstances these wetlands do support this vegetation type.

Wetland classifications presented are derived from the National Wetlands Inventory, which was established by USFWS to aid in conservation efforts by collecting nationwide wetland distribution and type information (USFWS 2021). Within the Oologah Lake project lands, wetlands generally occur near the rivers and flatter areas at the northern end of the lake. Table 2.2 lists the acreages of various types of wetlands present at Oologah Lake and Figure 2.3 displays the distribution of wetland habitat at Oologah Lake.

**Table 2.2 – Total Acres of Wetland and Open Water at Oologah Lake**

| Wetland Type | Acres |
|---|---|
| Freshwater Emergent Wetland | 107.16 |
| Freshwater Forested/Shrub Wetland | 5,551.70 |
| Freshwater Pond | 123.06 |
| Lake (Open Water) | 30,898.16 |
| Riverine | 451.96 |
| **TOTAL ACRES of Water and Wetland Resources** | **37,132.04** |

Source: USFWS 2021H

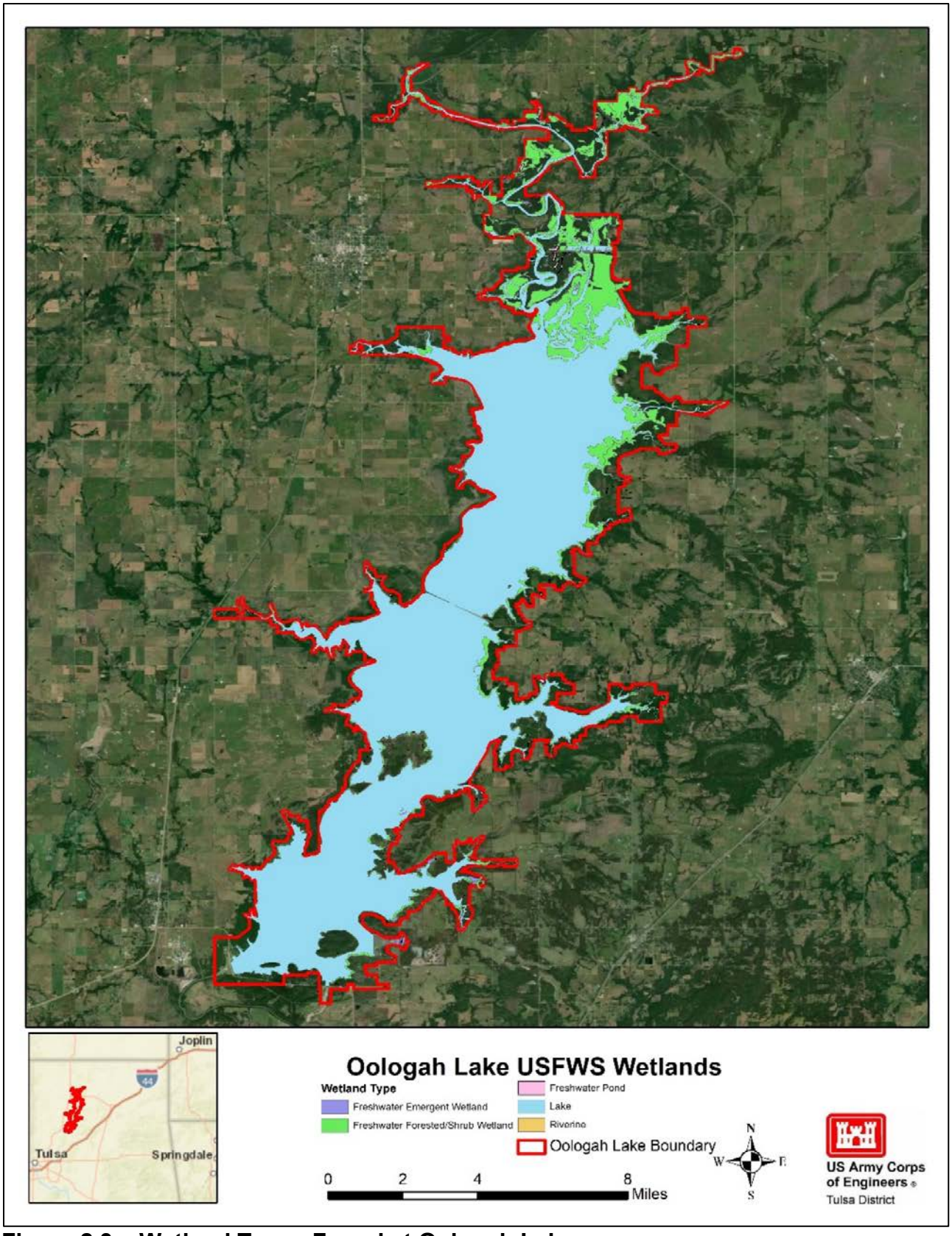


**Figure 2.3 – Wetland Types Found at Oologah Lake**

## Groundwater

Deep below Oologah Lake lies the Cherokee Minor Bedrock Aquifer and the Verdigris River Minor Alluvial Aquifer. The Cherokee Minor Bedrock Aquifer has a water storage capacity of 258,000 acre-feet per year (AFY) while Verdigris River Minor Alluvial Aquifer has a storage capacity of 162,000 AFY. There are not any major aquifers below the lake. Communities around the lake typically get their drinking water from Oologah lake, instead of from the aquifers.

## Hydrology

Most major storms in the Oologah Lake drainage basin have occurred in April through June and September through November. Thunderstorms and the remnants of hurricanes are the type of storms that produce most high runoff events in the basin. Time of year and antecedent soil moisture condition are major factors that determine the runoff from a given storm. Thus, some lesser rainfall storms have resulted in runoff as great as or greater than storms of higher rainfall. Generally, the storms common to the drainage basin are not of uniform intensity. Floods above Independence, Kansas, generally peak faster than those on the Lower Verdigris. This is partly due to the steep slopes, impervious shallow soils, the synchronized flood flows from the Upper Verdigris, Fall, and Elk, Rivers and the sluggish flow of water in the lower portions of the Verdigris and Caney Rivers. Below Oologah Dam, the heavily wooded overbanks attenuate peak flows and prolong flood duration. Base flow in the Verdigris River is moderately low, and periods of zero flow have been observed. The time from beginning of runoff to peak flow into Oologah Lake is about 36 hours. However, this time is highly dependent on the storm pattern and the time of that year significant runoff begins.

Oologah Lake is an integral part of the U.S. Army Corps of Engineers (USACE) plan for flood control and water supply in the Arkansas River Basin. The plan presently consists of thirty four major flood control projects, known as Great Salt Plains Dam, Heyburn Dam, Toronto Dam, Fall River Dam, Elk City Dam, Hulah Dam, Pensacola Dam, Markham Ferry Dam (Lake Hudson), Fort Gibson Dam, Birch Dam, Tenkiller Dam, Fort Supply Dam, Optima Dam, Canton Dam, Wister Dam, Big Hill Dam, Keystone Dam, Eufaula Dam, Council Grove Dam, Marion Dam, John Redmond Dam, Norman Dam, Sanford Dam, Cheney Dam, Kaw Dam, El Dorado Dam, Copan Dam, Skiatook Dam, Arcadia Dam, W.D. Mayo Lock Dam, Robert S. Kerr Lock and Dam Reservoir, Webbers Falls Lock and Dam, Chouteau Lock and Dam, and Newt Graham Lock and Dam. The USACE operates and maintains the dam and associated facilities and administers the Federal lands and flowage easements comprising the project through a combination of direct management and leases for park and recreation purposes and in consultation with Native Tribes.

## Water Quality

Oklahoma Department of Environmental Quality (DEQ) sets and implements standards for surface water quality to improve and maintain the quality of water in the state, based on various beneficial use categories for the water body. The Water Quality

in Oklahoma 2018 Integrated Report, which is a requirement of the Federal Clean Water Act Sections 305(b) and 303(d), evaluates the quality of surface waters in Oklahoma and identifies those that do not meet uses and criteria defined in the Oklahoma Water Quality Standards (WQS). The Oklahoma 2018 Integrated Report describes the status of Oklahoma natural waters based on historical data and assigns waterways to various categories depending on the extent to which they attain the WQS.

Existing water quality within Oologah Lake is affected by rainfall and associated stormwater flows originating from residential, commercial, and industrial point and nonpoint sources from properties upstream of the dam and reservoir. These stormwater flows have increased over time as a result of increased urbanization, development, and climate change.

The Oklahoma 2020 Integrated Report-303(d) List (DEQ, 2020) lists Oologah Lake as exceeding WQS for dissolved oxygen and turbidity.

As of February 2021, no fish consumption advisories have been issued for Oologah Lake, nor for the Verdigris River below Oologah Dam within the USACE Fee Owned Property (DEQ, 2021).

**Pool Fluctuations Caused By Floods, Droughts, and Project Operations**

Significant pool fluctuations resulting from floods, droughts, and normal project operations, including water supply, have disrupted lake activities in the past and will continue to do so in the future. The USACE is normally able to manage the lake level to accommodate water-based recreation except during exceptional floods and droughts. Prior to June 1971, the conservation pool was 608.0 NGVD29. During that time there were notable floods with peaks occuring April 8, 1965 with a maximum elevation of 629.98 NGVD29; June 1, 1969 with a maximum elevation of 627.09 NGVD29; and May 3, 1970 with a maximum elevation of 630.44 NGVD29. There was one notable drawdown during this period between October 1969 and January 1971 with the water level getting as low as 602.99 NGVD29 on January 22, 1970.

In 1971 the conservation pool was raised to 638.0 NGVD29 where it remains today, and the top of the flood control storage is 661.0 NGVD29. Since 1971, there were four floods that had peak elevations above the flood control elevation on the following days: October 9, 1986 reaching elevation 664.90 NGVD29; June 14, 1995 at elevation 662.35 NGVD29; July 7, 2007 reaching 663.95 NGVD29; and May 26 2019 reaching 665.82 NGVD29. There have also been four periods of significant drawdown below elevation 635.0 NGVD29 since 1971: from October 1978 through January 1979 with a low at 634.23 NGVD29 on November 11, 1978; on April 8 1981 with a low elevation of 634.27 NGVD29; September 15, 1988 with a low elevation at 634.49; and from October 2012 through March 2013 with a low on January 29, 2013 at 633.66 NGVD29. These significant events are documented on Figure 2.4 which provides a graphic representation of lake elevation from 1961 to 2020.

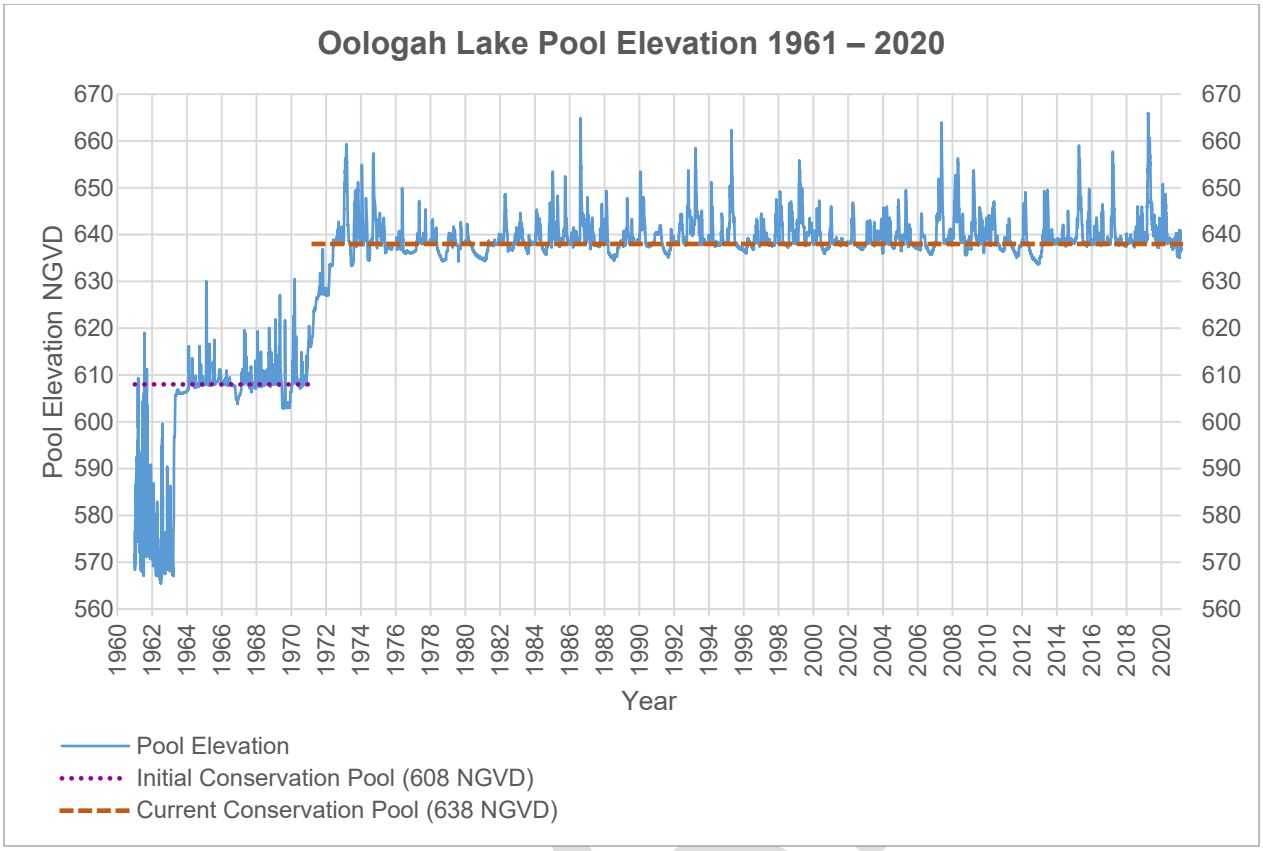


**Figure 2.4 – Oologah Lake Pool Elevation 1961 – 2020**
Source: USACE 2021

## 2.7 HAZARDOUS MATERIALS AND SOLID WASTE

There are no hazardous or solid waste advisories for Oologah Lake, the Arkansas River Basin, or the Verdigris Watershed.

## 2.8 HEALTH AND SAFETY

Oologah Lake's authorized purposes include flood risk management, water supply, recreation, navigation, and fish and wildlife. Compatible uses incorporated in project operation management plans include conservation and fish and wildlife habitat management components. The USACE, with some assistance from the Oklahoma Highway Patrol, ODWC, and USFWS, has established public outreach programs to educate the public on water safety and conservation of natural resources. In addition to the water safety outreach programs, the project has established recreation management practices to protect the public. These include safe boating and swimming regulations, and speed limit and pedestrian signs for park roads. Oologah Lake also has solid waste management plans in place for camping and day use areas that are maintained by the respective partners that hold the lease.

## 2.9 ECOREGION AND NATURAL RESOURCE ANALYSIS

### Natural Resources

Operational civil works projects administered by the USACE are required, with few exceptions, to prepare an inventory of natural resources. The basic inventory required is referred to within USACE regulations (ER and EP 1130-2-540) as a Level One Inventory. This inventory includes the following: vegetation in accordance with the National Vegetation Classification System through the sub-class level; assessment of the potential presence of special status species including but not limited to Federal and state listed endangered and threatened species, migratory species, and birds of conservation concern listed by the USFWS; land (soils) capability classes in accordance with NRCS soil surveys; and wetlands, which are previously discussed in Section 3.2. In addition to the data from the Level One Inventories, a Wildlife Habitat Appraisal Procedure (WHAP) was conducted.

TPWD's Wildlife Habitat Appraisal Procedure (WHAP) was used to assist in the preparation of the 2021 MP. The assessment was conducted on September 21-24, 2020 at Oologah Lake by USACE biologists, foresters, and park rangers. A total of 74 data collection sites were selected using aerial photography and knowledge of the Ray Roberts Lake staff. The purpose of the survey was to quickly assess wildlife habitat quality within the USACE Oologah Lake fee-owned property. The four major habitat types that were selected and assessed were marsh, riparian/bottomland hardwood forests (BHF), upland forests, and grasslands. The highest score a site can receive is 1.00 while the lowest is 0.03, while a score of 0 represents a site skipped and not incorporated into the report calculations. The scores are not species dependent but rather diversity dependent. The data gather from this survey helped to quantifiably describe the general habitat characteristics and identify unique/high quality areas found within USACE Oologah Fee Boundary. These data helped with revising the land classification based on what areas need the most protection. The WHAP assessment report can be found in Appendix C of this Plan.

The WHAP assessment revealed that the two most abundant habitat types surveyed were upland forests and grasslands. However, the two habitat types that scored the highest on average were marsh and grassland habitats. Overall, 60% of surveyed grassland points scored medium to high values. After combining the WHAP analytical analysis, continued urban development, and spatial distribution of higher scoring points, the Central Northern side of the Lake was identified as having higher quality in relation to the remaining lands administered by the USACE at Oologah Lake.

### Vegetation Resources

The ecoregion is historically known to be mostly tallgrass prairie, dominated by big and little bluestem (*Andropogon gerardii* and *Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), Indian blanket (*Gaillardia pulchella*), blazing star (*Liatris* spp.), with American persimmons (*Diospyros virginiana*) in drainage areas. The upland forests can be found near water but above flood plains and

are dominated by post oak (*Quercus stellate*), blackjack oak (*Quercus marlandica*), and hickories and pecans (*Carya* spp.); they are also known to have dominant prairie plants grow in unshaded portions of the forest floor. Sumac (*Rhus* spp.), coralberry (*Symphoricarpos orbiculatus*), and American persimmon (*Diospyros virginiana*) are commonly found growing along the edges of these forests. The floodplain areas are known to support forests of elm (*Ulmus* spp.), oak (*Quercus* spp.), hackberry (*Celtis* spp.), cottonwood (*Populus deltoides*), and sycamore (*Plantanus occidentalis*). These forested areas tend to have less understory growth due to their potential to flood and heavy shading. Unshaded areas tend to have sumac (*Rhus* spp.), elderberry (*Sambucus canadensis*), and strawberry bushes (*Euonymus americanus*) along with grasses and herbaceous forbs. In more inundated areas, sedges (*Carex* spp.), buttonbush (*Cephalanthus occidentalis*), and willows (*Salix* spp.) occur along floodplain edges and in floodplain wetlands (ODWC, 1996).

This region, like so many other ecological regions in Oklahoma, has undergone significant changes in the past 150 years including a growing population, growing demand for water resources, and increasing agriculture. Although habitat for wildlife is present throughout the ecological regions as a whole, populations of wildlife vary considerably within sub-regions. The diversity and configuration of the plant communities on the landscape influence wildlife populations. Other factors include fragmentation of once continuous habitat into smaller land holdings; completion for food and cover with livestock; conversion of woodland habitat to improved pastures, or urban and rural developments; and lack of proper wildlife and habitat management, which had historically been heavily influenced by grazing and fires.

## 2.10 FISHERIES AND WILDLIFE RESOURCES

Oologah Lake provides habitat for an abundance of fish and wildlife species. Predominant sport fish species in the lake are largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), white crappie (*Pomoxis annularis*), white bass (*Morone chrysops*), and walleye (*Sander vitreus*). Other prominent species include blue catfish (*Ictalurus furcatus*), flathead catfish (*Pylodictis olivaris*), gar (*Lepisosteus* spp.), sunfish (*Lepomis* spp.), and non-native carp (*Cyprinus* spp.). Although not sport fish, smaller fish like shads (*Dorosoma* spp.), darters (*Etheostoma* spp.), and shiners (*Cyprinella* spp.) are the most abundant fish in Oologah Lake.

Many of the undeveloped open spaces provide habitat for wildlife including white tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), opossum (*Didelphis virginiana*), beaver (*Castor canadensis*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), eastern cottontail rabbit (*Sylvilagus floridanus*.), fox squirrel (*Sciurus niger*), nine-banded armadillo (*Dasypus novemcinctus*), striped skunks (*Mephitis mephitis*), and raccoons (*Procyon lotor*). The area also provides habitat for a wide range of birds, small mammals, reptiles, amphibians, and invertebrates and acts as a stopover for migratory birds.

## 2.11 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for their survival. USFWS is the primary agency responsible for implementing the Endangered Species Act and is responsible for birds and other terrestrial and freshwater species. USFWS responsibilities under the Endangered Species Act include (1) the identification of threatened and endangered species; (2) the identification of critical habitats for listed species; (3) implementation of research and recovery efforts for these species; and (4) consultation with other Federal agencies concerning measures to avoid harm to listed species.

An endangered species is a species officially recognized by USFWS as being in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered eligible for listing as endangered or threatened when any of the five following criteria occur: (1) current/imminent destruction, modification, or curtailment of their habitat or range; (2) overuse of the species for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affecting their continued existence.

In addition, USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence. The candidate designation includes those species for which USFWS has sufficient information to support proposals to list as endangered or threatened under the Endangered Species Act; however, proposed rules have not yet been issued because such actions are precluded at present by other listing activity. Although not afforded protection by the Endangered Species Act, candidate species may be protected under other federal or state laws.

The USFWS's Information for Planning and Consultation (IPaC) database (2021) lists the threatened and endangered species, and trust resources that may occur within the Oologah Lake federal fee boundary (see USFWS Species List and the IPaC Report in Appendix C of the 2021 MP). Based on the IPaC report, there are 7 federally listed species that could be found within Oologah Lake: northern long-eared bat, piping plover, red knot, whooping crane, Neosho mucket, rabbitsfoot, and American burying beetle (USFWS 2021). A list of these species is presented in Table 2.3. Critical Habitat for the rabbitsfoot mussel has been designated within Oologah Lake federal fee boundary. However, after analysis done by USACE staff of the area it was determined that it no longer supports the habitat that the species needs to survive. Impoundment, siltation, channel modification, and invasive species such as the Asian clam and zebra mussel are most responsible for habitat decline (USDA 2002). The species identified as Threatened, Endangered or Candidate Species by ODWC that are not federally listed are included in Appendix C of the 2021 Master Plan as well as a list of Species of Greatest Conservation Need (SGCN) for the Tallgrass Prairie Region.

**Table 2.3 – Federally Listed Threatened & Endangered Species with Potential to Occur at Oologah Lake**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| American Burying Beetle | *Nicrophorus americanus* | Threatened | Not Listed |
| Neosho Mucket | *Lampsilis rafinesqueana* | Endangered | Not Listed |
| Northern Long-eared Bat | *Myotis septentrionalis* | Threatened | Not Listed |
| Piping Plover | *Charadrius melodus* | Threatened | Not Listed |
| Rabbitsfoot | *Theliderma cylindrica cylindrica* | Threatened | Not Listed |
| Red Knot | *Calidris canutus rufa* | Threatened | Not Listed |
| Whooping Crane | *Grus americana* | Endangered | Not Listed |

The American burying beetle (*Nicrophorus americanus*) is a member of the family *Silphidae* (carrion or burying beetles) that is listed as threatened (USFWS, 2020A). It is the largest species of *Silphidae* in North America. Existing populations of this species includes eastern Oklahoma and the project area. The American burying beetle is known to inhabit level areas in grasslands, grazed pastures, bottomland forest, open woodlands, and riparian areas. Wetlands with standing water or saturated soils and vegetation typical of hydric soils and wetland hydrology are listed as unfavorable habitats. American burying beetles are habitat generalists; however, it is thought that undisturbed habitat and the availability of carrion is the most likely influence on species distribution. Because of the availability of habitat and the project area being within its known range and the lack of recent sightings, the occurrence of this species is considered uncommon.

The Neosho mucket (*Lampsilis rafinesqueana)*, a freshwater mussel, is classified by USFWS (2020B) as endangered wherever it is found. The USFWS service lists the project area as a location where Neosho mucket may occur. Its preferred habitat consists of shallow waters with riffles but has been known to occur in larger rivers and creeks (NatureServe 2020A). It is not expected to occur in the project area because the existing occurrence in its known geographic existent is considered rare because the project area is not within one of the known rivers of occurrence.

USFWS lists the northern long-eared bat (*Myotis septentrionalis*) as threatened wherever it is found (USFWS, 2020C). The USFWS service lists the project area as a location where northern long-eared bats may occur. Northern long-eared bats seasonally migrate between winter hibernacula and summer maternity or bachelor colonies. Roosting may take place in tree bark, tree cavities, caves, mines, and barns. Northern long-eared bats forage along forested hillsides and ridges near roosting and hibernating caves. They emerge at dusk and feed on various insect species such as moths, flies, leafhoppers, caddisflies, and beetles from vegetation and water surfaces (NatureServe, 2020B). The species occurrence is expected to be rare within the project area because the project area lies within the western edge of its known range.

The piping plover (*Charadrius melodus)* is a threatened shorebird listed as endangered in the watershed of the Great Lakes of North America and as threatened in the remainder of its range, which includes the Northern Great Plains, the Atlantic Coast,

the Gulf Coast, the Bahama Islands, and the West Indies (USFWS, 1996). The USFWS (2020D) identifies Oologah Lake as "situated within the probable migratory pathway between breeding and winter habitats [of the Northern Great Plains population], and contain[ing] sites that could provide stopover habitat during migration."

The Northern Great Plains population of piping plover spends up to 10 months a year on its wintering ground along the Gulf Coast and arrives on prairie breeding grounds in early May. During migration periods, they use large rivers, reservoir beaches, mudflats, and alkali flats (NatureServe 2020A). They feed on a variety of aquatic and terrestrial invertebrates. The sandbars and bare gravel islands along the Arkansas River within the study area could provide suitable habitat during the plovers' spring and fall migrations. The occurrence of the species within the project area is considered to be rare because of the lack of recent sightings.

The rabbitsfoot (*Theliderma cylindrica cylindrica)*, is a freshwater mussel that is classified by USFWS (2020E) as threatened wherever it is found. The USFWS service lists the project area as a location where rabbitsfoot may occur. Its preferred habitat consists of high flowing rivers, creeks, and streams with high water quality with sandy to cobble substrates (NatureServe 2020C). It is not expected to occur in the project area because the existing occurrence in its known geographic existent is considered rare because the waters are turbid, reducing the quality of habitat for rabbitsfoot.

The red knot (*Calidris canutus rufa)* is a migratory shorebird listed as threatened wherever found (USFWS, 2020F). Although sightings are rare, the project area is listed as a location where the red knot is "known or believed to occur" and is located within the probable migratory path, between breeding in the Arctic tundra and winter habitats in the southern U.S. and Central and South America. Red knots forage along sandy beaches and mud flats, and this species may use the project area for temporary stopover and foraging. The sandbars and bare gravel islands along the Verdigris River within the study area could provide suitable habitat during the red knot's spring and fall migrations. The occurrence of the species within the project area is considered to be rare because of the lack of recent sightings.

The whooping crane (*Grus americana*) is a migratory bird listed as endangered wherever found except in experimental populations (USFWS, 2021G). Its habitat consists of marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands (AOU 1983, Matthews and Moseley 1990 and NatureServe 2016). Pockets of habitat for this species are present on Oologah Lake project land but these areas are used as a stopover during their annual migrations. When the species is migrating, sightings for the species are rare, and therefore they are considered a rare occurrence at Oologah Lake.

### Oklahoma Natural Heritage Inventory

The Oklahoma Natural Heritage Inventory (ONHI), administered by the University of Oklahoma (OU), manages and disseminates information on rare species, native plant communities, and animal aggregations in Oklahoma to help guide project planning efforts. An official request via email was made requesting this information for the Oologah project

area. In the inventory given to the USACE, ONHI indicates that there are three Federally endangered, threatened, and protected species that are known to occur within Oologah Lake Fee Boundary: Neosho mucket (*Lampsilis rafinesqueana*), rabbitsfoot (*Theliderma cylindrica*), and western prairie fringed orchid (*Platanthera praeclara*).

## 2.12 INVASIVE SPECIES

An invasive species is defined as a plant or animal that is non-native (or native nuisance) to an ecosystem and whose introduction causes, or is likely to cause, economic and/or environmental harm, or harm to human health. Invasive species can thrive in areas beyond their normal range of dispersal. These species are characteristically adaptable, aggressive, and have high reproductive capacity. Their vigor, along with a lack of natural enemies or controls, often leads to outbreak populations with some level of negative effects on native plants, animals, and ecosystem functions and are often associated with disturbed ecosystems and human activities.

Table 2.4 lists many of the invasive and noxious native species found at Oologah Lake. Other species are currently being researched for their invasive characteristics.

**Table 2.4 – Invasive and Noxious Native Species Found at Oologah Lake**

| Common Name | Scientific Name | Native/Non-native |
|---|---|---|
| **Birds** | | |
| Cattle egret | *Bubulcus ibis* | Non-native |
| Cowbirds | *Molothrus ater* | Native |
| Eurasian collared dove | *Streptopelia decaocto* | Non-native |
| European starling | *Sturnus vulgaris* | Non-native |
| House sparrow | *Passer domesticus* | Non-native |
| **Mammals** | | |
| Wild Boar | *Sus scrofa* | Non-native |
| **Insects** | | |
| Red imported fire ant | *Solenopsis invicta* | Non-native |
| **Plants** | | |
| Chinese privet | *Ligustrum sinense* | Non-native |
| Eastern red cedar | *Juniperus virginiana* | Native |
| Johnson grass | *Sorghum halepense* | Non-native |
| Japanese honeysuckle | *Lonicera japonica Thunb* | Non-native |
| Kudzu | *Pueraria montana* | Non-native |
| Multiflora rose | *Rosa multiflora* | Non-native |
| Musk thistle | *Carduus nutans* | Non-native |
| Russian olive | *Elaeagnus angustifolia* | Non-native |
| Sericea Lespedeza | *Lespedeza cuneata* | Non-native |
| **Mollusks** | | |
| Asian Clam | *Corbicula fluminea* | Non-native |
| Zebra mussels | *Dreissena polymorpha* | Non-native |
| **Fish** | | |
| Common Carp | *Cyprinus carpio* | Non-native |

Because of the lake's relative isolation from metropolitan areas, it does not have as many invasive species compared to those within or directly adjacent to major metropolitan areas. The remoteness protects the lake from the inadvertent release and spread of common landscape plants that could become aggressive colonizers from nearby residential developments.

Other invasive animals include several species of introduced fish (including released baitfish and "aquarium dumping"). Invasive mollusks including zebra mussels (*Dreissena polymorpha*) are an ongoing threat to native aquatic species and infrastructure due to their ability to infest and expand rapidly.

Although native, cowbirds (*Molothrus ater*) have become problematic due to their expanding range associated with agriculture and human development and are considered a nuisance. They often outcompete many other native species while also acting as a brood parasite, introducing their own eggs into the nests of other birds, to the detriment of the other birds' offspring. Eastern red cedars (*Juniperus virginiana*) are also native but spread aggressively in disturbed areas and within prairies and grasslands where fires and large herbivores have historically kept woody species like cedars from becoming a dominant species.

## 2.13 AESTHETIC RESOURCES

Oologah Lake includes many acres of scenic shorelines, lake views, and wildlife viewing areas providing high visual and scenic qualities. Some areas are admired for their scenic attractiveness (intrinsic scenic beauty that evokes a positive response), scenic integrity (wholeness of landscape character), and landscape visibility (how many people view the landscape and for what reasons and how long). Because Oologah Lake is located a short drive away from the Tulsa metropolitan area, people come from Tulsa urban and suburban communities to enjoy the scenic and naturalistic views offered at the lake. Some areas have been designated as Wildlife and Vegetative Management, or Environmentally Sensitive Areas to preserve specific animal, plant, or environmental features that also add to the scenic qualities at the lake. Nearby parks have been designed to access the lake, allow access to hiking trails, and take advantage of scenic qualities at the lake and surrounding areas.

Adjacent landowners are informed that removing trees from USACE property to obtain a view of the lake not only destroys wildlife habitat but also lowers the scenic quality of the shoreline when viewed by the general public from the water surface. Furthermore, unauthorized removal of trees and other vegetation from USACE property could result in fines. Additionally, reasonable measures must be taken to ensure that damage to the natural landscape from invasive species and catastrophic wildfire are minimized. Vegetative management, mowing permits, debris removal, and other shoreline issues are managed by the USACE Oologah Lake Office.

## 2.14 CULTURAL RESOURCES

Cultural resources preservation and management is an equal and integral part of all resource management at USACE-administered operational projects. The term "cultural resources" is a broad term that includes, but is not limited to, historic and prehistoric archaeological sites, deposits, and features; burials and cemeteries; historic and prehistoric districts comprised of groups of structures or sites; cultural landscapes; built environment resources such as buildings, structures (such as bridges), and objects; Traditional Cultural Properties (TCP) and sacred sites. These property types may be listed on the National Register of Historic Places (NRHP) if they meet the criteria specified by the NRHP, reflecting significance in architecture, history, archaeology, engineering, and culture. Cultural resources that are identified as eligible for listing in the NRHP are referred to as "historic properties," regardless of category. A TCP is a property that is eligible for inclusion in the NRHP based on its associations with the cultural practices,

traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. Ceremonies, hunting practices, plant-gathering, and social practices which are part of a culture's traditional lifeways, are also cultural resources.

Stewardship of cultural resources on USACE Civil Works water resources projects is an important part of the overall Federal responsibility. Numerous laws pertaining to identification, evaluation, and protection of cultural resources, Native American Indian rights, curation and collections management, and the protection of resources from looting and vandalism establish the importance of cultural resources to our Nation's heritage. With the passage of these laws, the historical intent of Congress has been to ensure that the Federal government protects cultural resources. Guidance is derived from a number of cultural resources laws and regulations, including but not limited to Sections 106 and 110 of the National Historic Preservation Act (NHPA) of 1966 (as amended); Archaeological Resources Protection Act (ARPA) of 1979; Native American Graves Protection and Repatriation Act (NAGPRA); and 36 CFR Part 79, Curation of Federally-Owned and Administered Archeological Collections. Implementing regulations for Section 106 of the NHPA and NAGPRA are 36 CFR Part 800 and 43 CFR Part 10, respectively. All cultural resources laws and regulations should be addressed under the requirements of the National Environmental Policy Act (NEPA) of 1969 (as amended), as applicable. The USACE summarizes the guidance provided in these laws in ER and EP 1130-2-540.

**Cultural History Sequence**

Six broad cultural divisions are applicable to a discussion of the culture history of the Oologah region: Paleoindian, Archaic, Woodland, Mississippian/Plains Village, Protohistoric, and Historic. These general adaptation types are adopted in this Master Plan to characterize prehistoric cultural traditions, within the following regional chronology:

- Paleoindian: 30,000 to 7000 BC
- Archaic: 7000 BC to 1 AD
- Woodland: AD 1 to 1000
- Mississippian/Plains Village: AD 1000 to 1500
- Protohistoric (Contact Period): AD 1500 to 1830
- Historic: AD 1830 to present

*Paleoindian Period*

While it is becoming increasingly evident that humans arrived in the Americas as early as 30,000 years ago, the Paleoindian Period is broadly accepted as spanning the end of the Pleistocene into the Early Holocene. The Clovis complex (9500-8900) is the earliest well substantiated archaeological period in the Central Plains. Paleoindian sites

are usually identified by the presence of the remains of extinct Pleistocene megafauna and signature stone tools. The most visible tools are projectile points, and these are used to reference different archaeological complexes. Point types are unnotched lanceolate projectile points, fluted (Clovis and Folsom) and unfluted (Allen-Frederick, Agate Basin, Hell Gap, Meserve, Plainview, Cody, Dalton, Plano, and undesignated "Late Paleoindian"). Long characterized as specialized big game hunters, it has now been demonstrated that the archaeological complexes of the Paleoindian period represent diversified economies of small bands of hunters and gatherers, some more reliant on megafauna than others, and some hunting megafauna during specific seasons (Blackmar and Hofman 2006). The Dalton Complex is well represented in Eastern Oklahoma and spans the period from the end of the Paleoindian period and into the Early Archaic (Ballenger 2001; Blackmar and Hofman 2006; Meltzer 2009).

In Oklahoma, the earliest proven evidence of human occupation occurs at sites such as the Domebo site, a Clovis era mammoth kill site in Caddo County, and Jakes Bluff, a bison kill site in Harper County (Gilbert, 2000). In Oklahoma, isolated Paleoindian points have typically been found on the surface. These points are most often collected, which results in loss of archaeological context. For these reasons, a limited number of Paleoindian sites have been recorded in the project area, though sites with both Paleoindian and Archaic deposits are better represented. The small number of sites from this period is much more a product of archaeological visibility than an actual representation of prehistoric populations and patterns of land use (Blackmar and Hofman 2006). In eastern Oklahoma sites such as the Packard site in Mayes County, the Quince Site in Atoka County, and the Billy Ross site in Haskell county include large quantities of local chert, which may indicate that later Paleoindian peoples were less nomadic than earlier Paleoindians (Hawkins 2011).

*Archaic Period*

During the Archaic period, an increase in seasonal variability of resources and increasing populations resulted in changing settlement and subsistence patterns (Gilbert 2000). Repeated occupation of sites, often on a seasonal basis, and features such as rock-lined hearths, roasting pits, and grinding tools reflect intensive plant processing and the cyclical exploitation of resources (Brogan 1981; Sabo and Early 1990). Increasing diversity of stone tools through time reflects the increasing variability of faunal and floral resources and diversity of activities taking place at habitation sites (Thies and Witty 1992). Projectile points from the Middle and Late Archaic are stylistically quite different (typically notched and stemmed) from those of the Paleoindian period. Archaic assemblages include a variety of large dart points, knives, drills, axes, gouges, scrapers, and grinding implements (such as manos and metates). The Archaic period is traditionally divided into Early, Middle, and Late periods, the overall extent of which was approximately 7000 BC to 1 AD.

The Calf Creek Culture was prominent in Oklahoma during the Archaic Period between 7,000 and 4,000 years ago. This group adapted to a long drought period by living in highly mobile bands, hunting bison, and supplementing their diet with edible starchy plant seeds that were more readily available in the dry climate. Calf Creek is distinguished

by finely made large spear points with deep notches on the base. Archaeologists believe there were four groups located in the east central, north central, south central, and western areas of the state based on their reliance on local flint found in the four areas (Gilbert 2000).

Prominent Calf Creek sites in Oklahoma include Primrose and Stillman Pit sites in Murray County, the Kubik site in Kay County, the Arrowhead Ditch site in Muskogee County, and the Anthony site in Caddo County. The Anthony site is unique in that it exhibits artifacts from all four Calf Creek groups and was likely a gathering place for the people as a whole (Gilbert 2000). Other Archaic sites in Oklahoma include the Pumpkin Creek site in Love County, the Lawrence site in Nowata County, and the Gore Pit site in Comanche County. The Lawrence site is near the project area and known for its burned rock cooking pit concentrations (Hawkins 2011).

*Woodland*

The Woodland Period in Oklahoma can be defined as one of technological innovation, with ceramics, the bow and arrow, gradual intensification of horticulture, and concomitant social changes differentiating this time period from more residentially mobile hunting and gathering populations of earlier times. As people began domesticating plants during this period, populations became more sedentary in order to cultivate and harvest crops. In North America sunflower, native squash, may grass, marsh elder, goosefoot, and pigweed were first domesticated while South American crops such as corn, beans, squash, and chiles were imported through trade later. Bone tools from bison were commonly used in agricultural practices. People lived in small, seasonal villages with houses made of pole frameworks with grass thatch or cane matting to form walls and circular hearths (Gilbert 2000).

The appearance in the archaeological record of small corner notched projectile points indicates that the bow and arrow was in use. The presence of ceramic sherds indicates that ceramic use in the form of pottery for storage and cooking had become widespread. Projectile points from this period include, in addition to the small corner notched points, large contracting stem points and corner-notched projectile points in a variety of styles, indicating continued use of the atlatl and darts, as well as spears likely employed for symbolic political or religious effect (Logan 2006, EHA 1980, Hawkins 2011, Ray et al. 2021).

Woodland period sites in Oklahoma continued to follow a north-south, east-west distinction. In eastern Oklahoma north of the Arkansas River the Cooper Culture has been defined near the project area in Delaware and Mayes counties. These archaeological assemblages are similar to groups living near Kansas City including spearpoints, ceramics, clay figurines, and the use of rock shelters as seasonal camps. South of the Arkansas River but north of the Ouachita Mountains, the Fourche Maline Culture is prominent and exhibited by the McCutchan-McLaughlin site in Latimer County. In western Oklahoma people continued a nomadic bison hunting communities and were slow to adopt the bow and arrow. The Certain Bison Kill site in Beckham County represents this,

though sites such as the Swift Horse site in Roger Mills County demonstrate more adaptation of plant subsistence and bow and arrow use (Hawkins 2011).

*Mississippian/Plains Village*

From 1000 to 1500 AD, two main cultures were present in Oklahoma. The Mississippian to the east and the Plains Village to the north and west. Although in other regions either the Mississippian or the Plains Village are considered unique cultures and time periods in prehistoric chronology, Oklahoma presents a crossroads where the cultures coexisted in the state around the same time. Both cultures became more reliant upon cultivating crops, and large villages soon became common. Both cultures also began creating more pottery forms and styles including bowls, jars, plates, bottles, and effigies with a wide variety of surface treatments. Ornamentation made from copper and a variety of minerals and textiles were widely used as well (Hawkins 2011).

In the Mississippian culture in Oklahoma, also known as the Caddoan culture, is the western-most representation of a mound building culture that dominated the southeast during this timeframe. Early Mississippians constructed houses and temples that had square or rectangular floor plans with center posts supporting the roofs. Later structures had only two center posts and some were circular. Large burial mounds surrounded by smaller mounds are defining features of Mississippian culture. Burials included grave goods that became more elaborate over time. The Harlan site in Cherokee County is the earliest known center of Mississippian culture in Oklahoma. Spiro Mounds in Le Flore County is the most famous Mississippian site in Oklahoma. Consisting of at least 12 mounds covering an area of 80 acres, the site contained many well preserved and elaborate objects that yielded a great deal of information about the Mississippian people (Gilbert 2000).

Plains Village people grew crops and hunted and gathered wild resources. Artifact assemblages contain gardening tools along with triangular arrow points for hunting. Sites from this time are often identified in lowland terraces of waterways where gardening with bone tools was viable. These villages have been found along major rivers and their tributaries including the Arkansas, Canadian, North Canadian, Washita, and Red Rivers (Gilbert 2000). Food was stored in underground cache pits that could be 3-5 feet deep and 3-5 feet wide. Ceramics were used for cooking directly over fire both inside and out and were usually smooth, though some were cord marked. Clay figurines have been found at Plains Village sites as well and may have been used in fertility ceremonies related to agriculture. Usually, Plains Village people still lived in villages of 75-150 people. Houses were square or rectangular and could be over 20 feet long. Rather than mounds, Plains Village people buried their dead in nearby cemeteries (Gilbert 2000). Examples of Plains Village sites in Oklahoma include the Roy Smith Site in Beaver County, the Heerwald site in Custer County, the Arthur site in Garvin County, and the McLemore site in Washita County.

*The Protohistoric (Contact) Period*

The period from A.D. 1500-1830 is referred to as the Protohistoric (or Contact) Period. During this time, non-native explorers, trappers, and traders visited the region, and land claims by first the Spanish, and then the French brought great changes (Everett 2021a). This was a time of reorganization and relocation by native peoples in response to rapid culture change as European contacts brought new technologies, goods traded throughout the continent, diseases which spread ahead of them, the fur trade, and the horse. The pressures of these rapid changes led to increased inter-group conflict, including conflicts over access to, and control of, resources. People aggregated into large villages situated along major rivers, and in the later part of the period many of these villages were fortified (Vehik 2006). The Tribes first encountered by Europeans in Oklahoma included the Caddo and Wichita in the southern and eastern part of the state, and the Plains Apache, Osage, Pawnee, and other more nomadic groups in the northern and western part of the state. The project area was primarily occupied by the Wichita though the Osage were known to hunt and raid in the area (Everett 2021a).

The first Europeans documented in Oklahoma were part of a Spanish expedition led by Francisco Vazquez de Coronado in 1541. In search of gold they erroneously believed to be in the province of Quivira, the expedition began in New Mexico and ended at a Wichita village in southern Kansas, passing through the panhandles of Texas and Oklahoma (Everett 2021a). Additional Spanish explorations in search of gold were conducted in the region through the early 1600s, though the most valuable finding of these expeditions were the descriptions of the land, animals, and peoples they encountered. Spain eventually lost interest in exploring the area northeast of New Mexico and viewed it as a buffer zone between its territory and the French.

In 1682, Robert Cavelier, Sieur de la Salle, claimed the territory drained by the Mississippi as part of the French Empire in North America. By 1700, French traders were established in the region and had developed trading relationships with Wichita groups in the Arkansas Valley of northern Oklahoma and with the Osage to the east. In 1718 Jean Baptiste Benard Sieur de La Harpe lead a trading expedition with the eventual goal of establishing a trading post along the Red River in present day Texas. The party traveled through eastern Oklahoma and stopped at a Wichita village in present Tulsa County at a site known as Lasley-Vore. In 1720 Captain Claude-Charles du Tisne also reached a Wichita village near the project area in Rogers County by traveling south down the Verdigris River. At both locations, the French made trade pacts with the Wichita for furs in exchange for guns (Everett 2021a).

The Caddoan language speaking Wichita and Affiliated Tribes were historically known as the Wichita Proper, Waco, Taovaya, Tawakoni, and Kichai. The Tribes can be traced back at least 800 years to the Washita River culture of central and western Oklahoma. The Washita River people resided in small villages of rectangular, mud-plastered houses with small gardens nearby. Between 1350 and 1450, some Washita River people began migrating north to the Great Bend of the Arkansas River in southern Kansas. Great Bend villagers lived in large, circular grass houses, grew crops, and hunted bison and small game. The archaeological record documents significant long-distance

trade with the southwest. Items such as painted and glazed pottery, turquoise beads and pendants, and shell beads distinctive to the Southwest Pueblo cultures attest to the extent of the trade networks in place. The Wichita used horses from the Spanish colonies to more effectively hunt buffalo and used guns, metal hoes, and buckets from the French in their daily lives and to trade with the Comanche. In the late 1700s, due to increased pressure from the Osage, the Wichita abandoned their homes in northern Oklahoma and traveled south into southeastern Oklahoma and Texas outside of the project area (Wichita and Affiliated Tribes 2021).

The Osage were one of five immigrant Tribes of Dhegiha Siouan speakers who originated in the Ohio River area. Over time the Dhegiha Sioux diffused into different Tribes as they migrated westward, and the Osage were one of the last to split and settle in the central and western portions of Missouri around 1300 (Hunter 2013). Osage villages were physically arranged to reflect the Osage cosmos with a central street running east-west representing the path of the sun. Dwellings were rectangular long houses with domed roofs constructed of poles and woven cattail mats, bark, hides, or some combination thereof. Osages planted crops near their permanent villages, though the entire village would move onto the plains during the summer and autumn buffalo hunts and return to the permanent village locations for the remainder of the year (Bailey and Swan 2004). As the French built trade alliances with the Osage in the late 1600s and early 1700s, the Osage benefited greatly from the influx of guns and other French trade goods, as well their villages' proximity to accessible river trade routes. The Osage became the dominant Tribe in the region and began forcing the Wichita and Caddo further south. Similarly, other eastern Tribes' forced removal to traditional Osage lands in Missouri put a strain on resources available to the Tribes. In the 1790s, French trader Rene Auguste Chouteau convinced roughly one third of the Tribe to relocate to the Three Forks region of Oklahoma where the Arkansas, Verdigris, and Grand Rivers converge near Chouteau's new trading posts (and within the project area). Known as the Arkansas Osage, the group mainly settled at Claremore with other villages nearby. As eastern Tribes such as the Cherokee were forced to move into Osage territory in Arkansas by the United States in the early 1800s, increased conflict between the Osage and eastern Tribes became more commonplace as the groups competed for natural resources. In an effort to stop the violence the United States signed treaties in 1818 and 1825 with the Osage establishing their reservation in southern Kansas and forcing Osage removal. However, the last Arkansas Osage did not leave the region until 1839, when they became too overwhelmed by eastern Tribes forced into the area by the Indian Removal Act of 1830 (Bailey and Swan 2004). Multiple Osage village sites have been identified near the project area archaeologically, including the Osage Union Mission established in 1821. The first printing press in Oklahoma was established at the Union Mission in 1835, technically ending the Protohistoric era in the state (Everett 2021b).

### Historical Resources

What is now the state of Oklahoma was included in the Louisiana Purchase in 1803, becoming part of what was known as the Louisiana Territory. When Louisiana joined the Union as a state in 1812, Louisiana Territory was renamed the Missouri Territory by the U.S. Congress to avoid confusion with the new state. In the 1820s,

Oklahoma was designated Indian Territory and closed to white settlement. From that time until 1890 when the Organic Act created the Oklahoma territory and incorporated it into the United States, more than three dozen Tribes had been forced to reside there (Bolton 2021).

Originally, the Cherokee were from the Appalachian Mountain area, first making contact with Hernando DeSoto's expedition in 1540. The first recorded Cherokee treaty was with the British in 1725 recognizing the Cherokee as a sovereign nation. Over time, missionaries and European influences created a strong spiritual and educational framework within the Cherokee with many members becoming Christian and educating their children in missionary schools. By 1828, the Cherokee Nation had created a written language, a newspaper published in both Cherokee and English, and its own Constitution. They even participated in chattel slavery of the antebellum south and were some of the largest plantation owners in Georgia. Despite this assimilation, several treaties culminating in the Treaty of New Echota ceded Cherokee lands to the United States (Cherokee Nation 2021). During the early 1800s, a group of Cherokee voluntarily moved west to Arkansas where they came into conflict with the Osage. This group became known as the United Keetoowah Band of Cherokee (UKB 2021). In 1838, remaining Cherokees, intermarried whites, and their slaves were forced to relocate to a reservation in a part of Indian Territory that used to be Osage lands, including the project area. Known as the Trail of Tears, an estimated one fourth of the Tribe perished in this move (Cherokee 2021). Once the Cherokee arrived in Indian Territory, political factions erupted into violence causing a civil war that lasted until the US forced a peace treaty in 1846. In 1856, the Cherokee Council designated the project area as part of the Cooweescoowee District (Cheatham 2021b). Following the treaty, the Cherokee enjoyed a renaissance of sorts in which the tribal newspaper was revived, books were published in the Cherokee language, college-level education was offered in Cherokee schools, and economic stability allowed average Cherokee citizens a better standard of living than neighbors in Arkansas, Kansas, and Missouri. This prosperity ended when the Cherokee were drawn into the American Civil War and officially sided with the Confederacy. Once the Confederacy was defeated, the Treaty of Fort Smith in 1866 forced the Cherokee to cede land, open their territory to railroads, begin the abolition of slavery within the Tribe, and essentially begin the process that would result in statehood. The Oklahoma land run in 1889 destroyed the Cherokee Outlet, which from lease income had supported the Tribe. In 1893 The Dawes Commission was established to allot lands of the Five Tribes including the Cherokee. This destroyed the Cherokee Nation land base, though the Tribal government remained intact (Strickland 2021).

The Delaware Tribe is one of many Tribes that descend from the Unami and Munsee speaking peoples collectively known as the Delaware that originated in the Delaware and Hudson River valleys (Obermeyer, 2009). The earliest contact between Europeans and the Delaware was in 1524 when Giovanni da Verrazano sailed into New York Harbor. In 1683 William Penn purchased land from the Delaware in a treaty that established Pennsylvania. By 1737 they had lost most of their land in Pennsylvania. In 1778 the Delaware became the first Tribe to sign a treaty with the United States and began a forced migration west. The Delaware had a series of settlements and resettlements in Pennsylvania, Ohio, Indiana, Missouri, and Kansas respectfully in which

the Tribe splintered (Stiefmiller 2021). In 1867, the main body of dispersed Delaware bands living in Kansas known today as the Delaware Tribe purchased land, including the project area, from the Cherokee. This group was a religiously diverse population living in agrarian frontier villages with a clan-based political organization that was allied with the United States (Obermeyer 2009). The Delaware founded the town of Alluwe within the project area in 1869. Delaware gradually moved from the area as the white population increased, with very few still residing in Alluwe when it became an oil boom town in 1907 (Cheatham 2021b). Today the original site of Alluwe is beneath the Oologah Lake conservation pool.

Oklahoma went through a period of instability during the Civil War. Its low population, proximity to Confederate (Texas and Arkansas) and Union (Kansas) neighbors, relatively minor tactical importance to the western campaign focused on the Mississippi River, and the Tribes' smaller militaries ensured the territory became used for troop movements to other locales and a hotspot for small raids and guerilla warfare for both sides. The Five Tribes (Cherokee, Choctaw, Chickasaw, Muskogee Creek, and Seminole) signed treaties with the Confederacy in 1861 as the Confederacy promised to respect Tribal lands and sovereignty, and to not abolish slavery. At this time, approximately 14 percent of Oklahoma's residents were slaves. The Tribes formed regiments that fought in engagements throughout the western theater, most notably at Pea Ridge, Arkansas and Honey Springs, Oklahoma (Huston, 2021). Coody's Bluff, within the project area, became a staging area for Confederates early in the war (Cheatham 2021a). Although initially abandoned by the Union, Ft. Gibson was reoccupied in 1862 and a culminative battle at Honey Springs in 1863 ensured the Union maintained control of the fort, if not the territory, for the remainder of the war. Due to constant marauding, retaliation, and split loyalties, refugee camps became common. Union loyalists were moved to Ft. Riley in Kansas and Ft. Smith in Arkansas, and Ft. Gibson was surrounded by as many as 7,000 refugees. Confederate camps along the Red River held close to 15,000 refugees. After the Confederacy surrendered, the Five Tribes signed a peace treaty with the United States in 1866. The treaty gave the western half of the territory to other Tribes in Kansas, slavery was abolished, freedmen obtained citizenship and property rights, and the territory was opened to railroads across Tribal lands (Huston 2021).

During Reconstruction, Oklahoma struggled with lawlessness as much as, if not more than, during the Civil War. It was difficult to police the region given the turmoil of the Civil War, and Tribal police and courts had no jurisdiction over non-Tribal citizens (Huston 2021). The territory became a popular hangout for outlaws and gangs including the James gang, the Younger gang, the Dalton Brothers, Cherokee Bill, and Bob Rogers, all of whom operated in the project area according to local legend (EHA 1980). In the 1890s, The Dawes Commission began the process of allotment that would transition communally held Tribal lands into individually owned private property. This led to a large loss of Tribal lands, Tribal citizens who accepted allotments now becoming United State Citizens, and allowed the area that had formerly been Indian Territory to become the territory of Oklahoma, which could then apply for statehood. Oklahoma achieved statehood in 1906 (Kidwell 2021).

Oologah Lake occupies parts of Nowata and Rogers Counties. Nowata County was formally organized in 1906 with the town of Nowata as its seat (Cheatham 2021a). Rogers County was originally named Cooweescoowee County at the state convention in 1906 after the Cherokee District it occupied, but citizen protests changed the name to Rogers in honor of Clement Rogers, a prominent Cherokee citizen and Will Rogers' father, who served as a legislator, judge, member of school boards, and member of the 1906 state constitutional convention. Claremore was selected as the county seat and work began on a county courthouse in 1937 (Thomas 2021).

In 1889, the first successful oil well was drilled in Oklahoma in Chelsea near the project area. Multiple shallow, interconnected oil fields were located in the project area including Chelsea, Alluwe, and Coody's Bluff. As Cherokee Nation oil leases began to be confirmed in 1904, Chelsea and Alluwe became hotbeds of activity. By the end of November 1904, 96 wells had been drilled at Chelsea, one of the largest numbers in the region. Although these shallow fields were quickly eclipsed by larger finds throughout the state, the Chelsea-Alluwe-Coody's Bluff District continued to be one of the most active early oil production areas with over 3,500 wells drilled by 1911. The increase in production lead to an increase of population as oil field workers were drawn to the area. Nowata and Alluwe became boom towns. Boom towns consisted of initial construction of flimsy buildings including housing, stores, bars, and brothels with the potential for replacement with more substantial structures if the boom lasted long enough. Workshops and other oilfield work areas would have been constructed on active oil fields. As larger fields were discovered through the state, workers began to migrate away from the Chelsea-Alluwe-Coody's Bluff District, and the population began to decrease by 1920 (Horn 2008). Alluwe was moved due to construction of the Oologah reservoir in the 1950s, and the original town location was bulldozed prior to inundation.

One of the most famous Oklahomans of history, Will Rogers, was born in the project area in 1879. A cowboy turned vaudeville actor, Rogers became best known for his home-spun humor and social commentary on current events and famous celebrities during the 1920s and 1930s in daily newspaper columns and radio broadcasts. He also starred in over 70 films. During a tour of Alaska with noted Oklahoma aviator Wiley Post in 1935, the pair were killed in a plane crash (Watson 2021). Will Rogers' birthplace and boyhood home became a tourist attraction, and the ranch house was purchased by the state and relocated in 1960 prior to the inundation of Oologah Lake. The house was later listed to the National Register of Historic places.

In 1938 the Flood Control Act authorized initial construction of Oologah Lake. The power portion of the proposed two stage development was authorized by the River and Harbor Act of 1946. Construction began in July 1950 and was paused in October 1951 for abutment access road construction. Construction of the dam resumed in December 1955 and was completed May 1963. In 1967 the dam was expanded, and all structures were completed in 1974. The dam consists of a rolled earth-filled embankment about 4,000 feet long and its maximum height is 137 feet above the streambed.

Historic site types and related resources expected in the project area include homesteads and ranches, farmsteads, trails, cemeteries, wells, cisterns, privies, rock

walls, foundations or foundation piers, cellar depressions, chimneys (stone or brick), stairs, oil and gas components, railroad lines, roads, schools, dumps, and water diversion features.

**Cultural Resources at Oologah Lake**

There are more than 209 known archaeological sites located wholly or in part on USACE fee lands associated with Oologah Lake. There are 98 known historic sites, 90 precontact sites, and 21 multicomponent sites with both historic and precontact components. Of these, three sites have been determined eligible for the NRHP, 122 are ineligible, and 84 sites have not been assessed for the NRHP. No sites are currently listed on the NRHP, though one NRHP property, the Will Rogers Birthplace, is immediately adjacent to USACE fee lands. The Will Rogers Birthplace dwelling was originally on USACE fee lands, but the structure was moved in 1960 in anticipation of the inundation of Oologah Lake. Therefore, the structure itself is listed on the NRHP, but the original homesite (which is located on USACE fee lands) is not part of that listing. Seven sites were discussed in earlier publications as being on USACE fee land but are not actually located on USACE fee land. Of those seven, four are historic, one is precontact, and two are multicomponent. Five are not eligible for the NRHP and two are unknown. The dam itself was completed in 1974 and is not old enough to be considered for NRHP inclusion. Once the structure is 50 years old it will need to be evaluated for the NRHP. Multiple significant sites at Oologah Lake have been protected through ESA designation.

Under the NHPA, properties of traditional religious and cultural importance to a living community may be determined to be eligible for inclusion on the NRHP. Commonly known as Traditional Cultural Properties (TCP), these properties are associated with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. Therefore, TCPs must be taken into account in order to comply with federal cultural resources regulations. Additionally, Executive Order 13007 states that each federal agency with responsibility for the management of Federal lands shall accommodate access to and ceremonial use of Native American sacred sites by religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. There have been no TCPs or sacred sites identified at this time at Oologah Lake. If TCPs or sacred sites are identified at Oologah Lake in the future, they could be given additional protected status through ESA designation.

Multiple formal archaeological surveys have been completed at Oologah Lake since the 1950s in response to ongoing activities such as lake construction, inadvertent discoveries, and NHPA Section 106 compliance. This section includes an overview of work conducted in the area. The first archaeological excavation known to take place within USACE fee lands of Oologah lake was conducted by James Shaeffer in 1959 (Shaeffer 1960). Shaeffer conducted a salvage excavation for a site discovered in a borrow pit during ODOT construction for rerouting Highway 28. Additional archaeological surveys of the current project area were undertaken in anticipation of the increase in the conservation and flood control pools of Oologah Lake. The preliminary survey of the conservation pool was carried out by Terry Prewitt in July and August of 1967 and resulted

in the location of 11 archaeological sites (Prewitt 1968). Six sites were tested and four of the six were found to warrant data recovery excavations. Excavations were conducted at two of these sites in the summer of 1968 (Baldwin 1969, 1970). In the fall of 1970, Gregory Perino conducted excavations at a different site prior to the conservation pool being raised 20 feet in 1971 (Perino 1971).

In 1979, the USACE Tulsa District contracted Espey, Huston & Associates, Inc. to conduct archaeological survey of all USACE land not inundated by the conservation pool of the reservoir (20,650 acres). Field work was conducted from December of 1979 through February of 1980 under direction of Peter Nichols (EHA 1980). The shoreline was pedestrian surveyed with subsurface testing carried out at the discretion of crew members, and 182 new sites were recorded (73 precontact and 109 historic). However, only some of the sites were described in detail in the report and were selected for further description “because of their significance in relationship to other sites in the project area” (EPA 1980). The report also acknowledged an abundance of historic sites that they did not record due to time constraints, especially those related to the oil and gas industry. In 1987 Susan Vehik published an assessment of sites discovered in the previous surveys in which she recommended sites for further analysis and created a predictive model for sites beneath the reservoir that had been inundated (Vehik 1987).

In April 1994, an unmarked grave was identified at a known archaeological site and a report was completed to assist with NAGPRA compliance (Jobson et al 1994). In 2008, the USACE Tulsa District partnered with the Oklahoma Energy Resources Board to clean up abandoned well sites and remove debris from historic oil production sites in the Oologah Lake area. As a result, Tulsa District compiled a historic overview of the area in regard to oil production and suggested that the area could constitute a historic district (Horn 2008). Rebecca Hawkins of Algonquin Consultants, Inc. surveyed 9 acres surveyed in advance of stockpiling sediments dredged from the Verdigris River and identified one archaeological site that was recommended as potentially eligible for the NRHP (Hawkins 2011). Most recently in 2020, the Tulsa District had a reconnaissance survey conducted at a previously unknown archaeological site where unmarked graves were discovered, prior to installing riprap protection over the site (Ray et al 2021). Small surveys have been, and continue to be, conducted in and near Oologah Lake for compliance with Section 106 of the NHPA. When funds are available, surveys and other preservation activities are also conducted in accordance with Section 110 of the NHPA.

**Long-term Cultural Resource Objectives**

As funding allows, the Tulsa District will plan and budget for a Historic Preservation Management Plan (HPMP) that shall be developed and incorporated into the Operational Management Plan (OMP) in accordance with EP 1130-2-540. The purpose of the HPMP is to provide a comprehensive program to direct the historic preservation activities and objectives at Oologah Lake and it will be accomplished if future funding is forthcoming. Completion of a full inventory of cultural resources at Oologah Lake is a long-term objective that is needed for compliance with Section 110 of the National Historic Preservation Act (NHPA). All currently known sites with unknown eligibility and newly recorded sites must be evaluated to determine their eligibility for the NRHP. Identification

and evaluation of sites is an ongoing process at Oologah Lake. As more significant sites are identified, they could be protected through ESA designation in the future.

In accordance with Section 106 of the NHPA, any proposed activities or projects at Oologah Lake will require review by District Archaeologists to assess their potential to impact historic properties. These activities may include those described in this master plan or those that may be proposed in the future by others for leases, licenses, right-of-way easements, recreational development, construction, wildlife management, or other activities that can be considered undertakings subject to Section 106 of the NHPA. The need for cultural resource surveys to locate and evaluate historic and prehistoric resources, consultation, or other compliance activities related to Section 106 of the NHPA shall be determined and coordinated by a qualified District Archaeologist. Resources determined eligible for the NRHP must be protected from proposed project impacts, or the impacts must be mitigated in consultation with appropriate parties.

The Archaeological Resources Protection Act (ARPA) secures the protection of archaeological resources and sites on lands owned and administered by the United States for the benefit of the American people. According to ARPA, it is illegal to excavate, remove, damage, or deface archaeological resources on public lands without a permit issued by the federal agency managing the land. It is also illegal to sell or transport archaeological resources removed from public lands. Tulsa District requires permits for archaeological investigations at Oologah Lake in accordance with ARPA and is increasing surveillance and coordination with law enforcement agencies in the state to enforce ARPA civil and criminal penalties.

According to the Native American Graves Protection and Repatriation Act (NAGPRA), it is the responsibility of a federal agency to inventory human remains and associated funerary objects, as well as summarize any potential sacred objects, that existed within their archaeological collections prior to the passage of the law and, to the extent possible, identify their cultural affiliation in order to repatriate such objects to affiliated Tribes requesting their return. In addition, there are responsibilities related to the inadvertent discovery of human remains or funerary objects that occurred on federal land after the passage of the law that require a separate process of consultation, affiliation determinations, and notifications prior to repatriation. Although NAGPRA compliance has been an ongoing focus of the Tulsa District and many consultations and repatriations have occurred over the past 25-30 years, there is still more work to be done.

In recognition of the significance of the responsibility the Tulsa District has to ensure the proper and respectful treatment of the individuals who have been - or may inadvertently be - disinterred from Tulsa District land and acknowledging the fact that this work requires more than a part-time effort to be accomplished, a new full-time position has been established to focus on the proper execution of this responsibility. The intensive process to verify existing documentation and complete any missing part of the process for all collections of human remains, funerary objects, or sacred objects subject to NAGPRA in Tulsa District archaeological collections is in progress. As a necessity, this renewed effort is starting with research and reorganization of associated records and archaeological collections to ensure the proper identification and initial inventory of all

NAGPRA materials that are under the control of Tulsa District. This effort will include NAGPRA collections that have been made – or may yet be discovered - at Oologah lake, therefore, compliance with NAGPRA is ongoing.

## 2.15 DEMOGRAPHIC AND ECONOMIC ANALYSIS

The following information covers the current demographic and economic data for counties near Oologah Lake, Oklahoma (Zone of Interest). This basic information gives a snapshot of the current population and looks at growth trends for the area.

### Zone of Interest

Oologah Lake is located in Rogers and Nowata Counties in north-eastern Oklahoma. The zone of interest for the socioeconomic analysis of Oologah Lake is defined as Craig, Mayes, Nowata, Osage, Rogers, Tulsa, Wagoner and Washington Counties in Oklahoma and Montgomery County in Kansas.

### Population

The total population for the zone of interest in 2019 was estimated at 1,014,119, as shown in Table 2.5. Approximately 64% of the zone of interest's total population is within Tulsa County and 9% is within Rogers County. Wagoner County makes up 8%, Washington and Osage Counties about 5% each, Mayes County approximately 4%, Montgomery County, KS about 3%. Craig and Nowata Counties make up about 1% each. The zone of interest accounts for approximately 26% of the population for Oklahoma.

The zone of interest's population is projected to increase by almost 448,000 people by 2070, and annual growth rate of 0.7%. Most of the growth is projected to occur in Tulsa County, which is projected to grow by 262,000 people by 2070, an annual growth rate of 0.7%. Rogers County is expected to grow by 75,000 people, or an annual average of 1.2%. Wagoner County is expected to grow by 60,000 people, an annual rate of 1.1%. Mayes County is projected to grow by 25,000 people (0.9% annually), Osage County by 23,000 (0.8% annually), Washington County by 11,000 people (0.4% annually) and Nowata County by 246 people (less than 0.1% annually). Craig County is projected to lose 237 people by 2070 and Montgomery County, KS is projected to lose approximately 8,000 people by 2070.

**Table 2.5 – 2000 and 2019 Population Estimates and 2070 Projections**

| Geographic Area | 2000 Population | 2019 Population Estimate | 2070 Population Projection |
|---|---|---|---|
| Oklahoma | 3,450,654 | 3,932,870 | 5,419,987 |
| Montgomery County, KS | 36,252 | 32,521 | 24,153 |
| Craig County, OK | 14,950 | 14,390 | 14,153 |
| Mayes County, OK | 38,369 | 41,044 | 66,371 |
| Nowata County, OK | 10,569 | 10,322 | 10,568 |

| Geographic Area | 2000 Population | 2019 Population Estimate | 2070 Population Projection |
|---|---|---|---|
| Osage County, OK | 44,437 | 47,226 | 70,082 |
| Rogers County, OK | 70,641 | 91,353 | 166,354 |
| Tulsa County, OK | 563,299 | 646,419 | 908,576 |
| Wagoner County, OK | 57,491 | 78,958 | 139,368 |
| Washington County, OK | 48,996 | 51,886 | 62,406 |
| Zone of Interest | 885,004 | 1,014,119 | 1,462,031 |

Sources: 2000 Population Estimates: U.S. Bureau of the Census, 2000 Decennial Census;
2019 Population Estimates: U.S. Bureau of the Census, American Community Survey, 5 Year Estimate;
2070 Projections: Center for Economic Development and Business Research, Wichita State University.

The distribution of the population by gender is shown in Table 2.6. For the zone of interest, the population is 49.1% male and 50.9% female, similar to the state's 49.6% male and 50.4% female distribution. All of the remaining counties are very similar to near 50%/50% distributions between male and female.

**Table 2.6 – 2019 Population by Gender**

| Geographic Area | Total Population | Male | Female |
|---|---|---|---|
| Oklahoma | 3,932,870 | 1,949,528 | 1,983,342 |
| Montgomery County, KS | 32,521 | 16,205 | 16,316 |
| Craig County, OK | 14,390 | 7,352 | 7,038 |
| Mayes County, OK | 41,044 | 20,458 | 20,586 |
| Nowata County, OK | 10,322 | 5,091 | 5,231 |
| Osage County, OK | 47,226 | 23,662 | 23,564 |
| Rogers County, OK | 91,353 | 45,473 | 45,880 |
| Tulsa County, OK | 646,419 | 315,509 | 330,910 |
| Wagoner County, OK | 78,958 | 39,025 | 39,933 |
| Washington County, OK | 51,886 | 25,270 | 26,616 |
| Zone of Interest | 1,014,119 | 498,045 | 516,074 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

Figure 2.5 shows the population by age group expressed as a percent of total population for Oklahoma, the zone of interest, and Rogers and Nowata Counties, where the lake is located. While the percentages are roughly similar for most of the age groups, it can be seen that there is a larger percentage of 25–34-year-olds in the zone of interest and Oklahoma compared to Rogers and Nowata Counties, with almost 14% of the zone of interest's population in this age group. The zone of interest also shows slightly larger percentages in the under 5 (7%), and 5 to 9 (7%) year age groups, to Rogers and Nowata Counties, but very similar to the state. Rogers and Nowata Counties have slightly higher percentages in the older age groups than the zone of interest and state overall.

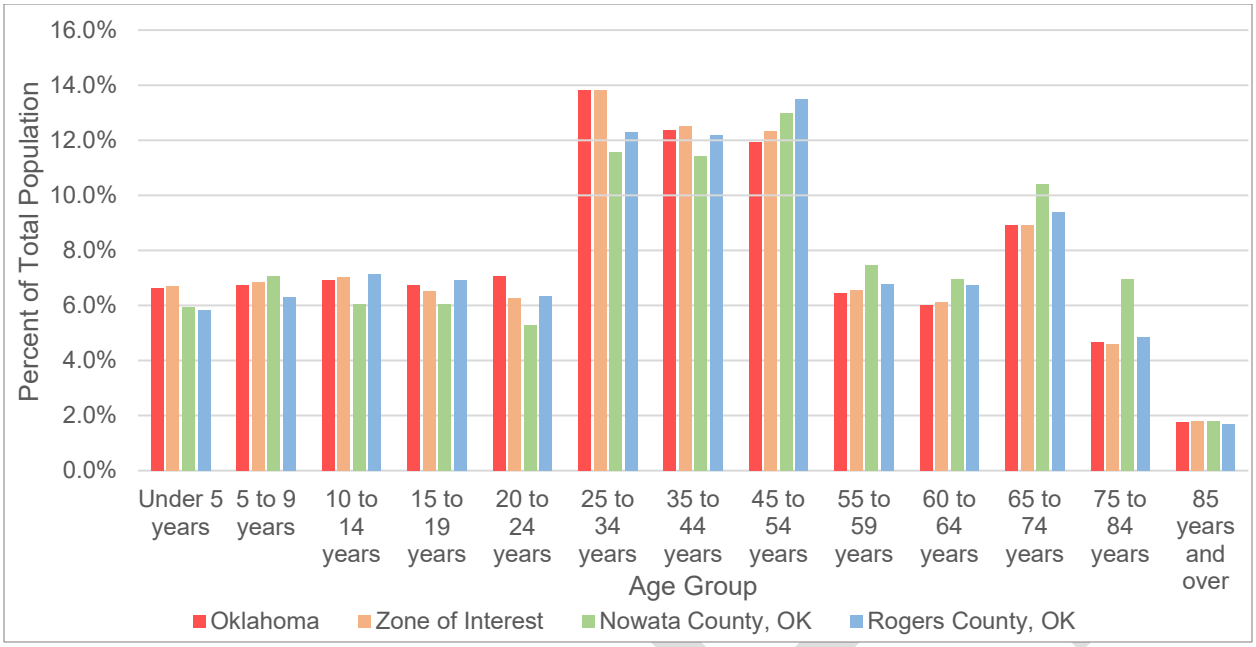


**Figure 2.5 – Percent of Population by Age Group, 2019**
Source: U.S. Bureau of the Census, American Community Survey, 5 Year Estimate

The 2019 population by race and Hispanic origin is shown in Table 2.7. In the zone of interest, approximately 65% of the population is White, 10% are Hispanic or Latino, 8% Black, 8% two or more races, 7% American Indian and Alaska Native, 3% Asian, and each of the other races making up less than 1% each of the total population. The zone of interest is similar to the state's breakdown. For the state, 66% are White, 11% are Hispanic or Latino, 7% each for Black, American Indian and Alaska Native, and two or more races, and 2% Asian, with each of the remaining races making up less than 1% each.

**Table 2.7 – 2019 Population by Race and Hispanic Origin**

| Geographic Area | Total | White | Black | American Indian and Alaska Native | Asian | Native Hawaiian and Other Pacific Islander | Hispanic or Latino | Some other race | Two or more races |
|---|---|---|---|---|---|---|---|---|---|
| Oklahoma | 3,932,870 | 2,581,231 | 280,944 | 285,402 | 84,020 | 5,629 | 417,906 | 5,195 | 272,543 |
| Montgomery County, KS | 32,521 | 25,832 | 1,608 | 1,054 | 317 | 59 | 2,197 | 20 | 1,434 |
| Craig County, OK | 14,390 | 9,114 | 441 | 3,062 | 119 | 12 | 533 | 0 | 1,109 |
| Mayes County, OK | 41,044 | 26,622 | 201 | 7,128 | 173 | 145 | 1,479 | 17 | 5,279 |
| Nowata County, OK | 10,322 | 6,887 | 253 | 1,548 | 15 | 19 | 318 | 8 | 1,274 |
| Osage County, OK | 47,226 | 29,932 | 5,248 | 5,837 | 193 | 16 | 1,704 | 7 | 4,289 |

| Geographic Area | Total | White | Black | American Indian and Alaska Native | Asian | Native Hawaiian and Other Pacific Islander | Hispanic or Latino | Some other race | Two or more races |
|---|---|---|---|---|---|---|---|---|---|
| Rogers County, OK | 91,353 | 65,588 | 906 | 11,333 | 1,284 | 62 | 4,345 | 32 | 7,803 |
| Tulsa County, OK | 646,419 | 400,632 | 64,101 | 30,187 | 21,371 | 614 | 82,309 | 1,531 | 45,674 |
| Wagoner County, OK | 78,958 | 56,445 | 2,755 | 6,769 | 1,148 | 64 | 4,895 | 133 | 6,749 |
| Washington County, OK | 51,886 | 37,768 | 1,400 | 5,356 | 1,147 | 10 | 3,116 | 28 | 3,061 |
| Zone of Interest | 1,014,119 | 658,820 | 76,913 | 72,274 | 25,767 | 1,001 | 100,896 | 1,776 | 76,672 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

## Education and Employment

Table 2.8 shows the highest educational attainment for the 2019 population 25 years of age and older. In the zone of interest, 28% of the population had earned a high school diploma or equivalent, 24% had some college, but no degree, and 19% had earned a Bachelor's degree. Approximately 9% held a graduate degree or higher and 9% had earned an Associate's degree. About 7% of the population had attended school between the 9th and 12th grades but did not earn a diploma. Almost 4% of the population had less than a 9th grade education. The area interest educational attainment is representative of the state overall. For Oklahoma, 31% had earned a high school diploma or equivalent, 23% had some college but no degree, and 17% has a Bachelor's degree. About 9% had a graduate degree or higher, and 8% had an Associate's degree. Only 8% had 9 to 12 years of education but without degree, and 4% had less than 9 years of education.

**Table 2.8 – 2019 Population Estimate by Highest Level of Educational Attainment, Population 25 Years of Age and Older**

| Geographic Area | Population 25 years and over | Less than 9th grade | 9th to 12th grade, no diploma | High school graduate (includes equivalency) | Some college, no degree | Associate's degree | Bachelor's degree | Graduate or professional degree |
|---|---|---|---|---|---|---|---|---|
| Oklahoma | 2,592,088 | 104,449 | 206,004 | 812,102 | 604,637 | 203,387 | 436,601 | 224,908 |
| Montgomery County, KS | 21,944 | 664 | 1,788 | 6,400 | 6,155 | 2,655 | 3,043 | 1,239 |
| Craig County, OK | 10,095 | 411 | 924 | 3,992 | 2,307 | 979 | 1,036 | 446 |
| Mayes County, OK | 27,968 | 1,225 | 2,544 | 11,038 | 6,775 | 2,380 | 2,761 | 1,245 |
| Nowata County, OK | 7,183 | 193 | 601 | 3,163 | 1,751 | 648 | 599 | 228 |

| Geographic Area | Population 25 years and over | Less than 9th grade | 9th to 12th grade, no diploma | High school graduate (includes equivalency) | Some college, no degree | Associate's degree | Bachelor's degree | Graduate or professional degree |
|---|---|---|---|---|---|---|---|---|
| Osage County, OK | 33,165 | 1,049 | 2,847 | 12,649 | 7,899 | 2,746 | 4,227 | 1,748 |
| Rogers County, OK | 61,618 | 1,439 | 3,474 | 19,774 | 15,479 | 6,135 | 10,918 | 4,399 |
| Tulsa County, OK | 424,885 | 17,697 | 27,311 | 107,747 | 99,637 | 37,312 | 90,827 | 44,354 |
| Wagoner County, OK | 53,588 | 1,405 | 3,631 | 17,618 | 13,504 | 4,999 | 8,844 | 3,587 |
| Washington County, OK | 35,467 | 737 | 2,672 | 12,053 | 7,229 | 2,677 | 6,848 | 3,251 |
| Zone of Interest | 675,913 | 24,820 | 45,792 | 194,434 | 160,736 | 60,531 | 129,103 | 60,497 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

Figure 2.6 shows the 2019 employment by sector expressed as a percent of total employment for the area of interest and the number of employment by sector for Oklahoma, the area of interest, and the constituent counties is presented in Table 2.9. For the area of interest, 22% of the employment is in the educational, health care and social assistance services sector, followed by 13% in manufacturing, 11% in retail trade. While most of the employment is in service sector jobs, manufacturing shows to be an important sector. About 10% are employed in professional, scientific, and management; 10% in arts, entertainment, recreation, and accommodation services; 7% in construction; and 6% in Transportation, Warehousing, and Utilities. The remaining sectors represent 5% or less each of total employment.

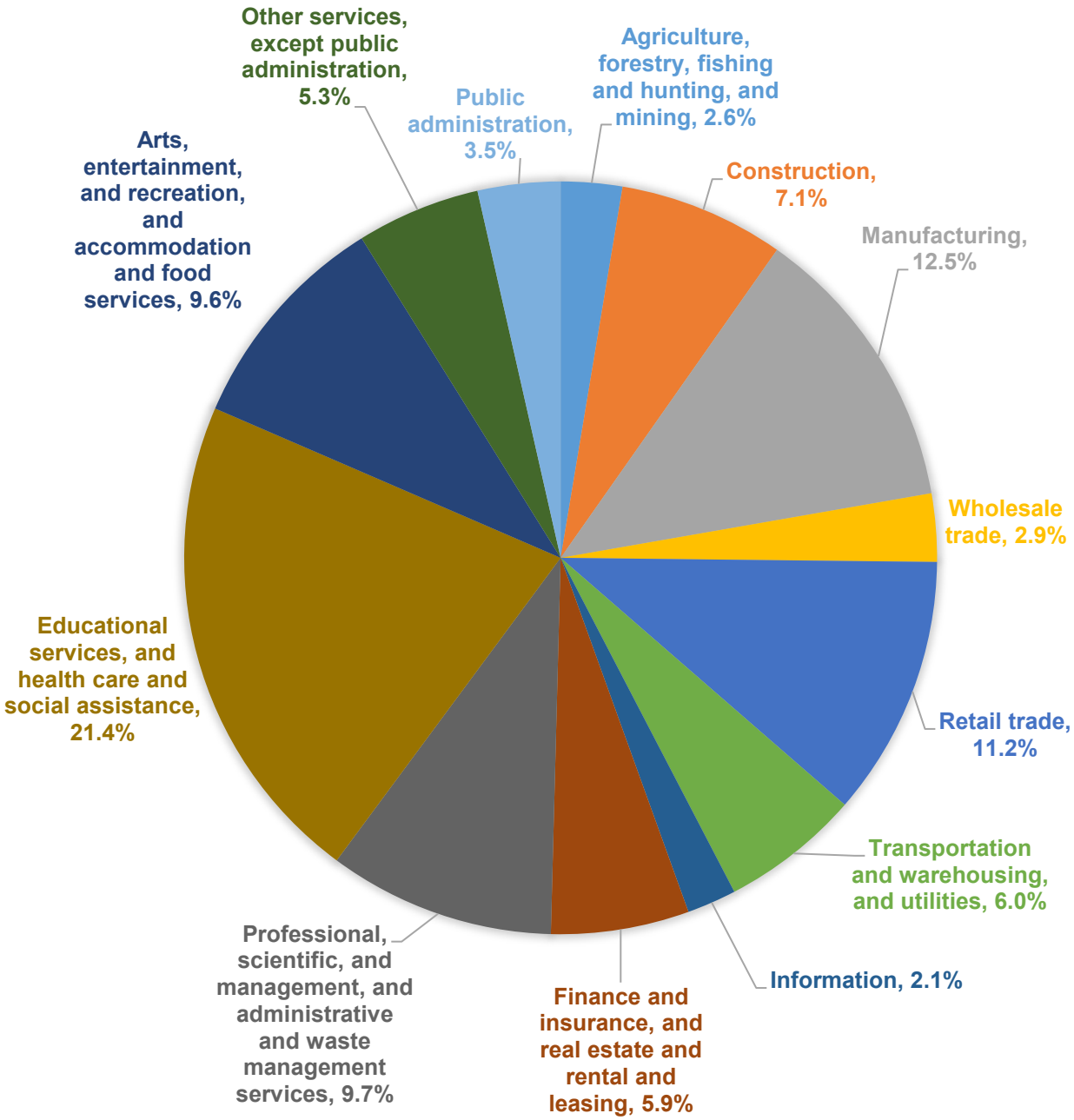


**Figure 2.6 – Percent Employment by Sector for Area of Interest (2019)**

**Table 2.9 – Employment by Sector (2019)**

| Employment Sector | Oklahoma | Montgomery County, KS | Craig County, OK | Mayes County, OK | Nowata County, OK | Osage County, OK | Rogers County, OK | Tulsa County, OK | Wagoner County, OK | Washington County, OK | Zone of Interest |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Civilian employed population 16 years and over | 1,772,123 | 14,494 | 5,702 | 17,282 | 4,293 | 19,105 | 45,878 | 314,296 | 36,917 | 22,277 | 480,244 |
| Agriculture, forestry, fishing and hunting, and mining | 82,013 | 435 | 401 | 638 | 285 | 1,148 | 860 | 7,195 | 608 | 1,083 | 12,653 |
| Construction | 126,029 | 672 | 315 | 1,420 | 367 | 1,491 | 4,368 | 20,727 | 3,167 | 1,637 | 34,164 |
| Manufacturing | 168,207 | 3,107 | 344 | 3,176 | 642 | 2,309 | 6,582 | 36,009 | 4,822 | 3,059 | 60,050 |
| Wholesale trade | 44,602 | 235 | 125 | 517 | 145 | 426 | 1443 | 9,285 | 1,359 | 498 | 14,033 |
| Retail trade | 205,201 | 1,629 | 771 | 2,140 | 391 | 1,850 | 5,290 | 35,151 | 3,997 | 2,627 | 53,846 |
| Transportation and warehousing, and utilities | 95,177 | 902 | 388 | 1,101 | 298 | 1,556 | 3,715 | 17,435 | 2,426 | 896 | 28,717 |
| Information | 29,207 | 115 | 92 | 271 | 25 | 317 | 625 | 7,746 | 579 | 404 | 10,174 |
| Finance and insurance, and real estate and rental and leasing | 97,129 | 537 | 232 | 741 | 197 | 847 | 2057 | 20,741 | 2,207 | 920 | 28,479 |
| Professional, scientific, and management, and administrative and waste management services | 152,395 | 896 | 298 | 1,148 | 283 | 1,412 | 3,453 | 33,973 | 3,315 | 1,924 | 46,702 |
| Educational services, and health care and social assistance | 397,126 | 3,689 | 1,516 | 3,219 | 997 | 4,000 | 9,195 | 67,365 | 7,636 | 4,936 | 102,553 |
| Arts, entertainment, and recreation, and accommodation and food services | 172,799 | 997 | 567 | 1,305 | 270 | 1,589 | 4,662 | 31,548 | 3,220 | 2,145 | 46,303 |

| Employment Sector | Oklahoma | Montgomery County, KS | Craig County, OK | Mayes County, OK | Nowata County, OK | Osage County, OK | Rogers County, OK | Tulsa County, OK | Wagoner County, OK | Washington County, OK | Zone of Interest |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Other services, except public administration | 92,823 | 710 | 291 | 837 | 225 | 855 | 1764 | 17,413 | 1,930 | 1,501 | 25,526 |
| Public administration | 109,415 | 570 | 362 | 769 | 168 | 1,305 | 1,864 | 9,708 | 1,651 | 647 | 17,044 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

### Households, Income, Poverty

Table 2.10 shows the number and size of households for Oklahoma and the zone of interest. The zone of interest has approximately 394,422 households, which makes up about 27% of the number of households statewide. About 64% of the households are in Tulsa County (252,661), about 9% are in Rogers County (34,755), 7% in Wagoner County (29,208), and about 5% each in Washington County (20,455) and Osage County (18,263). The remainder of the counties make up less than 5% each. The average household size for the area of interest is 2.54 persons, with the constituent counties ranging from 2.33 to 2.70. The household size for the zone of interest is just slightly smaller than the state overall, which has 2.58 persons per household.

**Table 2.10 – Number of Households and Average Household Size (2019)**

| Geographic Area | Total Number of Households | Average Household Size |
|---|---|---|
| Oklahoma | 1,480,061 | 2.58 |
| Montgomery County, KS | 13,576 | 2.33 |
| Craig County, OK | 5,422 | 2.44 |
| Mayes County, OK | 15,983 | 2.53 |
| Nowata County, OK | 4,099 | 2.47 |
| Osage County, OK | 18,263 | 2.51 |
| Rogers County, OK | 34,755 | 2.59 |
| Tulsa County, OK | 252,661 | 2.53 |
| Wagoner County, OK | 29,208 | 2.70 |
| Washington County, OK | 20,455 | 2.50 |
| Zone of Interest | 394,422 | 2.54 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

Median household income and per capita income are shone in Table 2.11. While the median household income for the zone of interest was not available, for the constituent counties, it ranged from $43,000 in Nowata and Craig Counties to $66,000 in Rogers County. By comparison, the state's median household income was $53,000. Rogers, Tulsa, Wagoner and Washington Counties have median household incomes

greater than the state median household income and Montgomery (KS), Craig, Mayes, Nowata, and Osage were below the state median.

The per capita income for the zone of interest was approximately $31,000 and was greater than the state's per capita income of $28,000. The constituent counties per capita income ranged from $21,000 in Craig County to $32,000 in Rogers and Tulsa Counties.

**Table 2.11 – Median and Per Capita Income (2019)**

| Geographic Area | Median Household Income | Per Capita Income |
|---|---|---|
| Oklahoma | $52,919 | $28,422 |
| Montgomery County, KS | $45,157 | $24,647 |
| Craig County, OK | $43,329 | $21,318 |
| Mayes County, OK | $50,345 | $24,472 |
| Nowata County, OK | $43,145 | $22,930 |
| Osage County, OK | $49,103 | $25,473 |
| Rogers County, OK | $66,132 | $32,205 |
| Tulsa County, OK | $55,517 | $32,044 |
| Wagoner County, OK | $62,795 | $29,415 |
| Washington County, OK | $54,997 | $30,847 |
| Zone of Interest | N/A | $30,698 |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

Percentages of families and persons falling below the poverty level is shown in Table 2.12. The percent of all families for the zone of interest was not available, but for the constituent counties, it ranged from 7.4% in Wagoner County to 12.9% in Craig County. Rogers and Wagoner Counties were below the state's percentage, Tulsa County was the same as the state, and the remaining counties had a higher percentage of families below the poverty level as compared to Oklahoma overall.

Approximately 15% of all persons in the zone of interest had incomes below the poverty level, slightly lower than the state's percentage of 16%. Osage, Rogers, Tulsa, Wagoner and Washington Counties had percentages lower than the state overall. Montgomery (KS), Craig, Mayes, and Nowata Counties had a larger percentage of persons below the poverty level than Oklahoma overall. Nowata had the highest percentage, with 21% of persons below the poverty level.

**Table 2.12 – Percentage of Families and People Whose Income in the Past 12 Months is Below the Poverty Level (2019)**

| Geographic Area | All Families | All People |
|---|---|---|
| Oklahoma | 11.3% | 15.7% |
| Montgomery County, KS | 12.5% | 18.7% |
| Craig County, OK | 12.9% | 18.6% |
| Mayes County, OK | 14.1% | 18.1% |
| Nowata County, OK | 12.2% | 21.3% |

| Geographic Area | All Families | All People |
|---|---|---|
| Osage County, OK | 11.4% | 15.6% |
| Rogers County, OK | 8.4% | 11.5% |
| Tulsa County, OK | 11.3% | 15.0% |
| Wagoner County, OK | 7.4% | 10.4% |
| Washington County, OK | 10.1% | 13.3% |
| Zone of Interest | N/A | 14.6% |

Source: U.S. Bureau of the Census, American Community Survey, 2019 5 Year Estimate

## 2.16 RECREATION FACILITIES, ACTIVITIES, NEEDS, AND TRENDS

Oologah Lake provides a great getaway for fishing, boating, picnicking, camping, or just drifting over the cool waters. Wide stretches of water, perfect for catching the wind, make it one of the most popular lakes in the area for sailing. The forested hills around the lake provide excellent hunting opportunities. Eleven public use areas scattered around the lake offer a variety of facilities making it easy to find something that is just right for everyone. See Appendix A for detailed park plates of each of the eleven public use areas at Oologah Lake.

Table 2.13 provides a listing of recreation facilities and the primary recreation amenities that each provides.

**Table 2.13 – Recreation Facilities**

| Location | Managing Entity | Designated Campsites | Boat Launching Ramps | Restrooms | Marina | Group Shelter | Fishing Facilities | Designated Picnic Area | Dump Stations | Swimming Area | Electrical (30 amp) | Electrical (50 amp) | Trails | Playground |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Big Creek** | U | N | ✓ | ✓ | | | C | | | | | | | |
| **Blue Creek** | U | E N T G D | ✓ | ✓ | | ✓ | | ✓ | ✓ | | ✓ | | Q | ✓ |
| **Clermont I** | U | | ✓ | | | | | ✓ | | | | | | |
| **Hawthorn Bluff** | U | E N T D | ✓ | ✓ | | ✓ | D, C | ✓ | ✓ | ✓ | ✓ | | H | ✓ |
| **Oologah Lake Office** | U | | | | | | D | ✓ | | | | | | |
| **Overlook** | U | | | ✓ | | | | ✓ | | | | | | |
| **Redbud Bay** | U | E | | ✓ | | | | | | | ✓ | | | |
| **Redbud Bay Boat Ramp** | U | | ✓ | | | | | | | | | | | |
| **Spencer Creek** | U | E N D | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | H | ✓ |
| **Verdigris River Park** | U | N | ✓ | ✓ | | ✓ | | | | | | | | |
| **Winganon Ramp** | U | | ✓ | | | | | | | | | | | |

| Location | Managing Entity | Designated Campsites | Boat Launching Ramps | Restrooms | Marina | Group Shelter | Fishing Facilities | Designated Picnic Area | Dump Stations | Swimming Area | Electrical (30 amp) | Electrical (50 amp) | Trails | Playground |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vada Point** | U | | ✓ | | | | | | | | | | | |
| **Double Creek** | O | E D | ✓ | ✓ | | | | ✓ | ✓ | | ✓ | | | ✓ |
| **Eastside Ramp** | O | | ✓ | | | | | | | | | | | |
| **Oologah Lake WMA, ODWC** | O | | | | | | | | | | | | | |
| **Redbud Bay Marina** | O | E T | | ✓ | ✓ | | | | | | ✓ | | | |
| **Sunnyside Ramp — City of Talala, OK** | O | | ✓ | | | | | | | | | | | |

Legend

✓ Exists at lake

**Managing Entity**

U U.S. Army Corps of Engineers

O Managed by Others

**Camping**

E Electric Campsites

N Non-electric Campsites

T Pull-through Campsites

G Group Camping

D Dump Station

**Fishing**

C Fish Cleaning Stations

D Fishing Docks

**Trails**

Q Equestrian Trails

H Hiking Trails

M Multipurpose Trails

Source: USACE

## Fishing and Hunting

Sportsmen enjoy the wide variety of fish and game at Oologah Lake that are available through fishing and hunting. Lands open to hunting include 6,540 acres managed by the Corps and 12,940 acres licensed to the Oklahoma Department of Wildlife Conservation. Hunting maps are available at the Lake Office and on the USACE Tulsa District website. Available game includes deer, turkey, cottontail rabbit, quail, squirrel, duck, goose, dove, and various furbearers.

The lake and its tailwaters contain millions of game fish, including white bass, paddlefish, catfish, crappie, largemouth bass, and walleye. Standing timber, brush piles

and millet planted on exposed mud flats are used to enhance the aquatic habitat. The USACE also works with the Oklahoma Department of Wildlife Conservation to assure a proper balance of fish populations. State of Oklahoma hunting and fishing laws are enforced on project lands.

### Camping and Picnicking

Oologah Lake includes eleven parks for the public to enjoy. These areas include showers, overnight camping pads, electric hookups, playgrounds, fresh water, picnic tables, group shelters, grills, trails, ramps, and other facilities.

### Water Sports

The lake offers plenty of recreational opportunities for boaters and non-boaters alike. Water lovers can enjoy skiing, sailing, canoeing, swimming, sunning, or simply relaxing on or around Oologah Lake. Fourteen boat launching ramps are located at convenient sites around the lake and two designated swimming beaches have been developed in Hawthorn Bluff and Spencer Creek. The marina in Redbud Bay offers a full range of services and supplies. Boating on the lake must be in accordance with Oklahoma boating laws and USACE regulations.

### Trails

The Will Rogers Country Centennial Trail is located on the east side of the lake and winds around the lakeshore from the spillway to Blue Creek Park for a total of 18 miles. Horseback riding, hiking, and biking are allowed on the trails. The Skull Hollow Nature Trail is located in Hawthorn Bluff on the west side of the lake and offers three different routes, the longest being a mile and a third in length. Hikers should check the news and notices for closure information since trails will be closed during any firearm hunting season for deer. Brochures on both trails are available at the Lake Office, from the gate attendants, or USACE Tulsa District website.

### Commercial Concession Leases

Concessionaires provide valuable services to the public at USACE lakes across the United States. The USACE makes efforts to attract concessionaires that are able to establish suitable, well-maintained businesses that will offer desirable, water-related services to the general public. Presently, the only commercial concession lease at Oologah Lake is Redbud Bay Marina & RV Park. Redbud Bay Marina & RV Park is 51.23 acres. For more details on the provided services and hours of operation, please visit the Redbud Marina & RV Park website.

### Recreation Analysis – Trends and Needs

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) was also referred to extensively in preparing the Plan. Preparation of the SCORP included two statewide surveys of cities and towns in Oklahoma and two Recreation Rallies, one in Tulsa and one in Oklahoma City, that were open to members of the public and

representatives of public and private recreation service providers. The SCORP also summarized the results of a survey conducted by the USACE in 2010 to garner public input on public preferences for lake usage and development in Oklahoma. The USACE survey was required by Section 3134 of the Water Resources Development Act of 2007 which established what is referred to as the Oklahoma Lakes Demonstration Program. In addition, the SCORP assessed public preferences through cited research pertinent to the recreation needs and issues of the people of Oklahoma and those who visit the state for recreational experiences.

The SCORP references data from the 2012 National Survey on Recreation and the Environment (NSRE) conducted by the U.S. Forest Service. The following are a list of Findings from USACE Recreation Survey Pursuant to Oklahoma Lakes Demonstration Program in the SCORP:

- 456 individuals responded to (1) receipt of invitations at a USACE lake in Oklahoma, or (2) a newspaper, radio, or television announcement.

- 416 responses were complete and usable for analysis. Other respondents chose to answer a limited number of questions (while leaving many others incomplete) or failed to limit their responses to a single lake.

- The sample on which this analysis is based was (1) better educated than the adult population in Oklahoma, (2) over-representative of the older adult population and under-representative of the adult population ages 18 – 25, (3) predominantly white and non-Hispanic, although the respondents did include minority voices, and (4) representative of the adult population of males and females.

- People have favorite lakes and favorite locations on those lakes. Knowledgeable lake visitors also avoid specific areas on their favorite lakes and have good, personal reasons for avoiding those locations.

- Personal preference for specific lakes and locations is motivated by aesthetic appearance of the property, quiet experience, safety and security of the property, friendly staff, special events, and tradition. Respondents rarely mentioned commercial development or private support services as motivators for preference of a recreation location.

- People desire public access locations, campgrounds, and public day use recreation sites at USACE lakes. They do not desire or support private development to the same extent as they do public development.

- Respondents want more development and more day use at some USACE managed lakes, primarily Lake Eufaula and Lake Texoma. By contrast, respondents do not want more development at Birch Lake and Canton Lake – except as restoration of dated or damaged facilities.

- One-half of the respondents believe present facilities at USACE lakes are inadequate. The structured survey responses revealed desires for changes related

to physical aspects of USACE lakes, while the open-ended responses revealed desires for changes related to policies.

- The changes related to facilities desired by respondents were by level of importance from most important: (1) hiking trails, (2) swim beaches, (3) bike trails, (4) playgrounds, (5) campgrounds, (6) equestrian trails and canoe trails.

- Crowding at these lakes is neither perceived nor an issue as related to number and location of docks, number of people, number of boats, or presence of structures.

- Respondents desire more parking, improved access roads, increased law enforcement, and retention of fee revenue at the lakes of origin.

The SCORP and NSRE document national and regional trends showing the highest demand for unpaved trails for walking and hiking with demand expected to increase in in the near future. Given the outdoor recreation trends, it is evident that future recreation development at Oologah Lake should rightfully focus less on campgrounds and more on providing increased trail opportunities (of all kinds), more facilities for family and group gatherings, and more wildlife and nature-related viewing opportunities. With the popularity of hunting in Wildlife Management Areas, trails can be developed for hiking and nature viewing during non-hunting seasons and provide parking and trailheads that can be used for both types of activities. The USACE should also place a high priority on the protection and retention of large, undeveloped parcels of public land. Doing so responds to outdoor recreation needs expressed in the SCORP and NSRE. These large expanses of natural habitat on public land are held in high regard by the citizens throughout the zone of interest. This Plan responds to these needs through revised land classifications, new management objectives, and conceptual management plans for each land classification.

## 2.17 REAL ESTATE

Originally, 50,150 acres of land was acquired in fee simple title and 15,119 acres of flowage easement rights were acquired for the Oologah Lake project. USACE policy at the time was, in general, to obtain fee title to lands up to the full pool elevation level of the reservoir. Instead of closely following the contour of the full pool elevation, property lines were blocked out allowing for a small buffer of land above the flood pool to accommodate shoreline erosion and to have a more manageable boundary line. Additional lands needed for operations or recreational development purposes were also acquired in fee.

### Outgrants

The term “outgrant” is a broad term used by the USACE to describe a variety of real estate instruments wherein an interest in real property has been conveyed by the USACE to another party. Outgrants at Oologah Lake include leases, licenses, easements, consents, permits, and others. At present, there are approximately 79

recorded outgrants in effect on USACE lands at Oologah Lake. These outgrants include the following (including consents):

- Commercial Concessions – 1; providing recreational opportunities to visitors that include, restaurants, wet and dry boat storage, RV and tent camp sites, ships stores, and marine vessel repair.
- Public Park Leases – 2
- Quasi Non-Profit Leases – 1
- Agricultural and Grazing Leases – 2
- Easements – 57; including cathodic protection units (corrosion protection), oil and gas pipelines, electric lines, telephone lines, waterlines and pumping stations, roads and bridges, and railroads
- Licenses – 1; fish and wildlife management activities.
- Consents – 14
- Total Fee Acres – 50,119

The demand for real estate outgrants at Oologah Lake ranks fairly low among all USACE lake projects in terms of the total number and complexity of real estate outgrants. Management actions related to outgrants include routine inspections to ensure compliance with the terms of the outgrant, public safety requirements, and environmental compliance such as proper solid waste disposal and storage of pesticides. Additional actions include review of maintenance and construction proposals made by grantees. Leases are generally inspected annually for overall compliance, whereas minor outgrants are inspected approximately every five years or as needed. The management of outgrants is a major responsibility shared by the Operations and Real Estate Divisions of Tulsa District.

## Guidelines for Property Adjacent to Public Land

It is the policy of the USACE to manage the natural, cultural, and developed resources of Oologah Lake to provide the public with safe and healthful recreational opportunities, while protecting and enhancing those resources. The boundary at Oologah Lake is typically unfenced due to limited access and difficult topography.

While private exclusive use of public land is not permitted, property owners adjacent to public lands do have all the same rights and privileges as any other citizen on their own property. Therefore, the information contained in these guidelines is designed

to acquaint the adjoining landowner and other interested persons with the types of property involved in the management of government land at Oologah Lake.

### Trespass and Encroachment

Government property is monitored by USACE personnel to identify and correct instances of unauthorized use, including trespasses and encroachments. The term "trespass" includes unauthorized transient use and occupancy, such as mowing, tree cutting and removal, livestock grazing, cultivation and harvesting crops, and any other alteration to Government property done without the USACE approval. Unauthorized trespasses may result in a Title 36 citation requiring violators to appear in Federal Magistrate Court, which could subject the violator to fines or imprisonment (See 36 C.F.R. Part 327 Rules and Regulations Governing Public Use of Water Resources Development Projects Administered by the Chief of Engineers). More serious trespasses will be referred to the USACE Office of Counsel for enforcement under state and federal law, which may require restoration of the premises and collection of monetary damages.

The term "encroachment" pertains to an unauthorized structure or improvement on Government property. When encroachments are discovered, lake personnel will attempt to resolve the issue at the project level. Where no resolution is reached, or where the encroachment is a permanent structure, the method of resolution will be determined by the USACE Real Estate Division, with recommendations from Operations Division and Office of Counsel. The USACE's general policy is to require removal of encroachments, restoration of the premises, and collection of appropriate administrative costs and fair market value for the term of the unauthorized use.

Acts of trespass and encroachment are all too common at Oologah Lake. Many incidents of unauthorized tree removal and mowing have occurred as well as the placement of personal property items such as outdoor furniture, firewood, boats, vehicles, and structures on USACE land. Trash dumping is an especially difficult and expensive problem at many USACE lakes. Efforts are continuously underway to resolve these unauthorized acts, but the sheer volume creates a workload that is difficult to accomplish.

# CHAPTER 3 – RESOURCE GOALS AND OBJECTIVES

## 3.1 INTRODUCTION

The terms “goal” and “objective” are often defined as synonymous, but in the context of this Master Plan goals express the overall desired end state of the Master Plan whereas resource objectives are specific task-oriented actions necessary to achieve the overall Master Plan goals.

## 3.2 RESOURCE GOALS

The following statements, paraphrased from *EP 1130-2-550*, Chapter 3, express the goals for the Oologah Lake Master Plan:

**GOAL A**. Provide the best management practices to respond to regional needs, resource capabilities and capacities, and expressed public interests consistent with authorized project purposes.

**GOAL B**. Protect and manage project natural and cultural resources through sustainable environmental stewardship programs.

**GOAL C**. Provide public outdoor recreation opportunities that support project purposes and public interests while sustaining project natural resources.

**GOAL D**. Recognize the unique qualities, characteristics, and potentials of the project.

**GOAL E**. Provide consistency and compatibility with national objectives and other State and regional goals and programs.

In addition to the above goals, USACE management activities are guided by USACE-wide Environmental Operating Principles as follows:

- Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.
- Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances.
- Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.
- Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.

- Seek ways and means to assess and mitigate cumulative impacts to the environment; bringing systems approaches to the full life cycle of our processes and work.

- Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.

- Respect the views of individuals and groups interested in USACE activities; listen to them actively and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment.

## 3.3 RESOURCE OBJECTIVES

Resource objectives are defined as clearly written statements that respond to identified issues and that specify measurable and attainable activities for resource development and/or management of the lands and waters under the jurisdiction of the Tulsa District, Oologah Lake Project Office. The objectives stated in this Master Plan support the goals of the Master Plan, the USACE Environmental Operating Principles (EOPs), and applicable national performance measures. They are consistent with authorized project purposes, federal laws and directives, regional needs, resource capabilities, and they take public input into consideration. Recreational and natural resources carrying capacities are also accounted for during development of the objectives found in this Master Plan, as well as regional and state planning documents including:

- Oklahoma Comprehensive Wildlife Conservation Strategy – Cross Timbers Region
- Oklahoma Statewide Comprehensive Outdoor Recreation Plan

The objectives in this Master Plan are intended to provide project benefits, meet public needs, and foster environmental sustainability for Oologah Lake to the greatest extent possible. The following tables list the objectives for Oologah Lake.

**Table 3.1 – Recreational Objectives**

| Recreational Objectives | Goals | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| Renovate existing facilities to provide a quality recreation experience for visitors while protecting natural resources for use by others. Examples include renovate of high impact zones at campsites, provision of universally accessible facilities, separation of day use and camping facilities, improved electrical service at campsites. | * | | * | | |
| Provide opportunities for day use activities, especially picnicking. Provide enough quality campsites in popular areas. | * | | * | | |

| Recreational Objectives | Goals | | | | |
|---|---|---|---|---|---|
| Monitor boating traffic and evaluate the need to conduct a comprehensive recreation boating use study to ensure visitor safety and enjoyment. | * | | * | | |
| Manage recreation facilities in accordance with public demand. Examples include universally accessible fishing docks, fish cleaning stations near boat ramps, playground equipment in day use and camping areas. | * | | * | | |
| Work with partners to expand existing trails and develop new ones. | * | | * | | * |
| Consider flood/conservation pool to address potential impact to recreational facilities (i.e., campsites, boat ramps, courtesy docks, etc.). | * | * | * | * | |
| Ensure consistency with USACE Natural Resource Management (NRM) Strategic Plan. | | | | | * |
| Monitor the Oklahoma SCORP, and OWCS to ensure that the USACE is responsive to outdoor recreation trends, public needs, and resource protection within a regional framework. All plans by others will be evaluated considering USACE policy and operational aspects of Oologah Lake. | | | | | * |

*Denotes that the objective helps to meet the specified goal.

**Table 3.2 – Natural Resource Management Objectives**

| Natural Resource Management Objectives | Goals | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| Give priority to the preservation and improvement of wild land values in public use planning, design, development, and management activities. Give high priority to examining project lands for the presence of old growth forests characteristic of the Level III Central Irregular Plains and Level IV Osage Cuestas Ecoregion. | * | * | | * | * |
| Provide access by Tribal Nations to any culturally significant plants and natural resources. | | * | | * | * |
| Consider flood/conservation pool levels to ensure that natural resources are managed in ways that are compatible with project purposes. | * | * | | * | |
| Actively manage and conserve fish and wildlife resources, especially threatened and endangered species and Species of Greatest Conservation Need, by implementing ecosystem management principles. Key among these principles is the use of native species adapted to the Level IV Osage Cuestas Ecological Region in restoration and mitigation plans. | * | * | | * | * |
| Manage high density and low-density recreations lands in ways that enhance benefits to wildlife. | | | | | * |
| Optimize resources, labor, funds, and partnerships for protection and restoration of fish and wildlife habitats. | | * | | | * |

| Natural Resource Management Objectives | Goals | | | | |
|---|---|---|---|---|---|
| Minimize activities which disturb the scenic beauty and aesthetics of the lake. | * | * | * | * | |
| Implement prescribed fire as a management tool to promote the vigor and health of Osage Cuestas forests, woodlands, and prairies. | * | * | | | * |
| Stop unauthorized uses of public lands such as off-road vehicle (ORV) use, trash dumping, unauthorized fires, fireworks, poaching, clearing of vegetation, agricultural trespass, timber theft, unauthorized trails and paths, and placement of advertising signs that create negative environmental impacts. | * | * | * | * | * |
| Monitor lands and waters for invasive, non-native and aggressively spreading native species and take action to prevent and/or reduce the spread of these species. The most prevalent aggressively spreading native species at Oologah Lake is eastern redcedar. The most prevalent invasive species are zebra mussels, feral swine, Johnsongrass, sericea Lespedeza, and Bermudagrass. A potential invasive species of great concern is the Emerald Ash Borer. | * | * | | * | * |
| Protect and/or restore important native habitats such as prairies, bottomland hardwoods, riparian zones, and wetlands, where they occur, or historically occurred on project lands. Special emphasis should be taken to protect and/or restore special or rare plant species. Emphasize actions that promote butterfly and /or pollinator habitat, migratory bird habitat, and habitat for birds listed by USFWS as Birds of Conservation Concern. | * | * | | * | * |

*Denotes that the objective helps to meet the specified goal.

**Table 3.3 – Visitor Information, Education, and Outreach Objectives**

| Visitor Information, Education, and Outreach Objectives | Goals | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| Provide opportunities (i.e. comment cards, updates to local municipalities, web page) for communication with agencies, special interest groups, and the general public. Utilize social media to inform visitors. | * | | | * | * |
| Provide educational, interpretive, and outreach programs at the lake office and around the lake. Topics to include: history, lake operations (flood risk management, and water supply), water safety, recreation, cultural resources, ecology, and USACE missions. | * | * | * | * | * |
| Promote USACE Water Safety message. | * | | * | * | * |
| Educate adjacent landowners on policies and permit processes in order to reduce encroachment actions. | * | * | * | * | * |
| Work with Tribal Nations to engage the public and provide educational and informational opportunities to the general public. | * | * | * | * | * |

*Denotes that the objective helps to meet the specified goal.

**Table 3.4 – General Management Objectives**

| General Management Objectives | Goals | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| Resurvey and maintain the public lands boundary line to ensure it is clearly marked and recognizable in all areas to reduce habitat degradation and encroachment actions. | * | * | | * | |
| Identify safety hazards or unsafe conditions; correct infractions and implement safety standards in accordance with EM 385-1-1. | | | | | * |
| Ensure green design, construction, and operation practices, such as the Leadership in Energy and Environmental Design (LEED) criteria for government facilities, are considered as well as applicable Executive Orders. | | | | | * |
| Manage non-recreation outgrants such as utility and road easements in accordance with national guidance set forth in ER 1130-2-550 and applicable chapters in ER 405-1-12. | * | | | | * |
| Manage project lands and recreational programs to advance broad national climate change mitigation goals, including but not limited to climate change resilience and carbon sequestration, as set forth in Executive Order 13990 and related USACE policy. | | | | | * |

*Denotes that the objective helps to meet the specified goal.

**Table 3.5 – Cultural Resources Management Objectives**

| Cultural Resources Management Objectives | Goals | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| As funding permits, complete an inventory in accordance with Section 110 NHPA and prepare a Cultural Resources Management Plan. | * | * | | * | * |
| Increase public awareness and education of regional and local Tribal history. | | * | | * | * |
| Monitor and enforce Title 36 and ARPA to prevent unauthorized excavation and removal of cultural resources. | | * | | * | * |
| Provide access by Tribal Nations to any cultural resources, sacred sites, or other Traditional Cultural Properties. | * | * | | | |
| Preserve and protect cultural resources sites in compliance with existing federal statutes and regulations. | * | * | * | * | * |

*Denotes that the objective helps to meet the specified goal.

# CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS

## 4.1 LAND ALLOCATION

All lands at USACE water resource development projects are allocated by USACE into one of four categories in accordance with the congressionally authorized purpose for which the project lands were acquired: Operations, Recreation, Fish and Wildlife, and Mitigation. At Oologah Lake, the only land allocation category that applies is Operations, which is defined as those lands that are required to operate the project for the primary authorized purposes of flood risk management, water supply, recreation, navigation, and fish and wildlife. The remaining allocations of Recreation, Fish and Wildlife, and Mitigation would apply only if lands had been acquired specifically for these purposes.

The USACE recognizes that some of the lands acquired were above elevation 661.0 NGVD29 which is the top of the flood control pool. Some of these lands were acquired for recreational purposes, but under the rules in place at the time of acquisition, these lands are not considered “separable” recreation lands in that the acquisition of separable lands normally requires a cost sharing sponsor, a non-federal operator, or were acquired by separate congressional authorization. The extent of federal land acquisition above the top of the flood control pool was often designed to develop a blocked perimeter which provides a more manageable boundary and provides a buffer against shoreline erosion that inevitably occurs during major flood events.

## 4.2 LAND CLASSIFICATION

### General

The objective of classifying project lands is to identify how a given parcel of land shall be used now and in the foreseeable future. Land classification is a central component of this plan, and once a particular classification is established any significant change to that classification would require a formal process including public review and comment.

### Prior Land Classifications

The previous version of the Oologah Lake Master Plan included land classification criteria that were similar, but not identical to the current criteria. These prior land classifications were based on predicted projected need rather than actual experience, which resulted in some areas being classified for a type of use that has not or is not likely to occur. Additionally, in the years since the previous Master Plan was published, wildlife habitat values, surrounding land use, and regional recreation trends have changed giving rise to the need for revised classifications. Refer to Table 8-1 in Chapter 8 for a summary of land classification changes from the prior classifications to the current classifications. The previous land classifications were as follows:

- Operations and Maintenance: includes the dam and areas required for project operations, similar to the current Project Operations land classification.

- Recreational Areas: includes areas designated for recreation, similar to the current High Density Recreation as well as some Multiple Resource Management Lands.

- Wildlife Management USACE Managed: includes areas managed by USACE for the purpose of Wildlife Management, similar to the current classification Multiple Resource Management Lands – Wildlife Management.

- Wildlife Management Oklahoma Managed: includes areas managed by the State of Oklahoma for the purpose of Wildlife Management, similar to the current classification Multiple Resource Management Lands – Wildlife Management.

**Current Land and Water Surface Classifications**

USACE regulations require project lands and waters to be classified in accordance with the primary use for which project lands are managed. There are six classifications and four subcategories of classification identified in USACE regulations, as well as four water designations which are as follows:

- Project Operations
- High Density Recreation
- Mitigation
- Environmentally Sensitive Areas
- Multiple Resource Management Lands
    - Low Density Recreation
    - Wildlife Management
    - Vegetative Management
    - Future/Inactive Recreation
- Water Surface
    - Restricted Areas
    - Designated No Wake Areas
    - Fish and Wildlife Sanctuary
    - Open Recreation

The land and water surface classifications for Oologah Lake were established after taking into account public comments, input from key stakeholders including elected officials, city and county governments, and lessees operating on USACE land as well as USACE expert assessment. Additionally, wildlife habitat values and the trends analysis provided in the SCORP and OCWS were used in decision making. Furthermore, the USACE consulted with Tribal Nations who have cultural and historical interests in the lands at Oologah Lake. Maps showing the various land classifications can be found in Appendix A. Each of the land classifications, including the acreage and description of allowable uses, is described in the following paragraphs.

## Project Operations

This classification includes the lands managed for operation of the dam, stilling basin, project office, maintenance compound, and levee, all of which must be maintained to carry out the primary authorized purposes of flood risk management, water supply, navigation, recreation, and fish and wildlife. In addition to the operational activities taking place on these lands, limited recreational use may be allowed for activities such as public fishing access below the discharge outlet works. Regardless of any limited recreation use allowed on these lands, the primary classification of Project Operations will take precedent over other uses. There are 413 acres of Project Operations land specifically managed for this purpose.

## High Density Recreation (HDR)

The following sections describe the various types of areas that are included in the HDR classification. The areas include leased lands to public entities, quasi-public and private club organizations, as well as USACE-managed public parks and privately managed commercial concessions that are open to the public.

*Public, Quasi-Public, and Private Club Leases*

These are lands developed, or available to be developed for intensive recreational activities including day use areas, campgrounds, marinas and related concession areas. Comprehensive resorts, as defined in ER 1130-2-550, Chapter 16, are also suitable for development in HDR areas. At Oologah Lake, HDR areas include four categories described below that are each managed to serve specific outdoor recreation purposes.

- Public Use Areas: This is the largest category of HDR areas and includes the parks listed in Section 5. These areas are operated by USACE and grantees including the state of Oklahoma and are open to the public at large. These areas provide amenities such as picnic areas, campgrounds, boat launching ramps, and trails.
- Commercial Marinas/Resorts: There is one marina under lease at Oologah Lake at Redbud Bay Recreation Area. The Redbud Bay area encompasses 102 acres that includes a subleased privately managed marina.
- Quasi-public Use Areas: These areas operate under non-profit lease agreements with USACE and include camps for boy scouts, girl scouts, church groups, civic groups and other incorporated, non-profit organizations. These areas provide recreational opportunities to the public at large but are also routinely reserved by the respective lessees to serve their organizational needs.

At Oologah Lake, prior land classifications included excessive acreage under the HDR classification. Several of the HDR areas, or large portions of some areas, were never developed and/or were determined by the study team to be unsuitable for development resulting in a change to another, more suitable land classification. At Oologah Lake, there are 1,699 acres classified as High Density Recreation land. Each of the High Density Recreation Public Use Areas is described briefly in Chapter 5 of this Plan.

*Status of Quasi-public and Private Club Leases*

In general, the quasi-public use areas and private club sites at Oologah Lake were established in the 1950's and 60's to serve a valid recreation need at the time. Recent national USACE policy in ER 1130-2-550, Chapter 16, and ER 1130-2-540, Appendix D place significant restrictions on any new or expanded leases for quasi-public areas and private club sites as follows:

- Quasi-public Areas - ER 1130-2-550, Chapter 16, clearly states that new recreation outgrants (leases), or proposed new development within existing recreation outgrants must be dependent on the project's natural resources and, typically, must accommodate or support water-based activities, marinas, campgrounds, picnic areas, trails, swimming beaches, boat launching ramps or comprehensive resort facilities that offer these amenities. The following quote is taken from the regulation:

  "*The primary rationale for any future recreation development must be dependent on the project's natural or other resources. This dependency is typically reflected in facilities that accommodate or support water-based activities, overnight use, and day use such as marinas, campgrounds, picnic areas, trails, swimming beaches, boat launching ramps, and comprehensive resort facilities. Examples that do not rely on the project's natural or other resources include theme parks or ride-type attractions, sports or concert stadiums, and standalone facilities such as restaurants, bars, motels, hotels, non-transient trailers, and golf courses. Normally, the recreation facilities that are dependent on the project's natural or other resources, and accommodate or support water-based activities, overnight use, and day use, are approved first as primary facilities followed by those facilities that support them. Any support facilities (e.g., playgrounds, multipurpose sports fields, overnight facilities, restaurants, camp stores, bait shops, comfort stations, and boat repair facilities) must also enhance the recreation experience, be dependent on the resource-based facilities, be secondary to the original intent of the recreation development…."*

- Private Club Leases – ER 1130-2-540, Appendix D, defines private clubs as private exclusive use and states that no new private exclusive use, or expansion of existing private exclusive use will be permitted except in accordance with regional policy at the USACE division office level. This policy within the USACE Southwestern Division, which has jurisdiction over Oologah Lake, is that new or expanded private club sites will not be allowed.

The quasi-public and private recreation leases in effect at Oologah Lake as of the publication of this Plan will be renewed for the foreseeable future, as long as each lease remains compliant with lease conditions and the areas are not needed for a higher public use or project operations.

## Mitigation

This classification is used only for lands set aside for mitigation for the purpose of offsetting losses associated with the development of the project. This is not the same as allocated lands that are purchased for the purpose of mitigation. There are no lands at Oologah Lake with this classification.

## Environmentally Sensitive Areas (ESA)

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. Several areas are designated as ESAs at Oologah Lake primarily for the protection of a combination of sensitive habitats, aesthetics, and legally protected cultural resources. Each of these areas is discussed in Chapter 5 of this Plan and illustrated on the maps in Appendix A. Some areas which were previously classified as a State or USACE Wildlife Management Area have been changed to Environmentally Sensitive Areas. Within those areas, hunting and other wildlife management activities are still permitted, but protection of sensitive resources takes priority over any other activity. The process of correspondence with Tribal Nations to designate ESAs is briefly described as a special topic in Chapter 6 of this Plan. There are 7,587 acres classified as ESA at Oologah Lake.

## Multiple Resource Management Lands (MRML)

This classification is divided into four sub-classifications identified as: Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. A given tract of land may be classified using one or more of these sub-classifications, but the primary sub classification should reflect the dominant use of the land. Typically, Multiple Resource Management Lands support only passive, non-intrusive uses with very limited facilities or infrastructure. Where needed, some areas may require basic facilities that include, but are not limited to minimal parking space, a small boat ramp, and/or primitive sanitary facilities. There are 12,317 acres of land under this classification at Oologah Lake. The following paragraphs list each of the sub-classifications, and the number of acres and primary uses of each.

*Low Density Recreation (LDR)*

These are lands that may support passive public recreational use (e.g., fishing, hunting, wildlife viewing, natural surface trails, hiking, etc.). Under prior land classifications, numerous areas with passive recreational use were classified wildlife management. The planning process resulted in most of these areas remaining classified as Wildlife Management rather than LDR. There are no acres under this classification at Oologah Lake.

*Wildlife Management (WM)*

This land classification applies to lands managed primarily for the conservation of fish and wildlife habitat. These lands generally include comparatively large contiguous parcels, most of which are located within the flood pool of the lake. Passive recreation

uses such as natural surface trails, fishing, hunting, and wildlife observation are compatible with this classification unless restrictions are necessary to protect sensitive species or to promote public safety. There are 12,317 acres of land included in this classification at Oologah Lake.

*Vegetative Management (VM)*

These are lands designated for stewardship of forest, prairie, and other native vegetative cover. Passive recreation activities previously described may be allowed in these areas. There are no acres under this classification at Oologah Lake.

*Future or Inactive Recreation*

These are lands with site characteristics compatible with High Density Recreation development but have been undeveloped or planned for very long-range recreation needs. There are no areas classified as Future or Inactive Recreation.

**Table 4.1 Change from Prior Land Classification to Proposed Land Classification**

| Prior Land Classifications (1977 Plan) | Acres | | Proposed Land Classifications | Acres |
|---|---|---|---|---|
| Operations and Maintenance | 329 | | Project Operations | 413 |
| Recreational Areas | 2,345 | | High Density Recreation | 1,699 |
| Wildlife Management USACE Managed | 4,090 | | Environmentally Sensitive Areas | 7,587 |
| Wildlife Management Oklahoma Managed | 15,253 | | Multiple Resource Management – Wildlife Management | 12,317 |

*Total Acreage differences from the 1977 total to the 2021 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

**Water Surface**

USACE regulations specify four possible sub-categories of water surface classification. These classifications are intended to promote public safety, protect resources, or protect project operational features such as the dam and spillway. These areas are typically marked by the USACE or lessees with navigational or informational buoys or signs or are denoted on public maps and brochures. The Water Surface Classification map can be found in Appendix A of this Plan. The four sub-categories of water surface classification are as follows:

*Restricted*

Restricted water surface includes those areas where recreational boating is prohibited or restricted for project operations, safety, and security purposes. The areas include the water surface immediately surrounding the gate control tower upstream of the

Oologah Lake Dam, around the water intake structures, just below the dam, upstream of the controlled spillway, and at the two designated swim beaches at Oologah Lake parks. There are 23 acres of restricted water surface at Oologah Lake.

*Designated No-Wake*

Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve boating safety near key recreational water access areas such as boat ramps. There are 11 boat ramps and one marina at Oologah Lake where no-wake restrictions are in place for reasons of public safety and protection of property. There are 288 acres of designated no-wake water surface at Oologah Lake. No-wake areas are typically denoted by buoys in appropriate areas.

*Fish and Wildlife Sanctuary*

This water surface classification applies to areas with annual or seasonal restrictions to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning. Oologah Lake has no water surface areas designated as a Fish and Wildlife Sanctuary.

*Open Recreation*

Open Recreation includes all water surface areas available for year-round or seasonal water-based recreational use. This classification encompasses the majority of the lake water surface and is open to general recreational boating. Boaters are advised through maps and brochures, or signs at boat ramps and marinas, that navigational hazards may be present at any time and at any location in these areas. Operation of a boat in these areas is at the owner's risk. Specific navigational hazards may or may not be marked with a buoy. Approximately 27,823 acres of water surface at Oologah Lake are designated as Open Recreation.

Table 4.1 provides a summary of land classifications at Oologah Lake, while Table 4.2 provides a summary of water surface classification at Oologah Lake. Acreages were calculated by historical and GIS data. A map representing these areas can be found in Appendix A.

**Table 4.2 Change from Prior Water Surface Classification to Proposed Water Surface Classification**

| Prior Water Surface Classifications (1977 Plan) | Acres | | Proposed Water Surface Classifications | Acres |
|---|---|---|---|---|
| Permanent Pool | 28,133 | | Permanent Pool | 28,134 |
| – | – | | – Restricted | 23 |
| – | – | | – Designated No Wake | 288 |
| – | – | | – Open Recreation | 27,823 |
| Flowage Easement | 15,119 | | Flowage Easement | 15,119 |

*Total Acreage differences from the 1977 total to the 2021 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

## 4.3 PROJECT EASEMENT LANDS

Project Easement Lands are primarily lands on which easement interests were acquired. Fee title was not acquired on these lands, but the easement interests convey to the Federal government certain rights to use and/or restrict the use of the land for specific purposes. Easement lands are typically classified as Operations Easement, Flowage Easement, and/or Conservation Easement.

At Oologah Lake the only easement lands are those lands where a flowage easement was acquired. A flowage easement, in general, grants to the government the perpetual right to temporarily flood/inundate private land during flood risk management operations and to prohibit activities on the flowage easement that would interfere with flood risk management operations such as placement of fill material or construction of habitable structures. There are 15,119 acres of flowage easements lands around Oologah Lake.

# CHAPTER 5 – RESOURCE PLAN

## 5.1 RESOURCE PLAN OVERVIEW

This chapter describes the management plans for each land use classification within the Master Plan. Management plans describe how the project lands and water surface will be managed in broad terms. A more descriptive plan for managing these lands can be found in the Oologah Lake Operations Management Plan (OMP). The OMP is an annually updated, task and budget-oriented plan identifying tasks necessary to implement the Resource Plan and achieve the goals and objectives of the Master Plan. Management of all lands, recreation facilities, and related infrastructure must take into consideration the effects of pool fluctuations associated with authorized project purposes. Management actions are dependent on congressional appropriations, the financial capability of lessees and other key stakeholders, and the contributions of labor and other resources by volunteers. Acreages shown for the various land classifications were calculated using GIS technology and may not agree with lease documents, prior publications, or official land acquisition records.

## 5.2 PROJECT OPERATIONS

The Project Operations (PO) classification is land associated with the dam, spillway, levees, lake office, maintenance facilities, and other areas managed solely for the operation and fulfillment of the primary mission of the project. There are 413 acres of lands under this classification, all of which are managed by the USACE. The Project Operation land management plan consists of continuing to provide physical security necessary to ensure continued operation of the critical operational structures.

Public access to Project Operations lands is restricted although limited recreational access is permitted when lake operations allow. Regardless of any authorized public recreational use of lands that are classified as Project Operations, the operation, maintenance, and safety requirements of the dam and associated lands and infrastructure take priority over any recreational access.

## 5.3 HIGH DENSITY RECREATION

Oologah Lake has 1,699 acres classified as High Density Recreation (HDR). These lands are developed for intensive recreational activities for the visiting public including day use and campgrounds. Depending on available space, funding, and public demand, those HDR lands managed as Public Parks, Commercial Concession leases, and Quasi-Public leases may support additional outdoor recreation development in the future. These areas have been developed to support concentrated visitation. Future development on HDR lands will take into consideration protection of natural resources and scenic quality as specified in the management objectives set forth in Chapter 3. National USACE policy set forth in ER 1130-2-550, Chapter 16, limits recreation development on USACE lands to those activities that are dependent on a project's natural resources and typically include water-based activities, overnight use, and day use such

as marinas, campgrounds, picnic areas, trails, swimming beaches, boat launching ramps and comprehensive resorts. Examples of activities that are not dependent on a project's natural resources include theme parks or ride-type attractions, sports or concert stadiums, and stand-alone facilities such as restaurants, bars, motels, hotels, and golf courses.

**Parks and Land Managing Entities**

Of the 1,699 total HDR acres, many acres are leased to non-federal partners referred to as grantees, and the USACE operates and manages the remaining areas. Each grantee is responsible for the operation and maintenance of their respective leased area. The USACE does not provide direct maintenance within any of the leased locations but may occasionally lend support to governmental entities where appropriate. The USACE reviews requests and ensures compliance with applicable laws and regulations for proposed activities in all leased and USACE-operated HDR areas. The USACE works with partners to ensure that recreation areas are managed and operated in accordance with the objectives prescribed in Chapter 3. A description of each recreation area operated by the USACE or a governmental entity, including existing and proposed facilities, is provided below:

*Dam Overlook*

The Overlook is a day-use area that encompasses 35 acres that is adjacent to the left abutment of the dam and is located on a high bluff overlooking the lake. It is covered with primarily mature hardwoods. State Highway 88 provides good direct access from U.S. Highway 66 to the east and U.S. Highway 169 to the west. Existing facilities consist of an overlook structure with waterborne toilets and 9 picnicking sites. No additional facilities are planned.

*Redbud Bay Recreation Area*

Operated by the USACE, Redbud Bay Recreation Area on Oologah lake is located off Oklahoma State Highway 88, between the Oologah Dam and the Oologah Spillway structures. The Redbud Bay area encompasses 102 acres that include the campground, boat ramp and parking lot, and a privately managed marina. Redbud Bay Campground is located on a small, rocky point and consists of 12 electric campsites with water and a central vault toilet. The boat ramp includes a courtesy dock and parking lot, that offers calm launching waters year-round, owing to protection from an island immediately to the north. Future plans include maintenance and minor improvements to existing facilities.

*Verdigris River Park*

Operated by the USACE, Verdigris River Park is an area that encompasses 131 acres and is located along the banks of the outlet channel below the dam. This area is used extensively by fisherman. It is readily accessible via State Highway 88 that crosses the dam. The developed portion of the area is sparsely wooded with large hardwoods. Available facilities include, 7 non-electric campsites, paved roads and parking areas, vault toilets, and a group shelter. A waterborne toilet is proposed for future development.

*Hawthorn Bluff Recreation Area*

Operated by the USACE, Hawthorn Bluff Recreation Area on Oologah Lake is a Class-A facility that encompasses 207 acres and is located off Oklahoma State Highway 88, immediately north of the Oologah Dam. Hawthorn Bluff campground consists of 67 electric campsites, 26 non-electric campsites, waterborne restrooms and showers, vault toilets, fishing dock, water spigots, and a sewer dump station. Hawthorn Bluff day use facilities include a two-lane boat ramp, courtesy dock, two electric group shelters, swim beach, volleyball court, 9-hole disc golf course, 16 picnic sites with tables, fishing dock, hiking trail, vault toilets, water hydrants, playground, and associated parking lots. Hawthorn Bluff provides excellent, convenient recreational opportunities for campers and day users, as well as picturesque views of the lake and fall foliage during Autumn months. Bald Eagles are a common sight during winter months. Future plans include maintenance and minor improvements to existing facilities.

*Blue Creek Recreation Area*

Operated by the USACE, Blue Creek Recreation Area is a Class-A facility that encompasses 112 acres and is located on the east shore in a large cove formed by Blue Creek 5 miles northeast of the dam. The park rises sharply from the conservation pool to a broad ridge that is approximately 40 percent wooded. Access is readily available from U.S. Highway 66 and Oklahoma Highway 88 over a network of paved roads. Existing facilities consists of 24 electric campsites, 32 non-electric campsites, 5 picnic sites, group shelter, paved roads and parking areas, waterborne restrooms and showers, vault toilets, water hydrants, boat ramp, sewer dump station, basketball court, volleyball court, and a horseshoe pit. There are plans to remove six campsites around the boat ramp to add additional parking.

*Clermont*

Clermont is a day-use area that encompasses 166 acres and is located on the north side of Blue Creek Cove. The topography is gently rolling with moderate slopes that dip sharply near the shoreline. The park is developed with paved roads and parking areas, picnic sites, and a boat ramp. Future plans include maintenance and minor improvements to existing facilities.

*Spencer Creek Recreation Area*

Operated by the USACE, Spencer Creek Recreation Area is a Class-A facility that encompasses 348 acres which is located on south shore of Spencer Creek, about 3 miles south of the town of Winganon. The topography ranges from steep bluffs to a rolling series of ridges. There is a good stand of hardwoods scattered throughout the area which provides scenic appeal and excellent sites for picnickers and campers. The park is a camping fee area with a total of 68 campsites, 30 with electric hookups and 38 non-electric. The park features 11 picnic sites, waterborne restrooms and showers, swimming beach, soccer field, playground, a two-lane boat ramp with a courtesy dock, ample day-use parking, a gate house, a dump station, 2 vault style restrooms, and a trailhead for the

1-mile Spencer Creek Hiking Trail that runs the full length of the park. No major changes are anticipated for this park although sufficient undeveloped acreage is available if expansion of facilities is needed. Future plans include maintenance and minor improvements to existing facilities.

*Double Creek Recreation Area*

This area is leased to the city of Nowata which encompasses 350 acres and is located about 1 mile southeast of Nowata. Access is by means of a paved county road from U.S. Highway 169. The park features 16 electric campsites with 3 vault style restrooms. A large portion of this area was previously pasture, however there are many trees along the shore and ravines. The cove is about two miles long and is moderately sloped on both sides where the developed area is located. Existing facilities include paved roads and parking areas, boat ramp, picnicking and camping sites, and a dump station. Future development in this park rests with the City of Nowata.

*Big Creek*

Operated by the USACE, Big Creek Recreation Area encompasses 37 acres and is located in the upper reaches of the lake. This park is used primarily as an access point for fishermen. The area is readily accessible via U.S. Highway 60 and gravel county roads. Big Creek is flat and covered with large hardwoods. The park has 12 primitive camping sites, vault style restroom, boat ramp, and a parking area. No additional facilities are planned.

*Sunnyside Ramp*

Sunnyside day use area is leased to the Indian Hills Homeowner's Association and encompasses 13 acres. The facilities at Sunnyside include a boat ramp and parking lot. Crumbling picnic tables and a structurally deficient concrete block vault toilet were removed by the USACE prior to the assignment of the lease to the Indian Hills HOA. Sunnyside is popular with fishermen and swimmers alike but is one of the first ramps at Oologah to become inundated during rising pool. There are no future developments by the USACE planned for Sunnyside, though the Indian Hills HOA has the latitude to explore future developments.

*Winganon Ramp*

Operated by the USACE, this is a small area of about 50 acres located on the north side of Spencer Creek, about 1.5 miles south of the town of Winganon. The topography is gently rolling, and the area is sparsely covered with trees. Existing facilities consist of paved and graveled roads, parking area, and a boat ramp. No additional facilities are planned.

*Will Rogers Park*

Will Rogers Park is listed on the National Register of Historic Places, as the famous entertainer who was born on November 4th, 1879 on what is now USACE property. During

the 1960's, the Will Roger's birth home was relocated off USACE lands as part of reservoir construction and is now situated on adjacent land owned by the Cherokee Nation. The area includes the historic Rogers ranch house, era-appropriate barn, livestock grazing, picnic areas, and hiking and equestrian trails. The adjacent USACE fee-lands are utilized by the visiting public for hiking, sight-seeing, horseback riding, and for historical tourism. Future plans include the leasing of the USACE fee lands to the Cherokee Nation, as part of the Cherokee's development of their own facilities.

*Eastside Ramp*

This area is leased to the Oklahoma Department of Wildlife Conservation within lands licensed for wildlife management. The Eastside Boat Ramp encompasses 3 acres and is located just north of the Winganon lake crossing. The topography is flat with scattered trees and provides good boat access to the north end of the lake with protection from south winds. Existing facilities include a single lane boat ramp with parking area. Future development in this area rests with the State of Oklahoma.

*Vada Point Ramp*

Vada Point Ramp is located at the intersection of Rogers County S. 4130 Rd and EW 320 Rd. Vada Point facilities consist of a boat ramp and parking lot and totals approximately 2 acres. Popular with crappie fishermen, Vada Point offers boat launching at high pool levels that inundate most of the other boat ramps at Oologah. Future plans include the repair and maintenance of the ramp and approach roads.

**Leasing of USACE Operated Park Areas**

The USACE encourages the leasing of parks to governmental entities in cases where the natural resources and outdoor recreation opportunities stand to be improved and better service afforded to the public.

## 5.4 MITIGATION

The Mitigation classification is applied to lands that were acquired specifically for the purpose of offsetting losses associated with the development of the project. There are no acres at Oologah Lake under this classification. USACE lands at Oologah Lake where environmental mitigation activities have taken place in association with real estate easements or other outgrants are not included in lands classified for Mitigation.

## 5.5 ENVIRONMENTALLY SENSITIVE AREAS

Twelve distinct areas totaling 7,587 acres are designated as Environmentally Sensitive Areas (ESA). These are areas where scientific, ecological, cultural, or aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the Endangered Species Act, the National Historic Preservation Act (NHPA), or applicable state statutes. The primary management objective for ESAs is to allow existing uses to continue but to protect sensitive resources

from intensive development, use, or disturbance beyond that which currently exists. In general, these areas must be managed to ensure that they are not adversely impacted. With the exception of natural surface pedestrian trails and minimal visitor parking areas, limited or no development of public use facilities is allowed on these lands and no real estate outgrants for easements should be granted unless disturbance can be confined to the boundaries of existing easements. No agricultural or grazing uses are permitted on these lands unless necessary for a specific resource management benefit, such as prairie restoration or provision of supplemental browse and forage for wildlife. An ESA classification provides the highest level of ecological protection among the various land use classifications. Future management of ESAs includes monitoring and surveillance of cultural resource sites to ensure they are not damaged or destroyed. For a brief description of consultation with Tribal Nations for ESA and land classification changes, see Chapter 6.

The ESAs listed and described in Table 5-1 provide the number of acres for each ESA and a brief description of the ESA. See Appendix A for the map that identifies the ESAs around the lake. Many of the ESAs were designated to protect culturally and/or historically significant sites. Since the purpose of the ESA designation is to protect those sites, many of the ESAs have been expanded well beyond the known cultural site, as to not identify the exact location and due to the likelihood that there may be additional unidentified sites adjacent to those which are being protected. Typically, the ESA table would provide a more detailed description of each ESA and why it is being protected, but due to the sensitivity and significance of many of the sites and the desire to obscure the specific details of the sites, the table only provides a more general description.

**Table 5.1 ESA Location and Description**

| ESA# | Acres | Location and Description |
|---|---|---|
| ESA 1 | 204 | ESA 1 is located northwest of Oologah Lake at the confluence of California Creek and Verdigris River. The area has been designated to protect historically and/or culturally significant sites and cultural resources. |
| ESA 2 | 133 | ESA 2 is located northeast of Oologah Lake along Big Creek. The area has been designated to protect historically and/or culturally significant sites and cultural resources. |
| ESA 3 | 360 | ESA 3 is located towards the north end of the lake at the confluence of Big Creek and Verdigris River. ESA 3 has been designated to protect historically and/or culturally significant sites and cultural resources. The area also includes wetlands, mature hardwoods, and areas managed for wildlife. |
| ESA 4 | 3,084 | ESA 4 is located towards the north end of the lake at the confluence of Verdigris River with Kentucky Creek and continues south towards the body of Oologah Lake. The area has been designated to protect historically and/or culturally significant sites and cultural resources and includes wetlands, mature hardwoods, and areas managed for wildlife. |
| ESA 5 | 287 | ESA 5 is located along Double Creek on the west side of the lake. It is on the west side of Oologah Lake, on the south side of Double Creek Cove, across from the recreation area. ESA 5 has |

| ESA# | Acres | Location and Description |
|---|---|---|
| | | been designated to protect historically and/or culturally significant sites and cultural resources and includes areas managed for wildlife. |
| ESA 6 | 77 | ESA 6 is located on the west side of the lake, to the east of the Double Creek Cove HDR area. The area has been designated to protect historically and/or culturally significant sites and cultural resources and includes areas managed for wildlife. |
| ESA 7 | 156 | ESA 7 is located on the west side of Oologah Lake, just north of the border between Nowata and Rogers Counties. Much of the area has a steep, narrow shoreline, except where seasonal creeks feed into the lake. The area has been designated to protect historically and/or culturally significant sites and cultural resources. |
| ESA 8 | 2,010 | ESA 8 is located on the east side of Oologah Lake, just north of the border between Nowata and Rogers Counties, where Lightning Creek and Panther Creek join the lake. ESA 8 has been designated to protect historically and/or culturally significant sites and cultural resources and includes wetlands and areas managed for wildlife. |
| ESA 9 | 452 | ESA 9 is located on the east side of the lake, between County Roads 300 and 320, where seasonal creeks reach the lake. The area has been designated to protect historically and/or culturally significant sites and cultural resources and includes wetlands and areas managed for wildlife. |
| ESA 10 | 78 | ESA 10 is located on the west side of Oologah lake, on the north side of the cove, just south of Allen's Point Drive. The area has been designated to protect historically and/or culturally significant sites and cultural resources and includes wetlands and areas managed for wildlife. |
| ESA 11 | 101 | ESA 11 is located on the east side of Oologah lake, on the northeast end of Spencer Creek Cove, on the west side of County Road 4200. ESA 11 has been designated to protect historically and/or culturally significant sites and cultural resources and includes wetlands and areas managed for wildlife. |
| ESA 12 | 646 | ESA 12 is the entirety of Goose Island on the southern end of Oologah Lake. The area has been designated to protect historically and/or culturally significant sites and cultural resources and includes areas managed for wildlife. |

## 5.6 MULTIPLE RESOURCE MANAGEMENT LANDS

Multiple Resource Management Lands (MRML) are, as the name implies, lands that serve multiple purposes, but that are sub-classified and managed for a predominant use. There are no lands sub-classified as Low Density Recreation (LDR), Vegetation Management (VM), or Future or Inactive Recreation Areas at Oologah Lake. The following paragraph describes the Wildlife Management sub-classification at Oologah Lake, how it is managed, and provides the number of acres in that sub-classification.

**MRML – Wildlife Management**

There are 12,317 acres of MRML – Wildlife Management, which is the dominant land classification at Oologah Lake. These are lands designated primarily for the stewardship of fish and wildlife resources but are available for passive recreation use such as natural surface trails, hiking, and nature study. The USACE goals and objectives for these lands is to continue working with USFWS and ODWC partners to ensure their wildlife management practices, as well as USACE management practices, are ecologically sustainable and providing the intended public benefits. In general, this land classification calls for managing the habitat to support native, ecologically adapted vegetation, which in turn supports native game and non-game wildlife species, with special attention given to federal and state-listed threatened and endangered species (see Table 2.3). Future management may include such activities as placement of nesting structures, construction of water features or brush piles, prescribed fire, fencing, removal of invasive species, and planting of specific food-producing plants that may be necessary to support wildlife needs. Additional best management practices may include use of erosion control blankets that do not pose entrapment hazards to wildlife; elimination of open-top vertical pipes that pose an entrapment hazard to wildlife; minimize nighttime lighting and only use down-shielded lighting to prevent disorientation of night-migrating birds; follow USFWS guidelines for building glass to prevent bird collisions; preserve and restore wildlife habitat in high density recreation areas; ensure that mowing practices provide standing tallgrass over winter to provide essential cover for wintering birds; and report sightings of state-listed species and presence of rare vegetative communities to USFWS and ODWC. Priority will be given to the improvement or restoration of existing wetlands, or the construction of wetlands where topography, soil type, and hydrology are appropriate.

Use of available funds for wildlife management must be prioritized to meet legal mandates and regional priorities. While exceptions can occur, management actions will be guided by the following, in order of priority: 1) Protect federal and state-listed threatened and endangered species. 2) Meet the needs of species protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. 3) Meet the needs of rare species and Species of Greatest Conservation Concern. 4) Meet the needs of resident species not included in the above priorities.

Additionally, agricultural leases for grazing or hay production may be employed when such actions are beneficial to long-term ecological management goals. Hunting and fishing activities are regulated by federal and state laws and special restrictions proposed by the USACE and approved through state regulatory processes. Natural surface pedestrian trails are appropriate for most Wildlife Management Areas.

*Fish and Wildlife Conservation and Management*

Lands open to hunting include 6,540 acres managed by USACE and 12,940 acres licensed to the Oklahoma Department of Wildlife Conservation. This includes lands classified as Wildlife Management as well as land classified as Environmentally Sensitive Areas. Areas which were previously classified as a State or USACE Wildlife Management

Areas that have been changed to Environmentally Sensitive Areas still allow hunting and wildlife management activities, but protection of sensitive resources takes priority over any other activity.

The Oklahoma Department of Wildlife Conservation has a license to manage 12,940 acres of project lands on Oologah Lake. The department plans to develop and manage the licensed area for quail, deer, dove, turkey, and waterfowl. The USACE manages an additional 6,540 acres of land in cooperation with ODWC available for public hunting.

## 5.7 WATER SURFACE

At conservation pool level of 638.0 NGVD29 there are 28,134 acres of water surface. The USACE is the primary agency responsible for managing the recreational use of the water surface at Oologah Lake. Enforcement of water surface rules and regulations is a shared responsibility between the USACE and the Marine Enforcement Division of the Oklahoma Highway Patrol (OHP). Zoning of the water surface is intended to ensure the security of key operations infrastructure, promote public safety, and protect habitat. In accordance with national USACE policy set forth in EP 1130-2-550, the water surface of the lake at the conservation pool elevation may be designated using the following classifications:

### Restricted

Restricted water surface includes those areas where recreational boating is prohibited or restricted for project operations and safety and security purposes. Vessels are not allowed to enter Restricted water surface. The total acreage of Restricted water surface is approximately 23 acres. The Restricted water surface at Oologah Lake includes the area around the intake gate control tower near the dam, immediately below the dam which is restricted for safety and security concerns, emergency spillway, and small areas around designated swimming beaches. Future management calls for one or more of the following management measures: placement of buoys; placement of signs near boat ramps; and describing the areas on maps available to the public.

### Designated No-wake

Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve visitor safety near key recreation water access areas such as boat ramps, swim beaches, and marinas. Designated No-Wake areas at Oologah Lake include approximately 288 acres. The following measures to be taken in No-wake Areas: placement of buoys, placement of signs near boat ramps, and describing the areas on maps available to the public

### Open Recreation.

Open Recreation includes all water surface areas available for year-round or seasonal water-based recreational use. Approximately 27,823 acres of Oologah Lake

water surface is designated as Open Recreation. Signs at boat ramps warn boaters that navigation hazards such as standing dead timber, shallow water, and floating debris may be present at any time and location and it is incumbent upon boat operators to exercise caution. Boating on the lake is in accordance with USACE regulations and water safety laws of Oklahoma. The USACE encourages all boaters and swimmers to wear lifejackets at all times and to learn to swim well.

### Recreational Seaplane Operations

Recreation seaplane landings and takeoffs may occur on water surface areas where this activity is not prohibited. A map depicting areas where seaplane landings and takeoffs are prohibited can be found in Appendix A. The USACE imposed restrictions that apply to seaplane operations are published by the Federal Aviation Administration in their Notice to Airmen and are also set forth in Title 36 of the Code of Federal Regulations, Chapter III, Part 327.4.

# CHAPTER 6 – SPECIAL TOPICS/ISSUES/CONSIDERATIONS

## 6.1 COMPETING INTERESTS ON THE NATURAL RESOUCES

Oologah Lake is a large, multi-purpose project with numerous authorized purposes. The authorized purposes accommodate the needs of federal, state, and municipal users which have developed over time and have contractual rights that must be honored. The benefits provided by virtue of authorized purposes are critical to the local and regional economies and are of great interest to the public. Aside from operating the reservoir to meet the needs of those entities with contractual rights, there are many competing interests for the utilization of federal lands including recreational users, adjacent landowners, those who own mineral rights, utility providers, and all entities that provide and maintain public roads. A growing population and increasing urbanization places additional stresses on these competing interests through increased demand for water resources and recreation spaces as well as diminishing quality and space for natural habitat and open spaces. Balancing the interests of each of these groups to ensure that valid needs are met while at the same time protecting natural and cultural resources is a challenge. The purpose of this Plan is to guide management into the foreseeable future to ensure responsible stewardship and sustainability of the project's resources for the benefit of present and future generations.

## 6.2 UTILITY CORRIDORS

USACE policy allows for the establishment of designated corridors on project lands, where feasible, to serve as the preferred location for future outgrants such as easements for roads or utility lines. After obtaining public input and examining the location of existing roads and utility lines on project lands, and due to the relatively low demand for easements at Oologah Lake, the USACE decided that the creation of utility corridors would not be necessary. Any utility seeking an easement to cross USACE property will still need to research alternate routes around USACE property and demonstrate that a feasible alternative does not exist and would need to undergo the required NEPA permitting process.

## 6.3 FLUCTUATING WATER LEVEL

The USACE often receives comments from the public noting how water levels fluctuate rapidly or for long periods, negatively affecting recreation. The Master Plan cannot provide a solution to the problem since water management is outside the scope of master planning, but the Plan acknowledges that the water level has negatively affected water-based recreation. Recreation is one of the authorized purposes of the lake, but the other authorized purposes are also a priority, and the lake must be managed with all authorized purposes in mind and hopefully creates the right balance where the public can still enjoy water-based recreation in spite of less-than-ideal water level throughout the year. The other project purposes are flood risk management, water supply, navigation, and fish and wildlife management, in addition to recreation.

## 6.4 PUBLIC HUNTING ACCESS

Many public lands operated by ODWC as wildlife management are located on land owned and managed by the USACE. Partnering with ODWC allows for an improved user experience and greater access to the public. Oklahoma has less public land available for hunting than many states, so public access on USACE lands are often the best opportunity for many Oklahoma residents. Hunting at all USACE projects is in accordance with applicable Federal and State regulations. Generally, all USACE hunting areas are open for public hunting of all legal species with the use of any legal weapon for that open season except in areas designated for restricted hunting. Hunting is prohibited in developed recreational areas, lands around dams, and around other structures. Vehicles must remain on established roads, and camping is allowed in designated areas only. Individuals interested in hunting on USACE lands should visit the Tulsa District Hunting Information webpage or visit the Oologah Lake Office for more information. Hunting maps, guidelines, and restrictions are available at the Tulsa District Website and Oologah Lake Office.

## 6.5 THREATENED AND ENDANGERED SPECIES

Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agency is not likely to: 1) jeopardize the continued existence of any endangered or threatened species, or 2) result in the destruction or adverse modification of critical habitat. The term, "jeopardize the continued existence of" means to reduce appreciably the likelihood of both the survival and recovery of listed species in the wild by reducing the species' reproduction, numbers, or distribution. Jeopardy opinions must present reasonable evidence that the project will jeopardize the continued existence of the listed species or result in destruction or adverse modification of critical habitat.

While the action of revising a Master Plan is not likely to jeopardize the continued existence of a federally listed species, and is not likely to destroy or adversely modify their habitat, it is possible that management and operation of Oologah Lake could result in incidental take. Since incidental take may adversely affect a federally listed species, formal consultation between the USACE Tulsa District and USFWS on actions within Tulsa District, including those at Oologah Lake, was conducted in accordance with Section 7(a)(2) of the ESA. This consultation resulted in a Biological Opinion (BO) in which one species of significance to Oologah Lake, the American burying beetle, was addressed. This species is discussed in detail below.

### American Burying Beetle (ABB)

The ABB was designated as an endangered species in July 1989 (54 FR 29652). It is considered an annual species and typically reproduces once in its lifetime. The ABB competes with other invertebrate and vertebrate species for carrion used for food and recruitment success. Although ABBs are considered feeding habitat generalists, they are believed to be more selective regarding breeding habitat. The ABB historic range in

Oklahoma includes at least twenty counties including those around Oologah Lake. It is currently known to occur in at least 29 counties in the eastern portion of the state.

Direct adverse impacts to ABBs at Oologah Lake may result from infrequent and short duration actions involving maintenance, operation, and enhancement of project lands and during flooding risk reduction operations. For example, natural resource management measures, optimization and management of public use areas, and real estate outgrants that include soil disturbance and vegetation modification all have potential consequences for ABBs and their habitats. Inundation is an unavoidable consequence of flood risk reduction, but these impacts may actually reduce flooding of ABBs and their habitats below the dam relative to pre-reservoir conditions.

In accordance with the BO issued by the USFWS, the Tulsa District is required to comply with two reasonable and prudent measures regarding ABBs. The first requires the USACE to evaluate the likelihood of specific action areas to contain ABBs or suitable habitats. If suitable habitat may be impacted the USACE may either conduct presence/absence surveys or assume presence, implement minimization measures, and provide mitigation. The USACE must also provide an annual report to the Service detailing the ABB acres impacted by soil disturbance, a copy of ABB survey results, and reasonable and prudent measures implemented.

The second reasonable and prudent measure pertaining to ABBs requires the Corps develop an ABB mitigation and management plan. This includes protection and active improvement of ABB habitat on 3,350 acres of existing USACE lands to provide action impact mitigation. The Corps will also conduct ABB surveys to provide baseline and ABB trend data for evaluation of mitigation and management plan success.

## 6.6 CULTURAL RESOURCES AND CONSULTATION WITH TRIBAL NATIONS

It is required for federal agencies to consult with affiliated Native American Tribes on activities that take place on federal land under federal guidance including but not limited to Sections 106 and 110 of the National Historic Preservation Act (NHPA) of 1966 (as amended); Archaeological Resources Protection Act (ARPA) of 1979; Native American Graves Protection and Repatriation Act (NAGPRA); and 36 CFR Part 79, Curation of Federally Owned and Administered Archeological Collections. Implementing regulations for Section 106 of the NHPA and NAGPRA are 36 CFR Part 800 and 43 CFR Part 10, respectively. All cultural resources laws and regulations should be addressed under the requirements of the National Environmental Policy Act (NEPA) of 1969 (as amended), as applicable. The USACE summarizes the guidance provided in these laws in ER and EP 1130-2-540. Additionally, Executive Order 13007 states that each federal agency with responsibility for the management of Federal lands shall accommodate access to and ceremonial use of Native American sacred sites by religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.

The Tulsa District takes its responsibilities for consultation on a government-to-government basis very seriously and consulted extensively with multiple Native American

Tribes on the Oologah Lake Master Plan. The Tulsa District consulted with Tribes primarily on developing ESAs and ensuring areas of Tribal concern were addressed. This process has allowed Tribes to become more familiar with USACE property at Oologah Lake, and has increased USACE staff awareness of Tribal histories, sites, and concerns in the area. This exchange of knowledge from developing the master plan will allow USACE staff to better engage with Tribes on future projects at Oologah Lake and will likely lead to more efficient reviews and better outcomes meeting objectives for both parties.

## 6.7 EQUESTRIAN TRAILS

Riding horses is extremely popular around Oologah Lake, and the trails provide a unique opportunity for riding on public land. Will Rogers Country Centennial Trail is a popular trail constructed in 1975 and dedicated to the National Recreation Trail Database in 1979 by the USACE. The trail is primarily for equestrian use, but hikers and mountain bikers are encouraged to use it as well. Mile markers are placed at each mile to help visitors navigate the trail. Numerous trail head parking areas also have a large map for visitors. The trail meanders from dense woods and open fields to miles of shoreline. Little to no equine riding or hiking experience is required to enjoy this trail except for Kight Hill, which contains steep slopes and is classified as “expert” or more “experienced” level trail. The total length of the trail is 18 miles, 12 miles of main trail and about 6 miles on Kight Hill. For public safety, the trail closes every fall during all deer gun seasons, exact dates differ yearly, so riders should be attentive to signs. Volunteers help to maintain the trails cleanliness and beauty, and the USACE encourages volunteer individuals and organizations to contact the Oologah Lake Project office if they would like to volunteer. Visitors can obtain trail maps at designated trail heads and the Oologah Lake Project Office.

# CHAPTER 7 – PUBLIC AND AGENCY COORDINATION

## 7.1 PUBLIC AND AGENCY COORDINATION OVERVIEW

The USACE is dedicated to serving the public interests in support of the overall development of land uses related to land management for cultural, natural, and recreational resources of Oologah Lake. An integral part of this effort is gathering public comment and engaging stakeholders in the process of planning.

USACE policy guidance in ER and EP 1130-2-550 requires thorough public involvement and agency coordination throughout the master plan revision process including any associated NEPA process. Public involvement is especially important at Oologah Lake to ensure that future management actions are environmentally sustainable and responsive to public outdoor recreation needs. The following milestones provide a brief look at the overall process of revising the Oologah Lake Master Plan.

The USACE began planning to revise the Oologah Lake Master Plan in the spring of 2020. The objectives for the Master Plan revision are to (1) revise land classifications

to reflect changes in USACE land management policies since the 1977 Master Plan Revision, (2) prepare new resource goals and objectives, and (3) revise the Master Plan to reflect new agency requirements for Master Plan documents in accordance with ER 1130-2-550, Change 7, January 30, 2013 and EP 1130-2-550, Change 5, January 30, 2013.

The public input process began early in the planning stage. USACE employees scheduled and hosted a public scoping workshop in Oologah, Oklahoma on February 27, 2020 to explain the master planning process and provide an avenue for public and agency stakeholders to ask questions and provide comments. The Tulsa District mailed and emailed letters to a wide variety of agencies, tribes, and other stakeholders, placed advertisements in local papers, and posted information on the USACE webpage and social media two weeks prior to the public scoping meeting.

## 7.2 INITIAL STAKEHOLDER AND PUBLIC PRESENTATION

The public scoping workshop was conducted in an open format at the At Home RV Park and Event Center and was intended for interested individuals, elected officials, interest groups, partner agencies, other government agencies, and businesses. Participants were asked to sign-in at a table where USACE staff provided the participants with information regarding the structure of the scoping meeting and comment forms. After signing in, participants were directed to an area where topic-specific information tables were set up. Large-scale boards were displayed at each table to convey information about the following topics:

- Public Involvement Process
- Project Overview
- Overview of the National Environmental Policy Act process
- Master Plan and current land classifications
- Instructions for submitting comments

At each of the information tables and throughout the meeting room, USACE representatives were available to answer questions and receive written comments. Interested persons had the opportunity to comment about the project using a variety of methods, including the following:

- Filling out a comment form at the open house
- Taking a comment form home to be mailed in
- Submitting a comment using electronic mail
- Submitting a comment and mailing it in on letterhead or choice of paper

In total, six (6) individuals, not including USACE personnel, attended the public scoping meeting held at the onset of the process on 27 February 2020 for the Oologah Lake Master Plan Revision. During the initial 30-day comment period, a total of two (2) separate written comments were received from 1 member of the public.

Much like national forests or parks, Oologah Lake is a federally owned and managed public property. It is USACE's goal to be a good neighbor as well as steward of the public interest as it concerns Oologah Lake. As such, the USACE is bound to the equal enforcement of policies and rules for this publicly held national asset. A summary of public comments and government responses can be found in Appendix E

## 7.3 PUBLIC AND AGENCY REVIEW OF DRAFT MP, AND EA

A virtual (online) public workshop to announce the final draft Master Plan with the EA will be held beginning 29 September 2021 followed by a 30-day comment period. The virtual public involvement process is necessary due to the public meeting constraints resulting from the COVID-19 pandemic. A presentation explaining the virtual process and high points of the draft Master Plan will be posted on the USACE Tulsa District Website. All comments received must be in writing, and all comments will be considered when developing the final Master Plan. After reviewing all public and agency comments, a final Master Plan will be published to the Tulsa District Website.

# CHAPTER 8 – SUMMARY OF RECOMMENDATIONS

## 8.1 SUMMARY OVERVIEW

The preparation of this Master Plan for Oologah Lake followed the recent USACE master planning guidance in ER 1130-2-550 and EP 1130-2-550, both dated 30 January 2013. Three major requirements set forth in the new guidance include the preparation of contemporary Resource Objectives, Classification of project lands using the newly approved classification standards, and the preparation of a Resource Plan describing in broad terms how the land in each of the land classifications will be managed into the foreseeable future. Additional important requirements include rigorous public involvement throughout the process, consideration of regional recreation and natural resource management priorities identified by other federal, state, and municipal authorities, and consultation with local Tribal Nations. The study team endeavored to follow this guidance to prepare a Master Plan that will provide for enhanced recreational opportunities for the public, improve environmental quality, and foster a management philosophy conducive to existing and projected USACE staffing levels at Oologah Lake. Factors considered in the Plan development were identified through public involvement and review of regional and statewide planning documents including the 2012 Oklahoma SCORP, Mobility Plans by ODOT, EPA Ecoregion Handbook and descriptions, and the USFWS ICAP website. This Master Plan will ensure the long-term sustainability of the outdoor recreation program and natural resources associated with Oologah Lake.

## 8.2 LAND AND WATER CLASSIFICATION PROPOSALS

A key component in preparing this Master Plan was examining prior land classifications and addressing the needed transition to new land classification standards that reflect how lands are being managed now and will be managed in the foreseeable future. The new land classification standards will also comply with current USACE standards. Public comment was solicited to assist in making these land reclassification decisions. Consultation was also conducted with Tribal Nations to provide input on cultural and natural resources to help inform the land classification decisions. Chapter 7 of this Plan describes the public involvement process and Appendix E provides a summary of public comments received. After analyzing public comment, examining recreational trends, and taking into account regional natural resource management priorities, USACE team members reclassified the Federal lands associated with Oologah Lake as described in Table 8.1 and changes to the water surface are provided in Table 8.2.

**Table 8.1 Change from Prior Land Classification to Proposed Land Classification**

| Prior Land Classifications (1977 Plan) | Acres | | Proposed (2021) Land Classifications | Acres |
|---|---|---|---|---|
| Operations and Maintenance | 329 | | Project Operations | 413 |
| Recreational Areas | 2,345 | | High Density Recreation | 1,699 |
| – | | | Environmentally Sensitive Areas | 7,587 |
| Wildlife Management USACE Managed | 4,090 | | Multiple Resource Management – Wildlife Management | 12,317 |
| Wildlife Management Oklahoma Managed | 15,253 | | – | – |
| **Total Land Acres** | **22,017** | | **Total Land Acres** | **22,016** |

*Total Acreage differences from the 1977 total to the 2021 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

**Table 8.2 Change from Prior Water Surface Classification to Proposed Water Surface Classification**

| Prior Water Surface Classifications (1977 Plan) | Acres | | Proposed (2021) Water Surface Classifications | Acres |
|---|---|---|---|---|
| Permanent Pool | 28,133 | | Permanent Pool | 28,134 |
| – | – | | – Restricted | 23 |
| – | – | | – Designated No Wake | 288 |
| – | – | | – Open Recreation | 27,823 |
| Flowage Easement | 15,119 | | Flowage Easement | 15,119 |

*Total Acreage differences from the 1977 total to the 2021 totals are due to improvements in measurement technology, deposition/siltation, and erosion. Totals also differ due to rounding while adding parcels.

Table 8.3 lists the descriptions and justifications for the reclassification of USACE lands at Oologah Lake. The team examined numerous parcels that ranged from a few acres to hundreds of acres, and rather than describing how each individual parcel was reclassified, the changes are grouped by classification category. A few examples of changes made to individual parcels are provided to assist in understanding how and why changes were made.

**Table 8.3 Reclassification Proposals**

| Proposal | Acres | Justification |
|---|---|---|
| **From Recreational Area to Environmentally Sensitive Area** | 77 | Significant historic and cultural sites are located within the ESA, and this portion did not contain areas which would be designated as High Density Recreation. |
| **From Recreational Area to Wildlife Management Area** | 845 | These areas are not currently used for High Density Recreation and includes hunting and wildlife management, and some areas also contain less sensitive historic or cultural sites which should not be developed into HDR. |
| **From State Wildlife Management to Environmentally Sensitive Area** | 6,990 | These areas have historically been managed by the state for wildlife management including hunting and food plots. However, due to the presence of sensitive historic or cultural sites, these areas have been designated as ESAs. Hunting and other wildlife management practices can be performed within an ESA as long as they do not disturb the protected resources. Within an ESA, the protected resources including sensitive natural or cultural resources must be prioritized to any other function. |
| **From State Wildlife Management to Wildlife Management Area** | 8,263 | This change was to reflect current land classification since the current WM land classification does not account for managing entity. Areas managed by the state for wildlife management will not change due to this land classification change. |
| **From USACE Wildlife Management to Environmentally Sensitive Area** | 521 | These areas have historically been managed by the USACE for wildlife management including hunting and food plots. However, due to the presence of sensitive historic or cultural sites, these areas have been designated as ESAs. Hunting and other wildlife management practices can be performed within an ESA as long as they do not disturb the protected resources. Within an ESA, the protected resources including sensitive natural or cultural resources must be prioritized to any other function. |
| **From USACE Wildlife Management to High Density Recreation** | 279 | These areas have been included in recreational leases, are currently being used as recreation, or are adjacent to current recreation areas, and have changed to reflect the current usage. |

| | | |
|---|---|---|
| **From USACE Wildlife Management to Project Operations** | 84 | A small portion of land currently being used for Project Operations has been changed to reflect current usage. Recreation and wildlife management activities can occur where permitted, but project operations and maintenance take priority to other incidental usage. |
| **From USACE Wildlife Management to Wildlife Management** | 3,209 | This change was to reflect current land classification since the current WM land classification does not account for managing entity. Areas managed by the USACE for wildlife management will not change due to this land classification change. |
| **Water Surface Changes** | 311 | The 1977 Plan did not designate any of the water surface with any classification or designation. This Plan proposes to designate approximately 23 acres of water surface as Restricted. Furthermore, the Plan proposes to designate approximately 288 acres as No-Wake Areas for a total of 311 acres with changes.<br><br>The Restricted water surface at Oologah Lake includes the area around the intake gate control tower near the dam, around the water intake structures, just below the dam, upstream of the controlled spillway, and small areas around designated swimming beaches. Future management calls for one or more of the following management measures: placement of buoys; placement of signs near boat ramps; and describing the areas on maps available to the public.<br><br>Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve visitor safety near key recreation water access areas such as boat ramps, swim beaches, and marinas. The following measures to be taken in No-wake Areas: placement of buoys, placement of signs near boat ramps, and describing the areas on maps available to the public. |

**Note:** The land classification changes described in this table are the result of changes to individual parcels of land ranging from a few acres to more than 100 acres. Acreages were measured using GIS technology. The acreage numbers provided are approximate and may differ from totals due to rounding.

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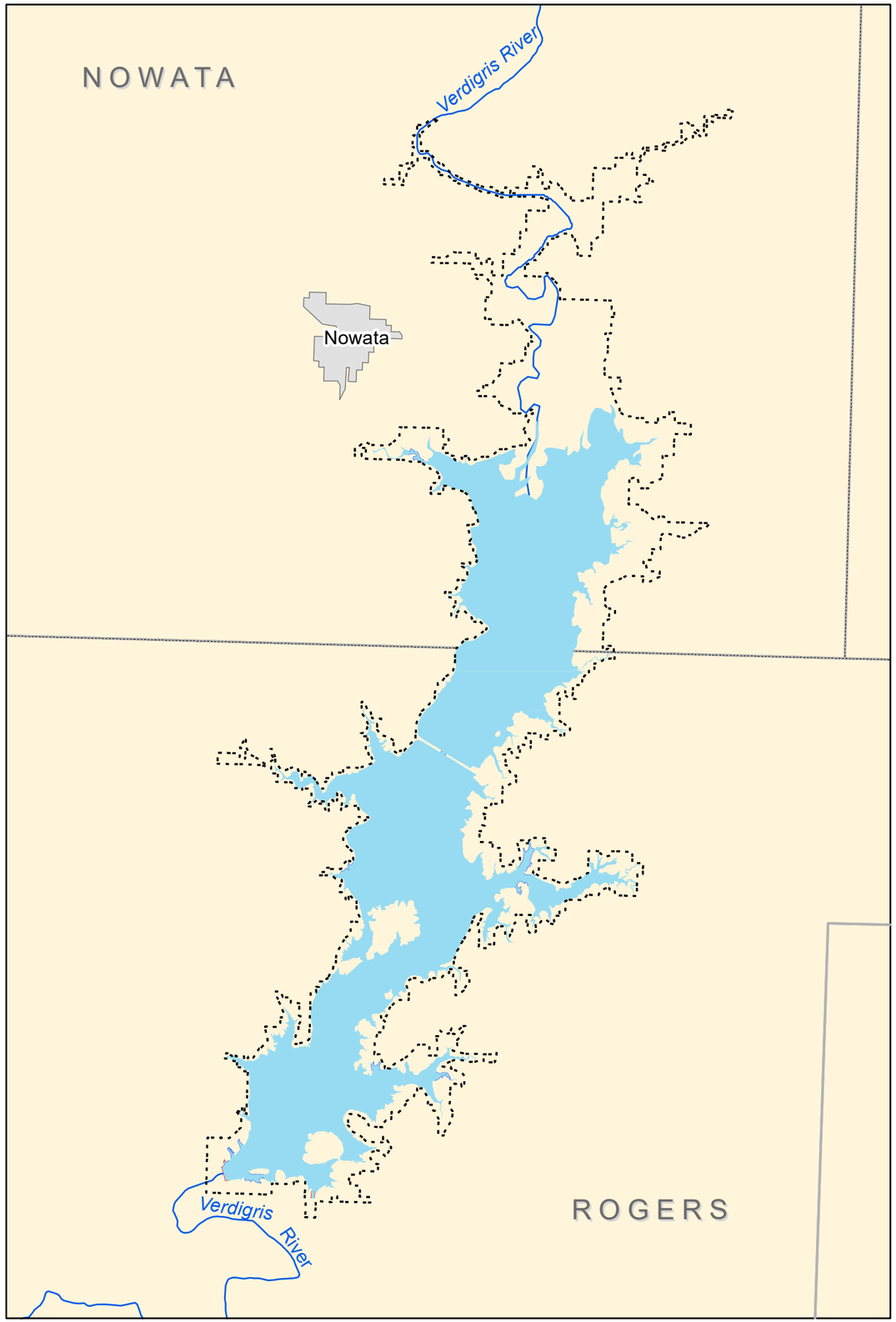
# APPENDIX A – LAND CLASSIFICATION, MANAGING AGENCIES, AND RECREATION MAPS




# INDEX TO MASTER PLAN MAPS

## GENERAL

| MAP NO. | TITLE |
|---|---|
| OL20MP-OI-00 | PROJECT LOCATION & INDEX TO MAPS |
| OL20MP-OM-01 | LAND MANAGING ENTITIES |
| OL20MP-OP-01 | SEA PLANE GUIDE |
| OL20MP-OW-01 | WATER SURFACE CLASSIFICATIONS AND MARINAS |

## LAND CLASSIFICATION

| MAP NO. | TITLE |
|---|---|
| OL20MP-LC-01 | MASTER PLAN REIVISION LAND CLASSIFICATION CHANGES |
| OL20MP-OC-00 | LAND AND WATER CLASSIFICATIONS (00) |
| OL20MP-OC-01 | LAND AND WATER CLASSIFICATIONS (01) |
| OL20MP-OC-02 | LAND AND WATER CLASSIFICATIONS (02) |
| OL20MP-OC-03 | LAND AND WATER CLASSIFICATIONS (03) |
| OL20MP-OC-04 | LAND AND WATER CLASSIFICATIONS (04) |
| OL20MP-OC-05 | LAND AND WATER CLASSIFICATIONS (05) |
| OL20MP-OC-06 | LAND AND WATER CLASSIFICATIONS (06) |
| OL20MP-OC-07 | LAND AND WATER CLASSIFICATIONS (07) |
| OL20MP-OC-08 | LAND AND WATER CLASSIFICATIONS (08) |
| OL20MP-OC-09 | LAND AND WATER CLASSIFICATIONS (09) |
| OL20MP-OC-10 | LAND AND WATER CLASSIFICATIONS (10) |
| OL20MP-OC-11 | LAND AND WATER CLASSIFICATIONS (11) |
| OL20MP-OC-12 | LAND AND WATER CLASSIFICATIONS (12) |
| OL20MP-OC-13 | LAND AND WATER CLASSIFICATIONS (13) |
| OL20MP-OC-14 | LAND AND WATER CLASSIFICATIONS (14) |
| OL20MP-OC-15 | LAND AND WATER CLASSIFICATIONS (15) |

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| MAP NO. | TITLE |
|---|---|
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| OL20MP-OR-0B | PARK PLATE INDEX |
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| OL20MP-OR-02 | REDBUD BAY AND MARINA |
| OL20MP-OR-03 | BLUE CREEK PARK |
| OL20MP-OR-04 | CLERMONT PARK |
| OL20MP-OR-05 | SPENCER CREEK COVE |
| OL20MP-OR-06 | WINGANON RAMP |
| OL20MP-OR-07 | BIG CREEK RAMP |
| OL20MP-OR-08 | DOUBLE CREEK COVE |
| OL20MP-OR-09 | SUNNYSIDE RAMP |
| OL20MP-OR-10 | HAWTHORN BLUFF |
| OL20MP-OR-11 | VERDIGRIS RIVER PARK |




WATER SURFACE

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

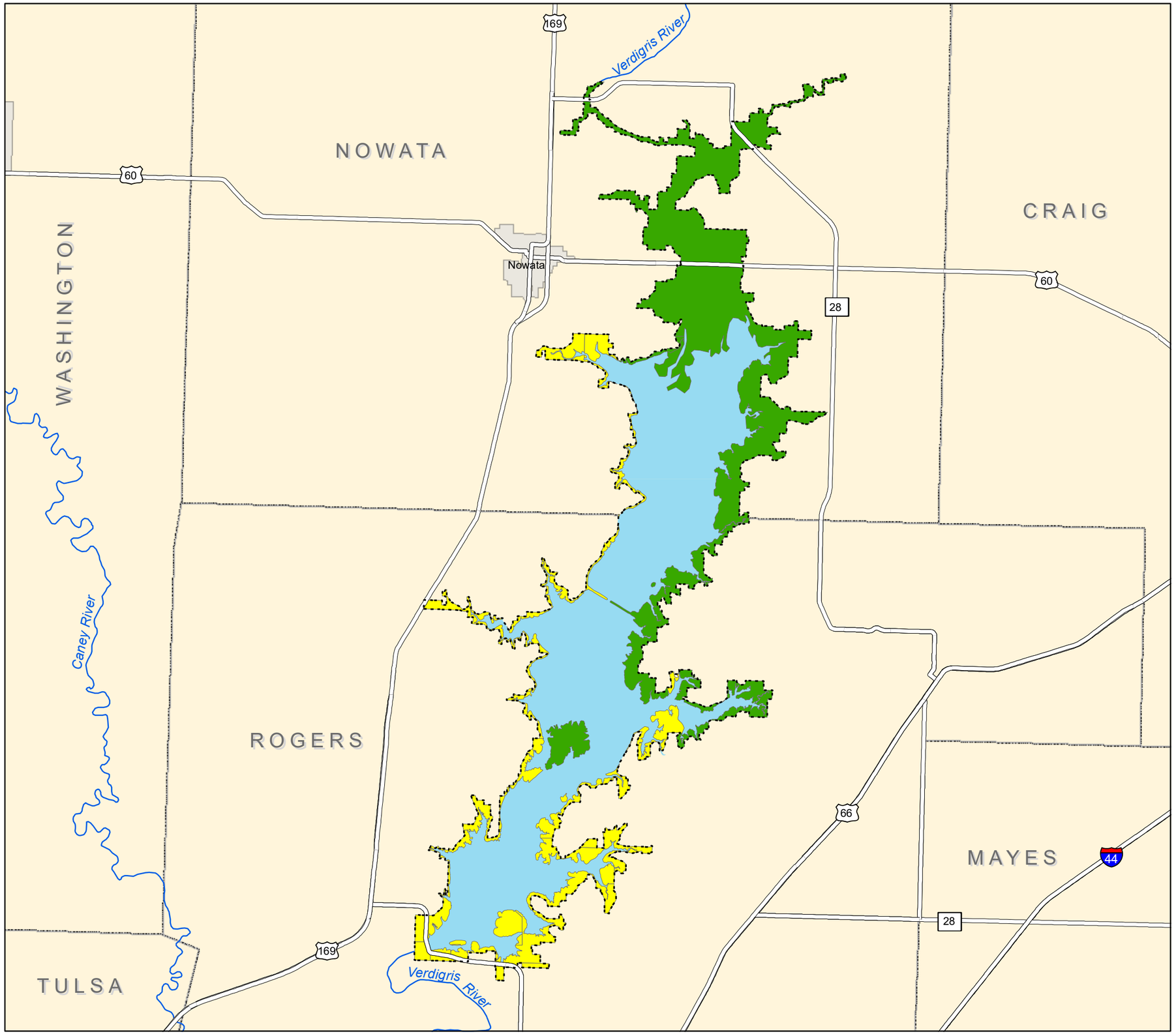
# OOLOGAH LAKE MASTER PLAN

## PROJECT LOCATION AND MAP INDEX

N

0 1.5 3 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OI-00 |





U.S. ARMY CORPS OF ENGINEERS

OKLAHOMA DEPT. OF WILDLIFE CONSERVATION

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

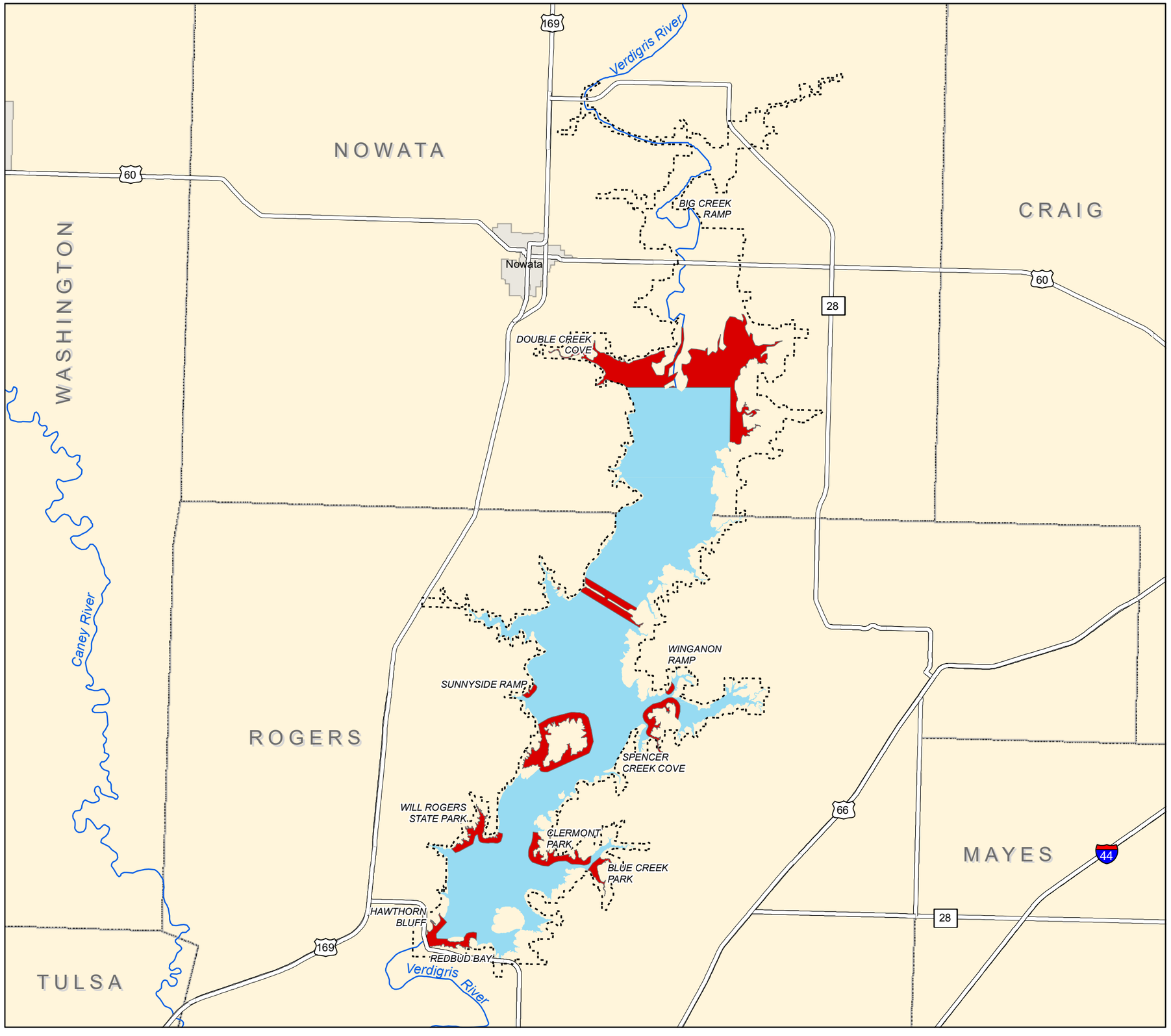
# OOLOGAH LAKE MASTER PLAN

## LAND MANAGING ENTITIES

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OM-01 |





FEE BOUNDARY

RESTRICTED AREA

WATER SURFACE

**TAKE OFF AND LANDING PROHIBITED WITHIN 1400' OF DAM STRUCTURE, 1,000' OF BRIDGES, AND WITHIN 700' OF RECREATION AREAS**

**OPERATIONS OF A SEAPLANE AT CORPS PROJECTS IS AT THE RISK OF THE PLANE'S OWNER, OPERATOR, AND / OR PASSENGERS.**

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

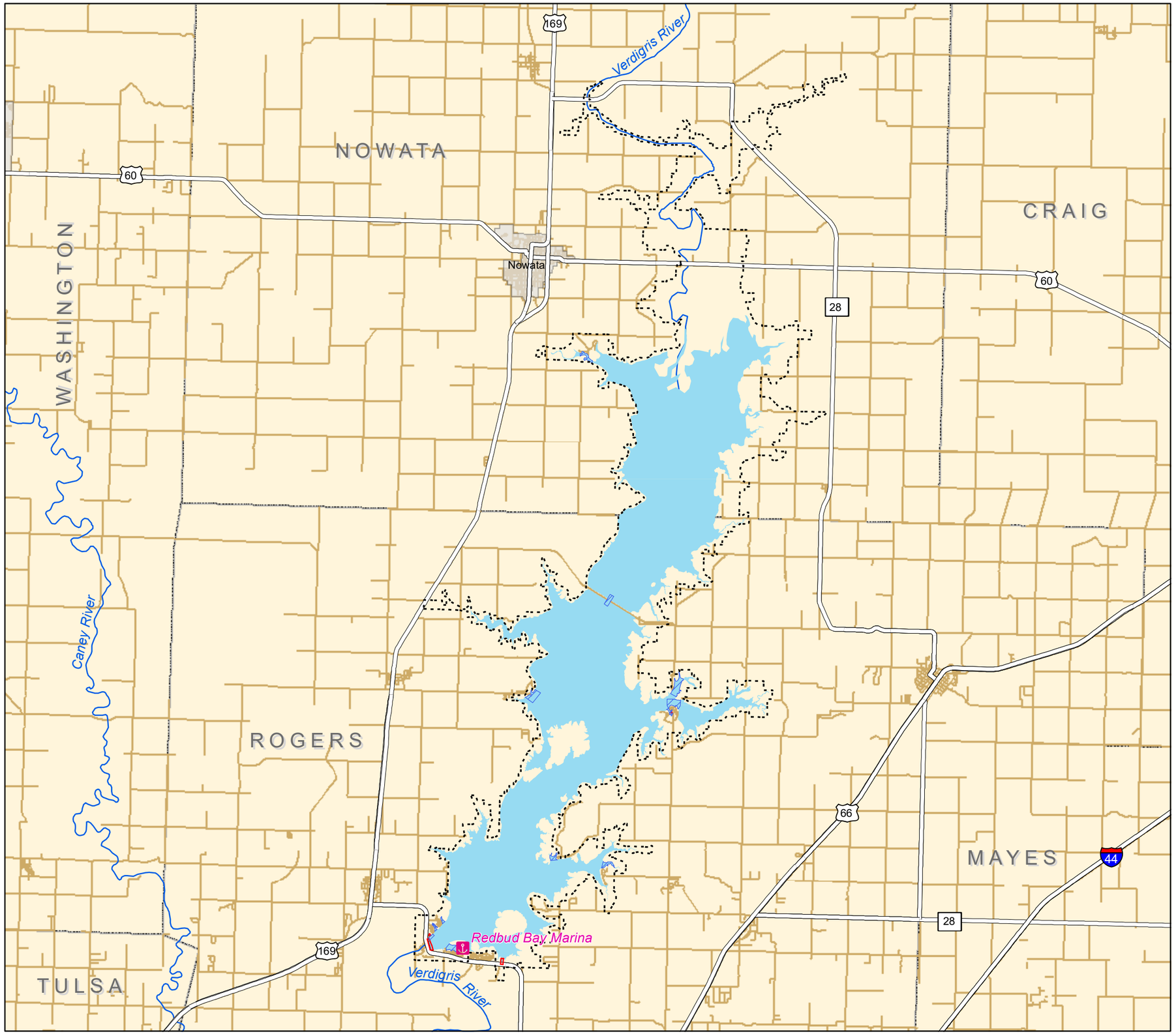
# OOLOGAH LAKE MASTER PLAN

## SEA PLANE GUIDE

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OP-01 |





MARINAS / CONCESSIONS

WATER SURFACE: RESTRICTED

WATER SURFACE: DESIGNATED NO WAKE AREAS

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## WATER SURFACE CLASSIFICATIONS AND MARINAS

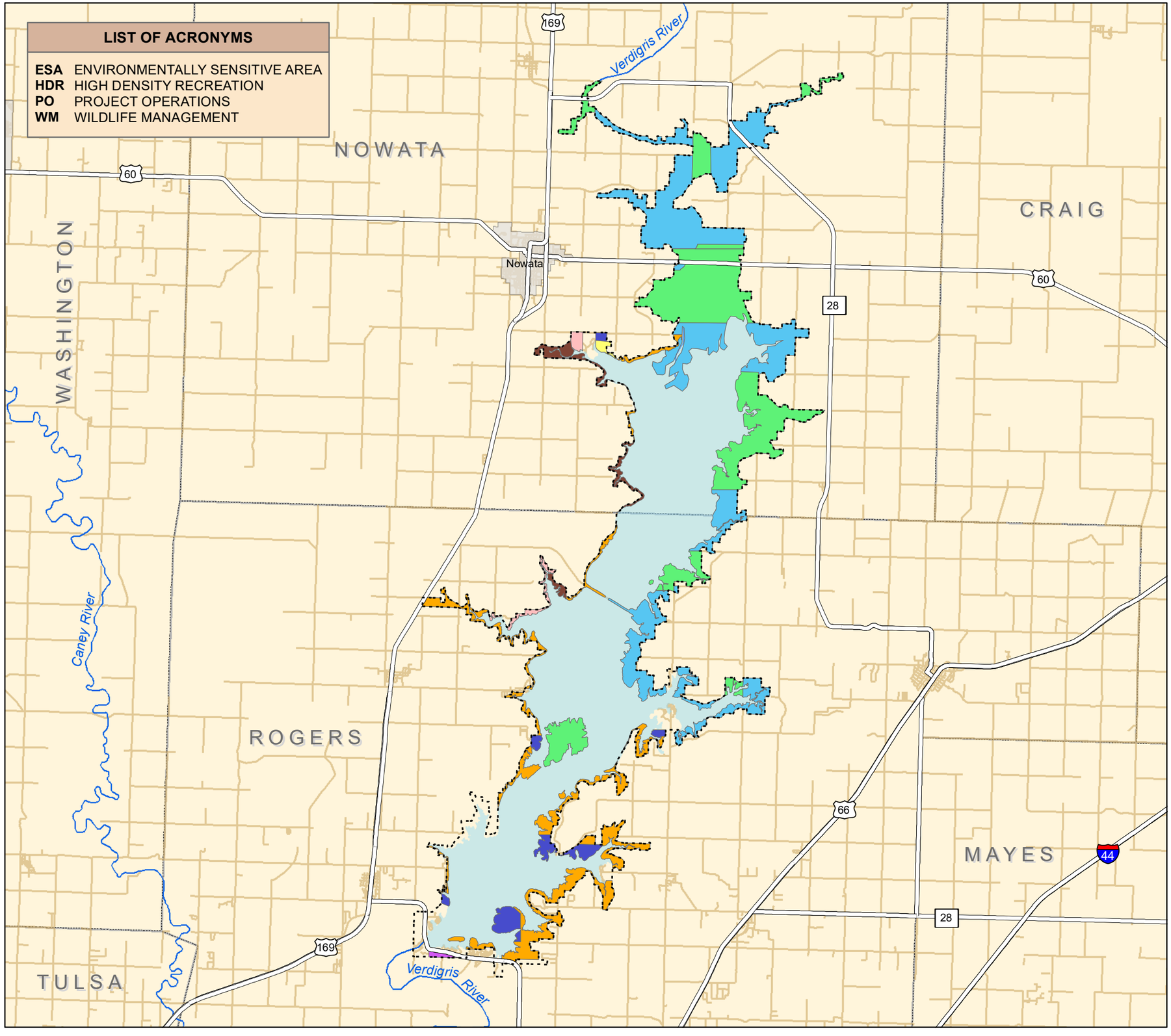
N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OW-01 |

## LIST OF ACRONYMS

| | |
|---|---|
| **ESA** | ENVIRONMENTALLY SENSITIVE AREA |
| **HDR** | HIGH DENSITY RECREATION |
| **PO** | PROJECT OPERATIONS |
| **WM** | WILDLIFE MANAGEMENT |





**LAND CLASSIFICATION CHANGES FROM 1977 MASTER PLAN TO 2021**

- FROM HDR TO ESA
- FROM HDR TO WM
- FROM STATE WM TO ESA
- FROM STATE WM TO WM
- FROM USACE WM TO ESA
- FROM USACE WM TO HDR
- FROM USACE WM TO PO
- FROM USACE WM TO WM

**USACE BASE MAP LAYERS**

- WATER SURFACE
- FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

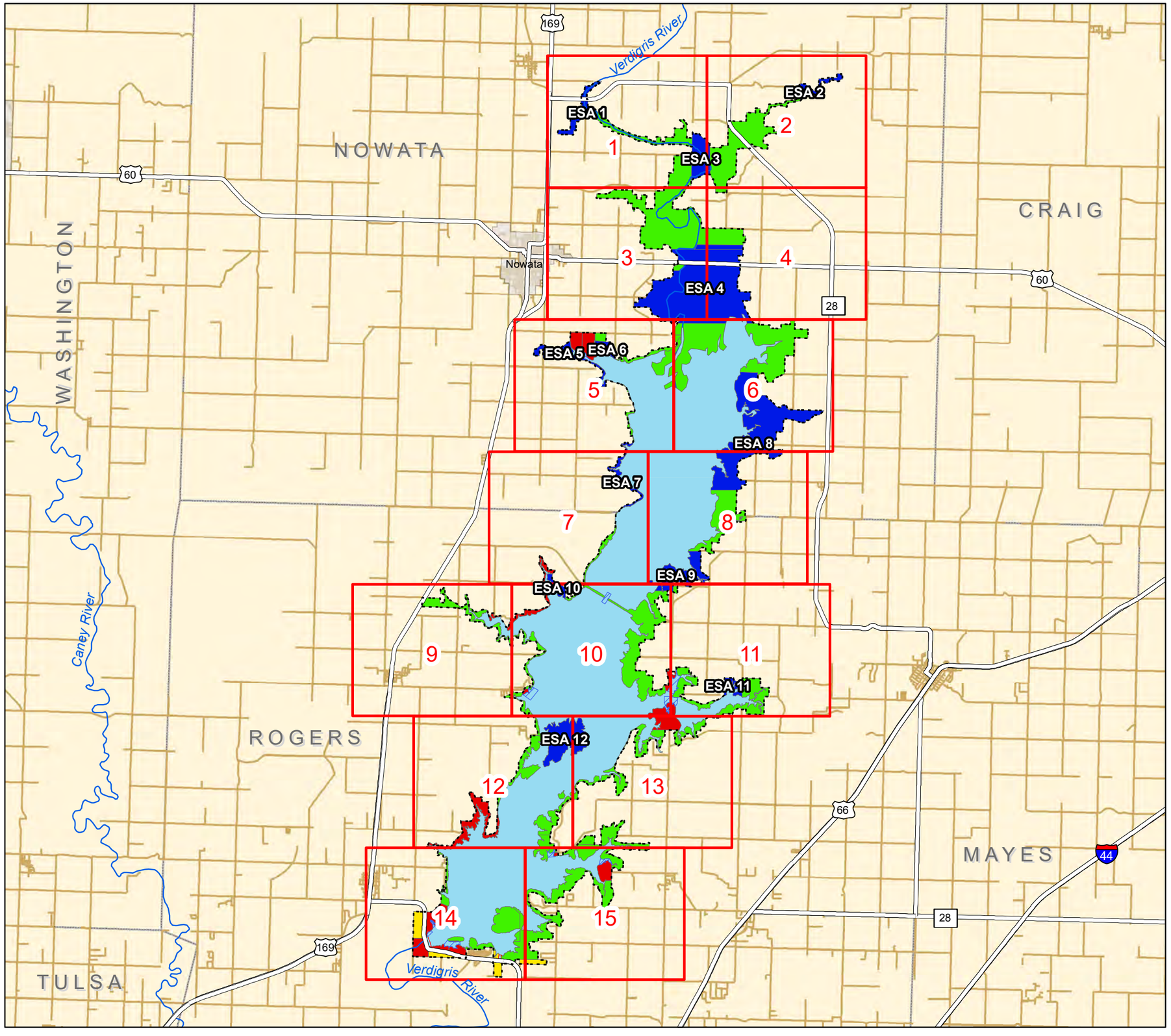
# OOLOGAH LAKE MASTER PLAN

## MASTER PLAN REVISION LAND CLASSIFICATION CHANGES

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-LC-01 |





- INDEX GRID
- ENVIRONMENTALLY SENSITIVE AREA
- HIGH DENSITY RECREATION
- PROJECT OPERATIONS
- WILDLIFE MANAGEMENT
- WATER SURFACE: RESTRICTED
- WATER SURFACE: DESIGNATED NO WAKE AREAS
- WATER SURFACE: OPEN RECREATION
- FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 00)

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-00 |

NOWATA CO.

Verdigris River

W 1700 Rd

28

Rd 016

416 Rd

417 Rd

418 Rd

169

ESA 1

415 Rd

N4180 Rd

Ew 18

N416 Rd

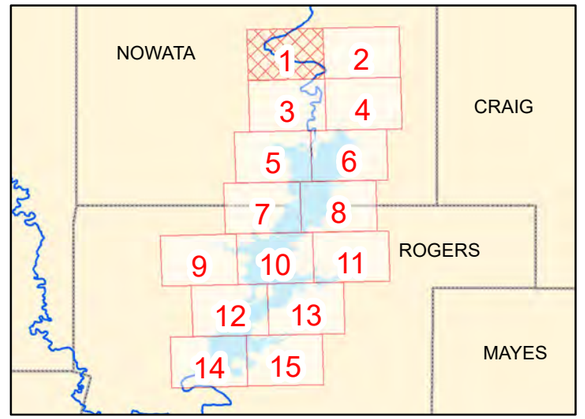
417 Rd

Ew 19 Rd

ESA 3

N415 Rd

E020 Rd




ENVIRONMENTALLY SENSITIVE AREA

WILDLIFE MANAGEMENT

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

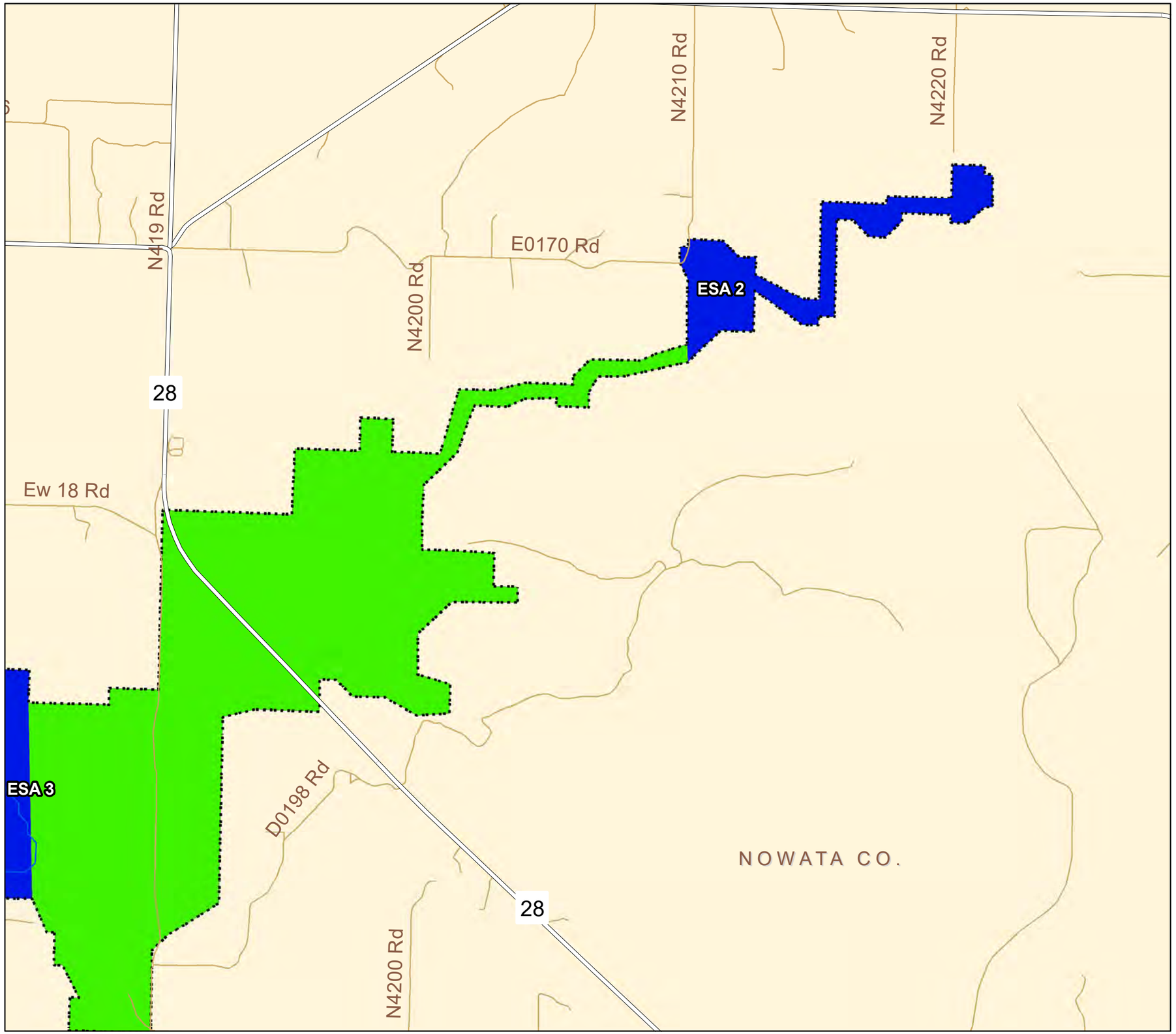
# OOLOGAH LAKE MASTER PLAN

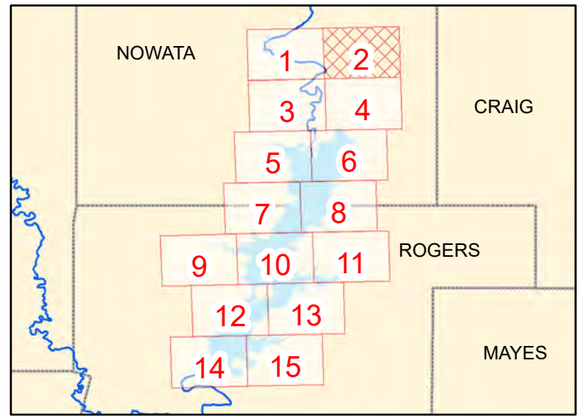
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 01)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-01 |




ENVIRONMENTALLY SENSITIVE AREA

WILDLIFE MANAGEMENT

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 02)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-02 |

E020 Rd

NOWATA CO.

E0202 Rd

E021 Rd

Verdigris River

Nowata

N4150 Rd

N4155 Rd

Vinita Rd

60

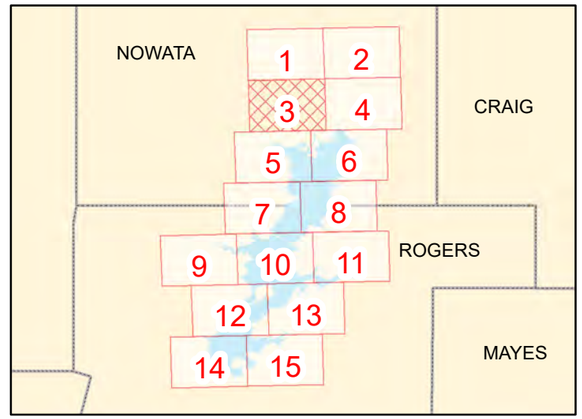
N4160 Rd

N4170 Rd

E0230 Rd

ESA 4

D4165 Rd




ENVIRONMENTALLY SENSITIVE AREA

WILDLIFE MANAGEMENT

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

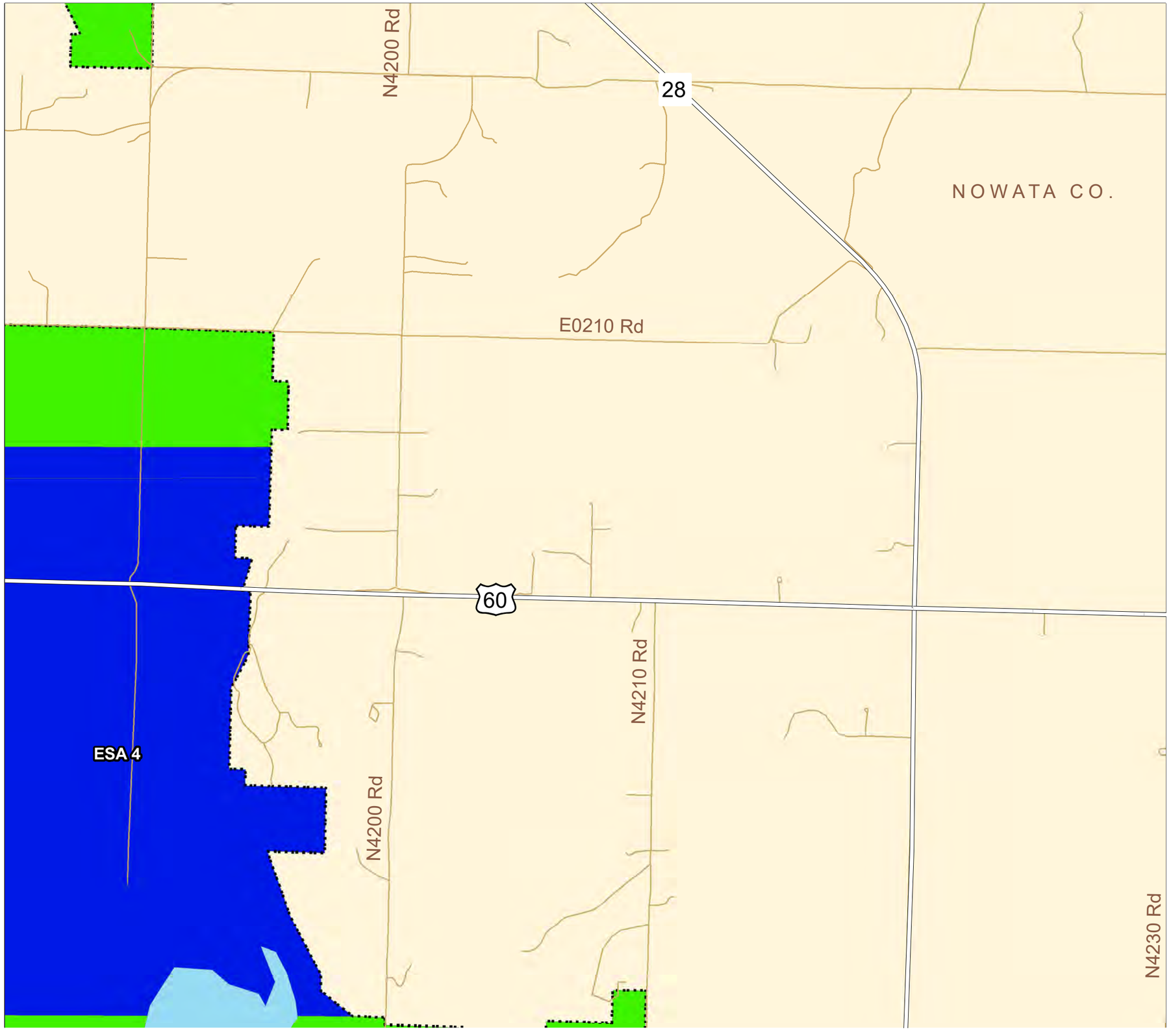
# OOLOGAH LAKE MASTER PLAN

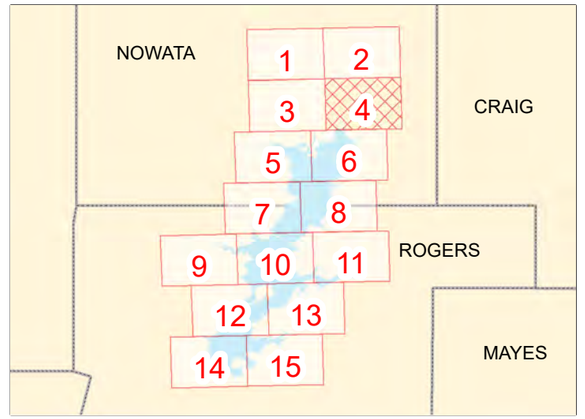
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 03)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-03 |




ENVIRONMENTALLY SENSITIVE AREA
WILDLIFE MANAGEMENT
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

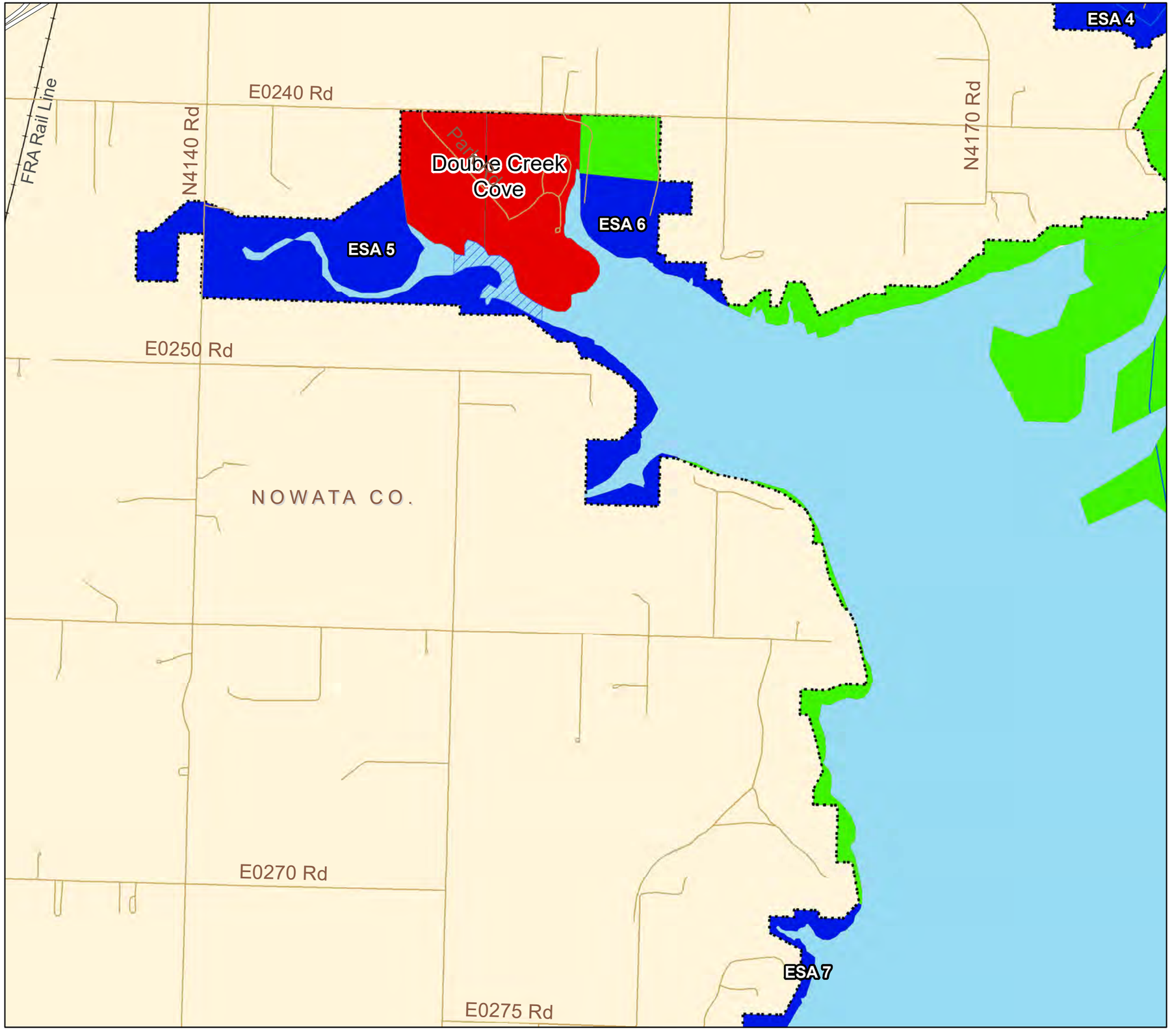
OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

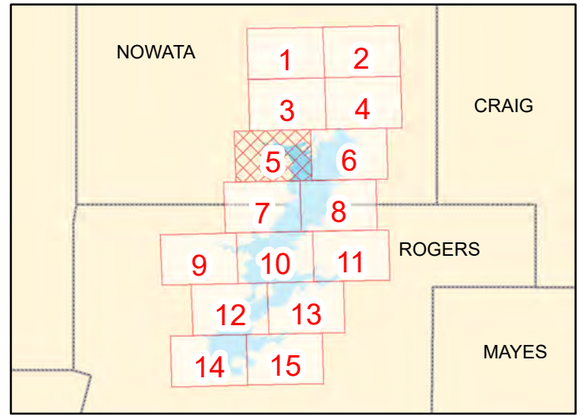
# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 04)

N
0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-04 |




ENVIRONMENTALLY SENSITIVE AREA
HIGH DENSITY RECREATION
WILDLIFE MANAGEMENT
WATER SURFACE: DESIGNATED NO WAKE AREAS
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 05)

N
0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-05 |

ESA 4

NOWATA CO.

E0250 Rd

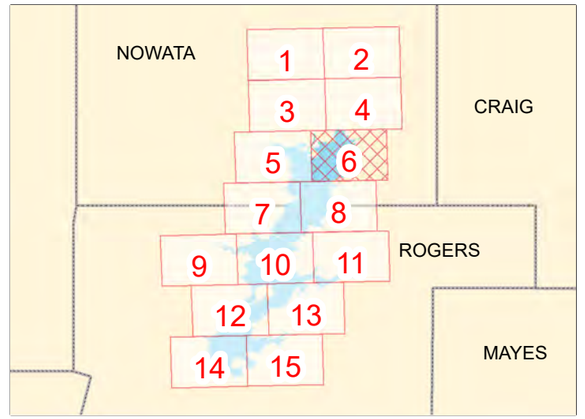
N4200 Rd

N4210 Rd

28

ESA 8

E0270 Rd




ENVIRONMENTALLY SENSITIVE AREA
WILDLIFE MANAGEMENT
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

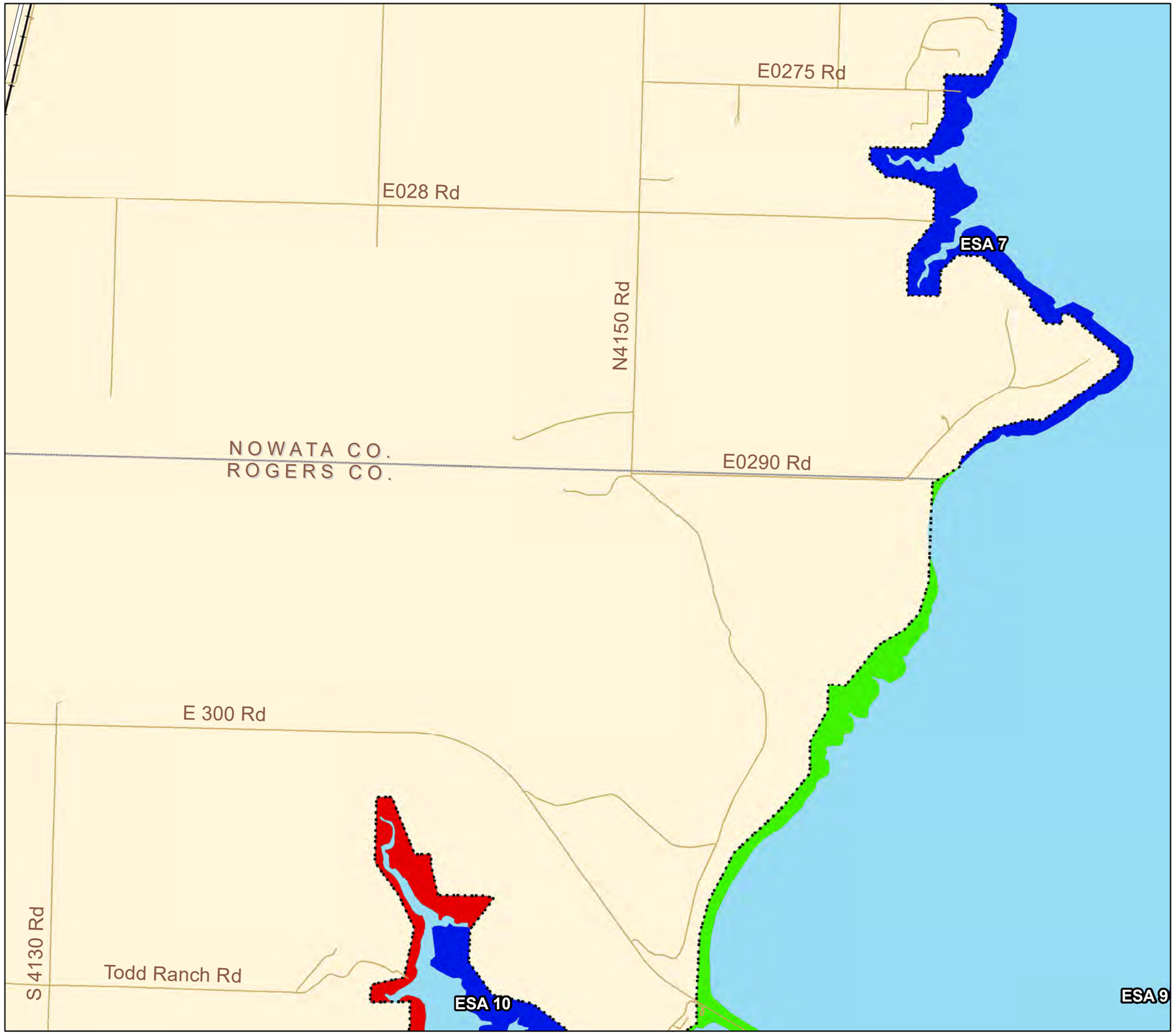
OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

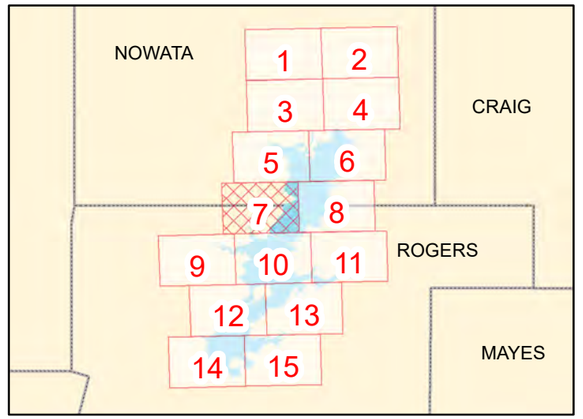
# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 06)

N 0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-06 |




ENVIRONMENTALLY SENSITIVE AREA
HIGH DENSITY RECREATION
WILDLIFE MANAGEMENT
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 07)

N
0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-07 |

ESA 8

ESA 9

N4190 Rd

N4190 Rd

S 4190 Rd

S 4210 Rd

S 4200 Rd

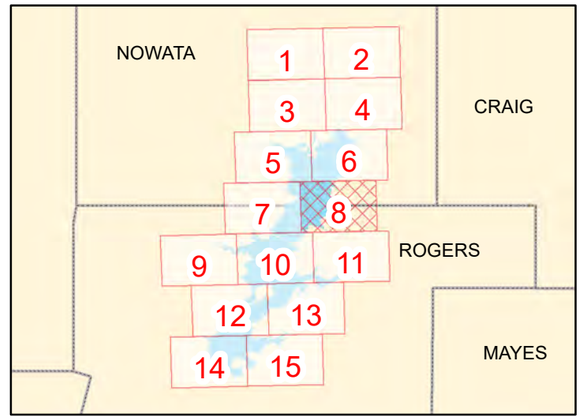
E0280 Rd

E0290 Rd

E 0290 Rd

E 31 Rd

NOWATA CO.
ROGERS CO.




ENVIRONMENTALLY SENSITIVE AREA
WILDLIFE MANAGEMENT
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 08)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-08 |

ROGERS CO.

E 315 Rd

S 4130 Rd

Ew 320 Rd

E 320 Rd

E 324th Rd

FRA Rail Lines

S 4100 Rd

S 4110 Rd

169

E 330 Rd

S Farra St

Willow St

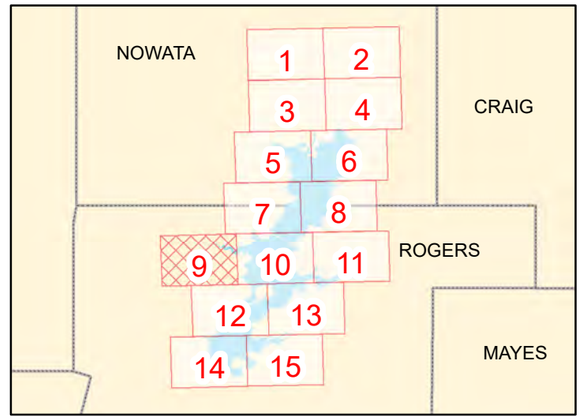
Elm St

E0335 Rd

Sunnyside

S 4100 Rd

E 340 Rd




HIGH DENSITY RECREATION
WILDLIFE MANAGEMENT
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

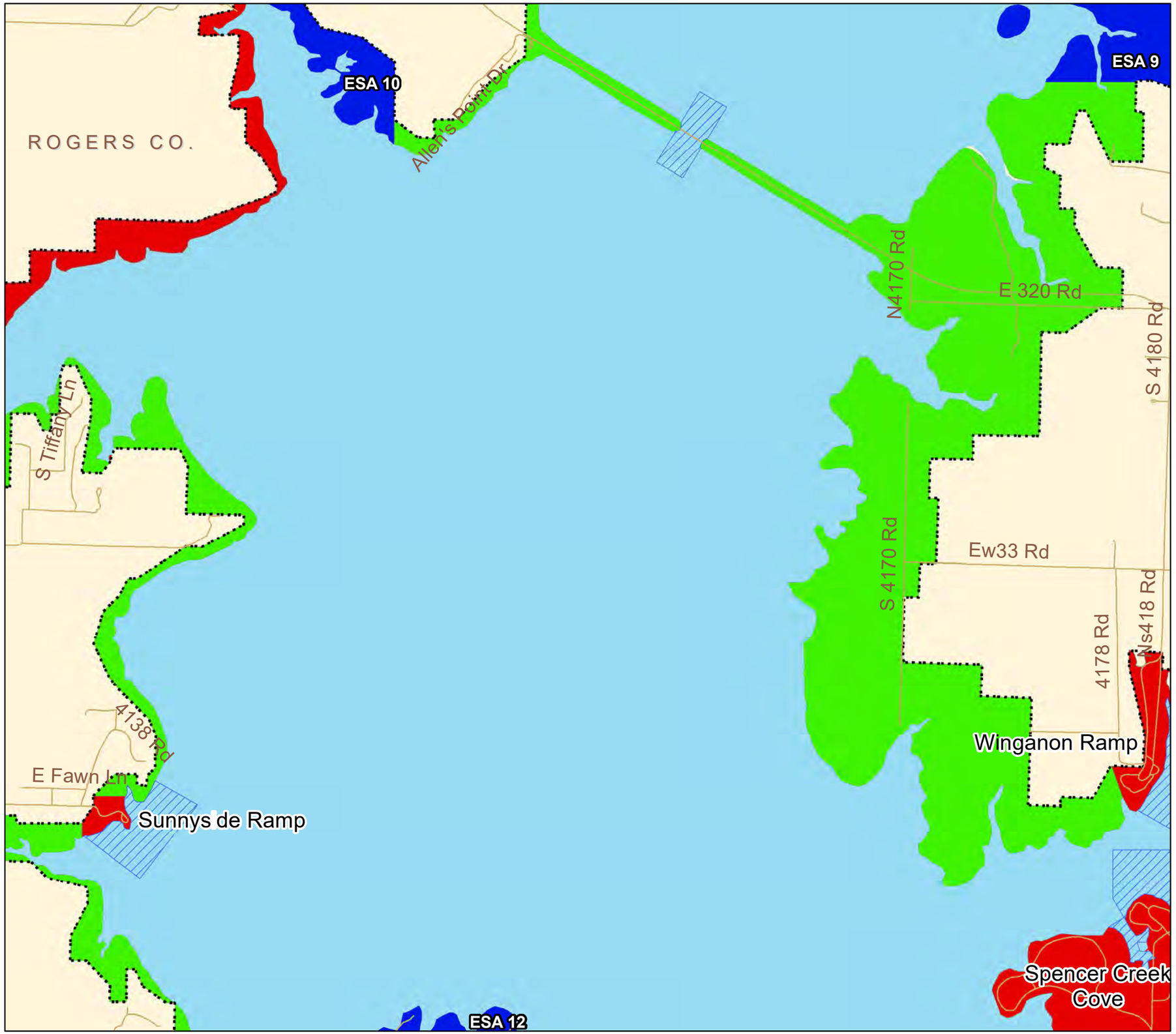
# OOLOGAH LAKE MASTER PLAN

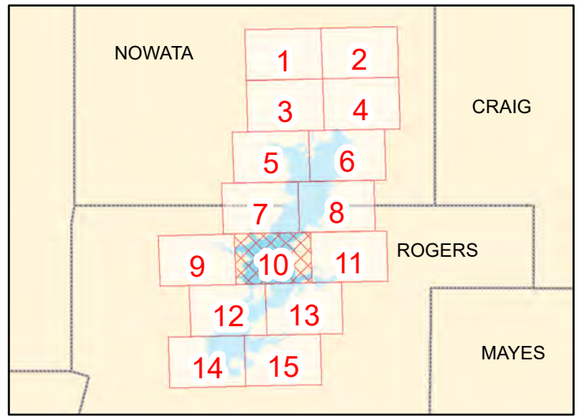
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 09)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-09 |




- ENVIRONMENTALLY SENSITIVE AREA
- HIGH DENSITY RECREATION
- WILDLIFE MANAGEMENT
- WATER SURFACE: RESTRICTED
- WATER SURFACE: DESIGNATED NO WAKE AREAS
- WATER SURFACE: OPEN RECREATION
- FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

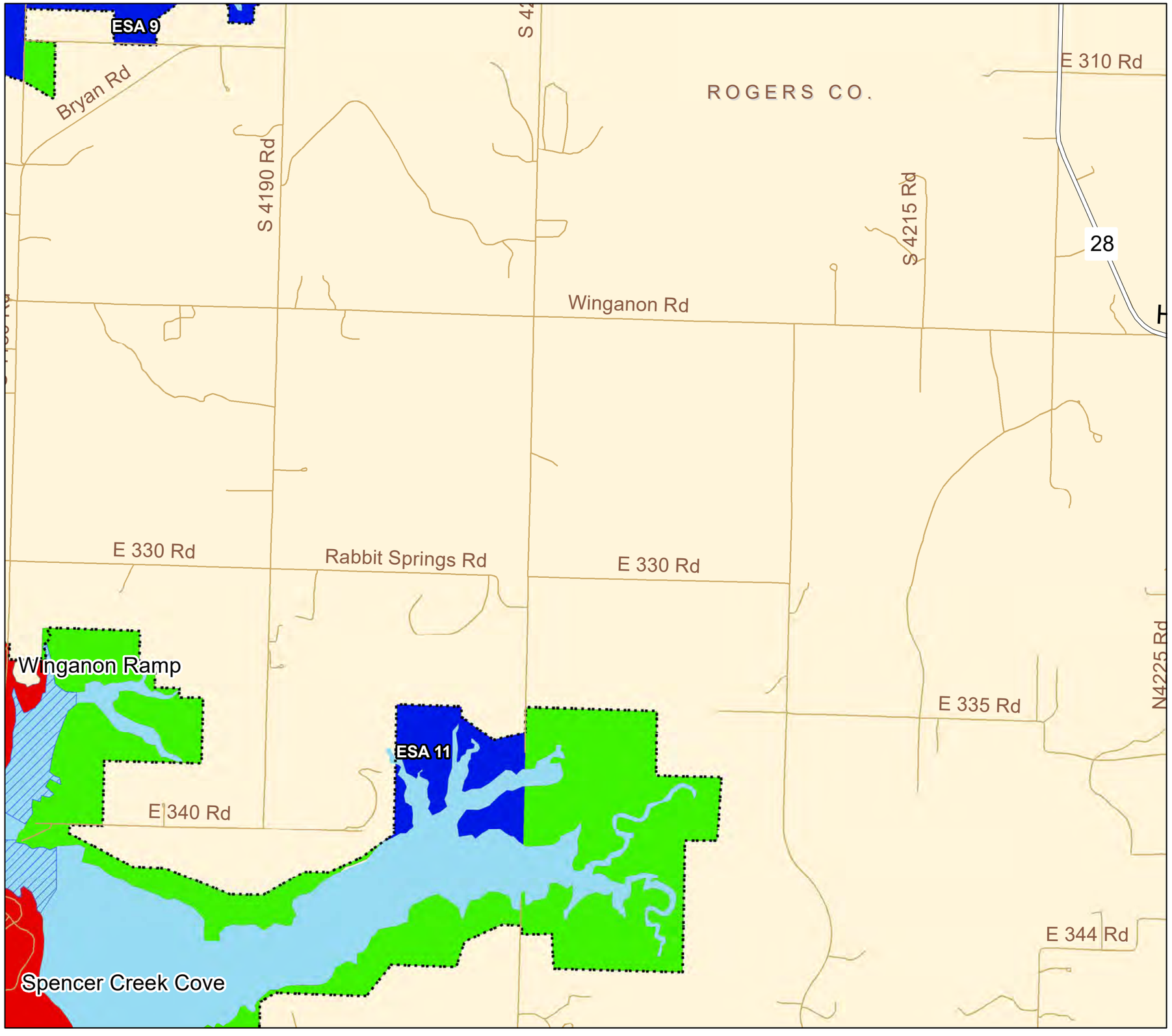
# OOLOGAH LAKE MASTER PLAN

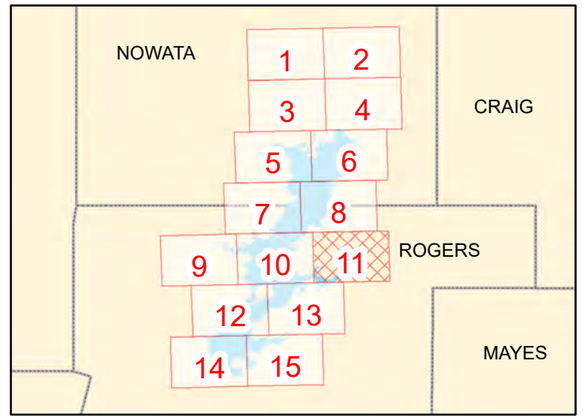
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 10)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-10 |




ENVIRONMENTALLY SENSITIVE AREA
HIGH DENSITY RECREATION
WILDLIFE MANAGEMENT
WATER SURFACE: DESIGNATED NO WAKE AREAS
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 11)

N
0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-11 |

Goose Island Rd E

E 350 Rd

E0352 Rd

E0350 Rd

Goose Island Rd

ESA 12

ROGERS CO.

E 355 Rd

S 4130 Rd

War Acres Rd

E 360 Rd

E 360 Rd

S 4130 Rd

S 4110 Rd

E 370 Rd

S 4120 Rd

E 380 Rd

W Rogers B rth Place

D4155 Rd

NOWATA

CRAIG

ROGERS

MAYES

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

ENVIRONMENTALLY SENSITIVE AREA

HIGH DENSITY RECREATION

WILDLIFE MANAGEMENT

WATER SURFACE: DESIGNATED NO WAKE AREAS

WATER SURFACE: OPEN RECREATION

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

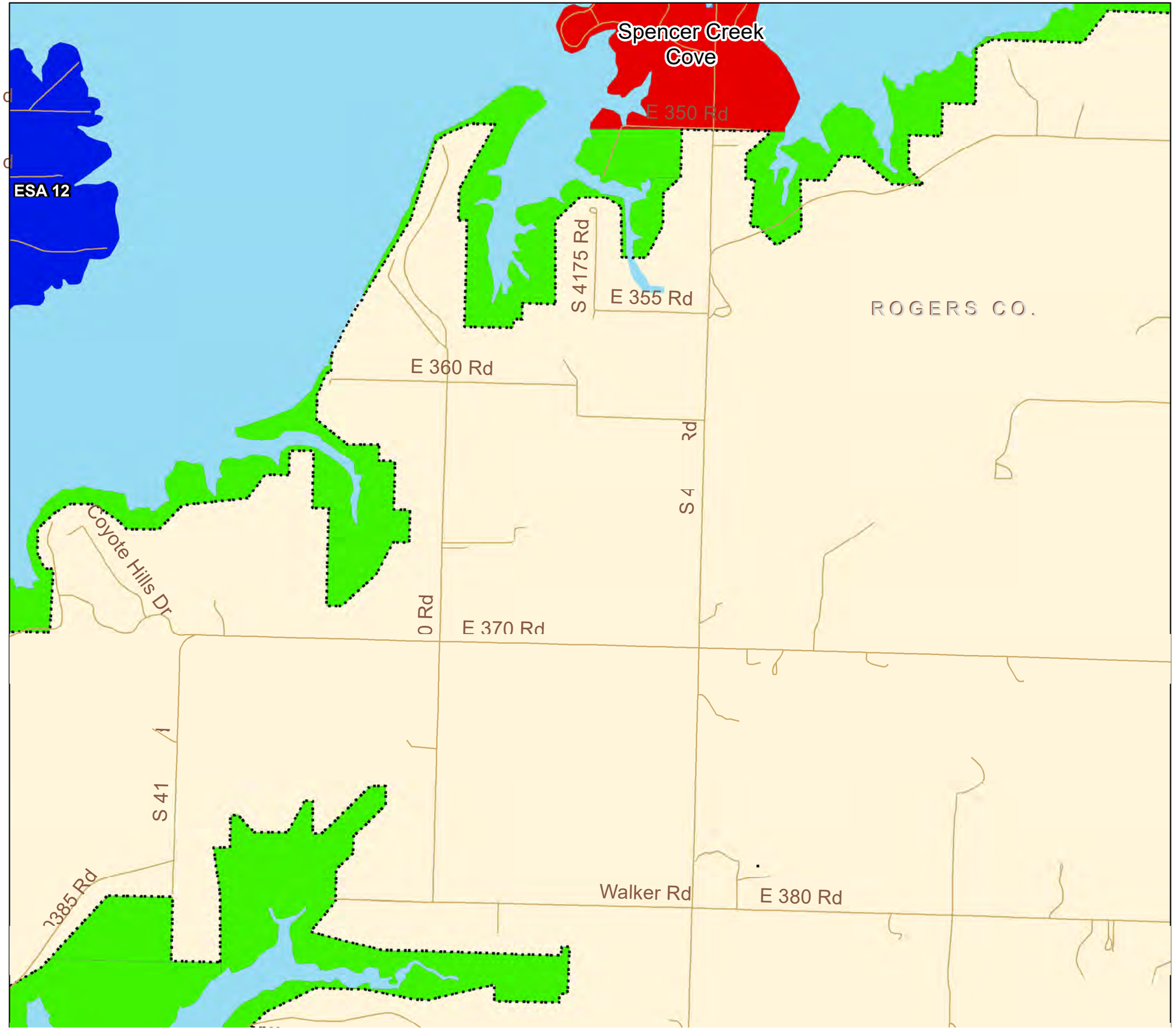
# OOLOGAH LAKE MASTER PLAN

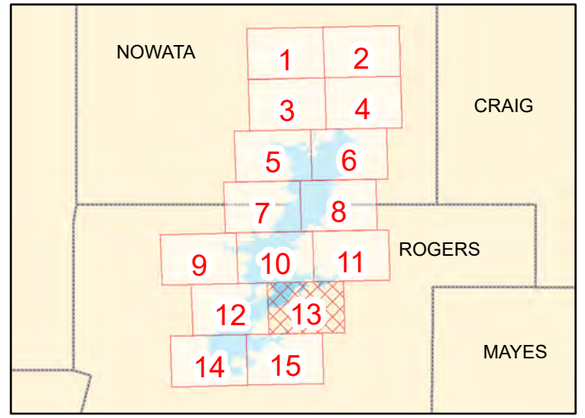
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 12)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-12 |




ENVIRONMENTALLY SENSITIVE AREA
HIGH DENSITY RECREATION
WILDLIFE MANAGEMENT
WATER SURFACE: DESIGNATED NO WAKE AREAS
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 13)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-13 |

ROGERS CO.

Will Rogers Birth Place

169

E 390 Rd

S Oologah Rd

S 4120 Rd

Elm St

88

Hawthorn Bluff

Verdigris River Park

Redbud Bay

E Redbud St

S Oak

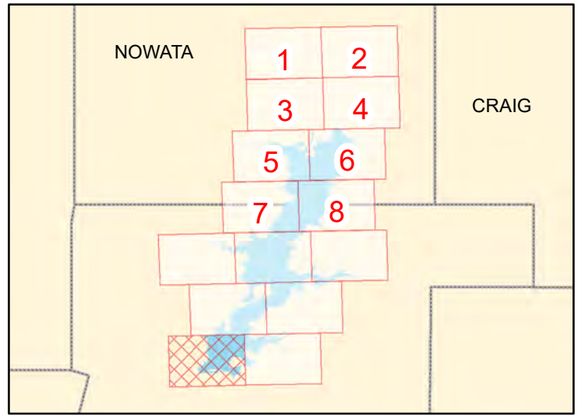
Canyon Rd

N4133 Rd

Verdigris River

FRA Rail Lines

88




HIGH DENSITY RECREATION
PROJECT OPERATIONS
WILDLIFE MANAGEMENT
WATER SURFACE: RESTRICTED
WATER SURFACE: DESIGNATED NO WAKE AREAS
WATER SURFACE: OPEN RECREATION
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

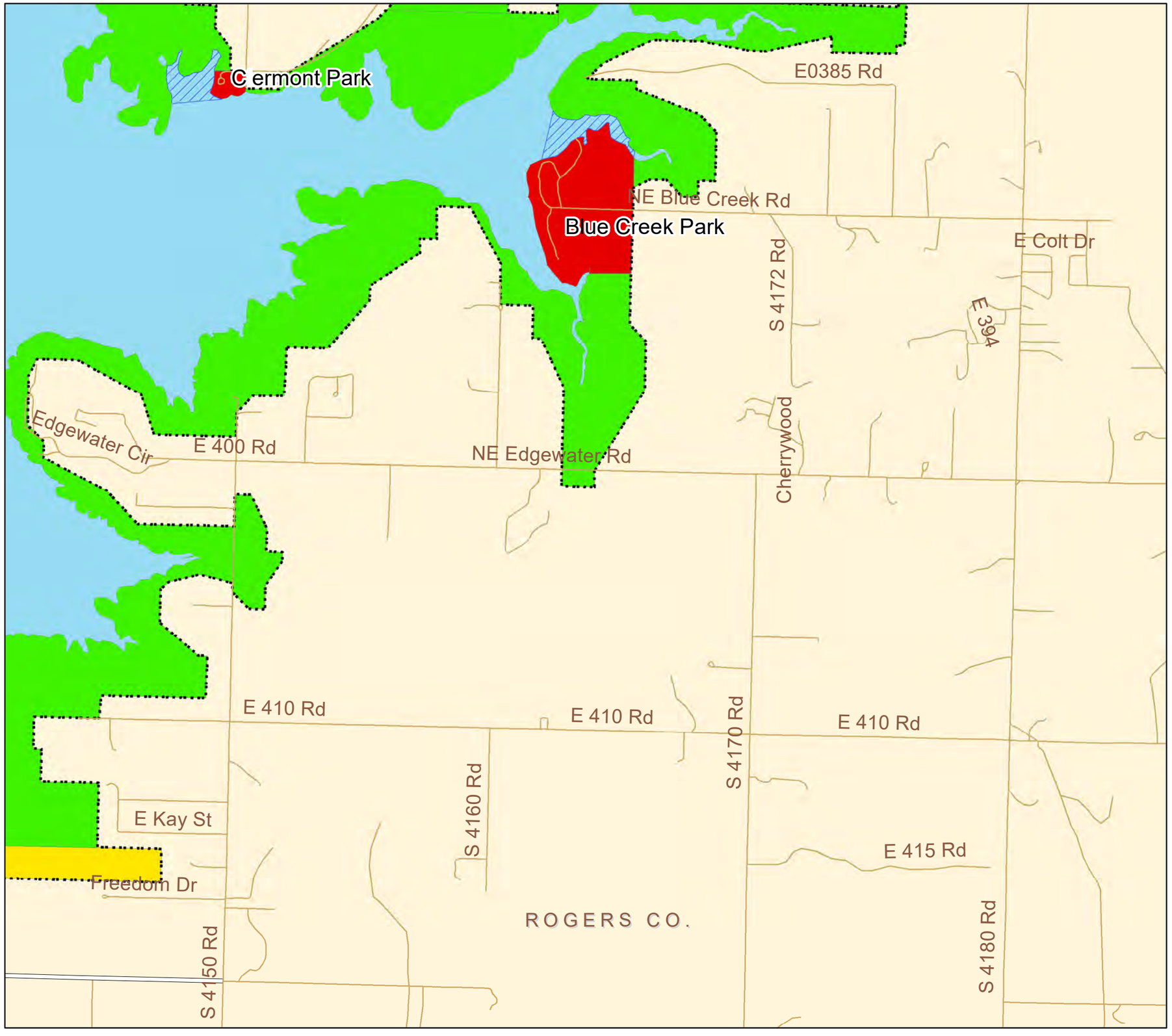
# OOLOGAH LAKE MASTER PLAN

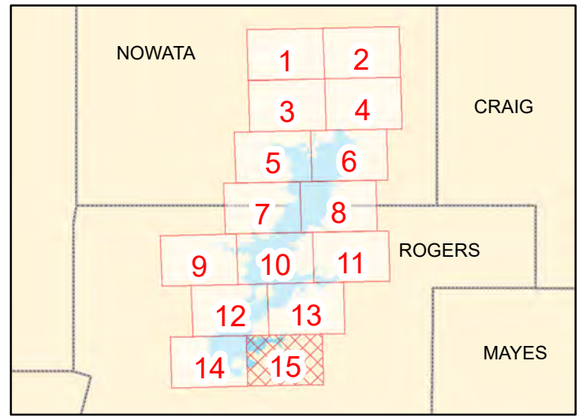
## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 14)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-14 |




- HIGH DENSITY RECREATION
- PROJECT OPERATIONS
- WILDLIFE MANAGEMENT
- WATER SURFACE: DESIGNATED NO WAKE AREAS
- WATER SURFACE: OPEN RECREATION
- FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

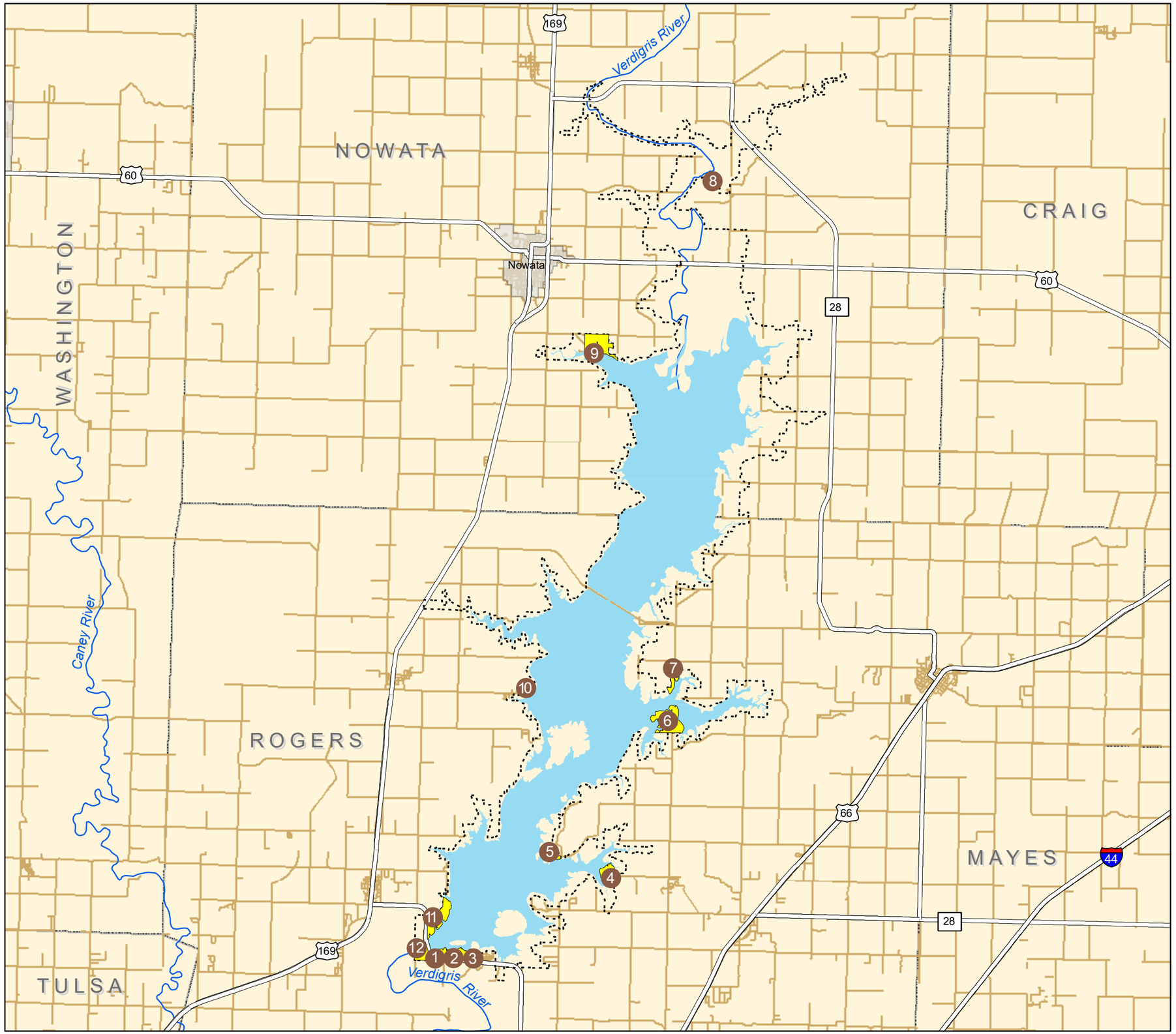
# OOLOGAH LAKE MASTER PLAN

## LAND AND WATER CLASSIFICATIONS (INDEX SHEET 15)

N

0 0.25 0.5 1 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OC-15 |





US ARMY CORPS OF ENGINEERS

KEY TO PARKS

1. OVERLOOK
2. REDBUD BAY
3. REDBUD BAY MARINA
4. BLUE CREEK PARK
5. CLERMONT PARK
6. SPENCER CREEK COVE
7. WINGANON RAMP
8. BIG CREEK RAMP
9. DOUBLE CREEK COVE
10. SUNNYSIDE RAMP
11. HAWTHORN BLUFF
12. VERDIGRIS RIVER PARK

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

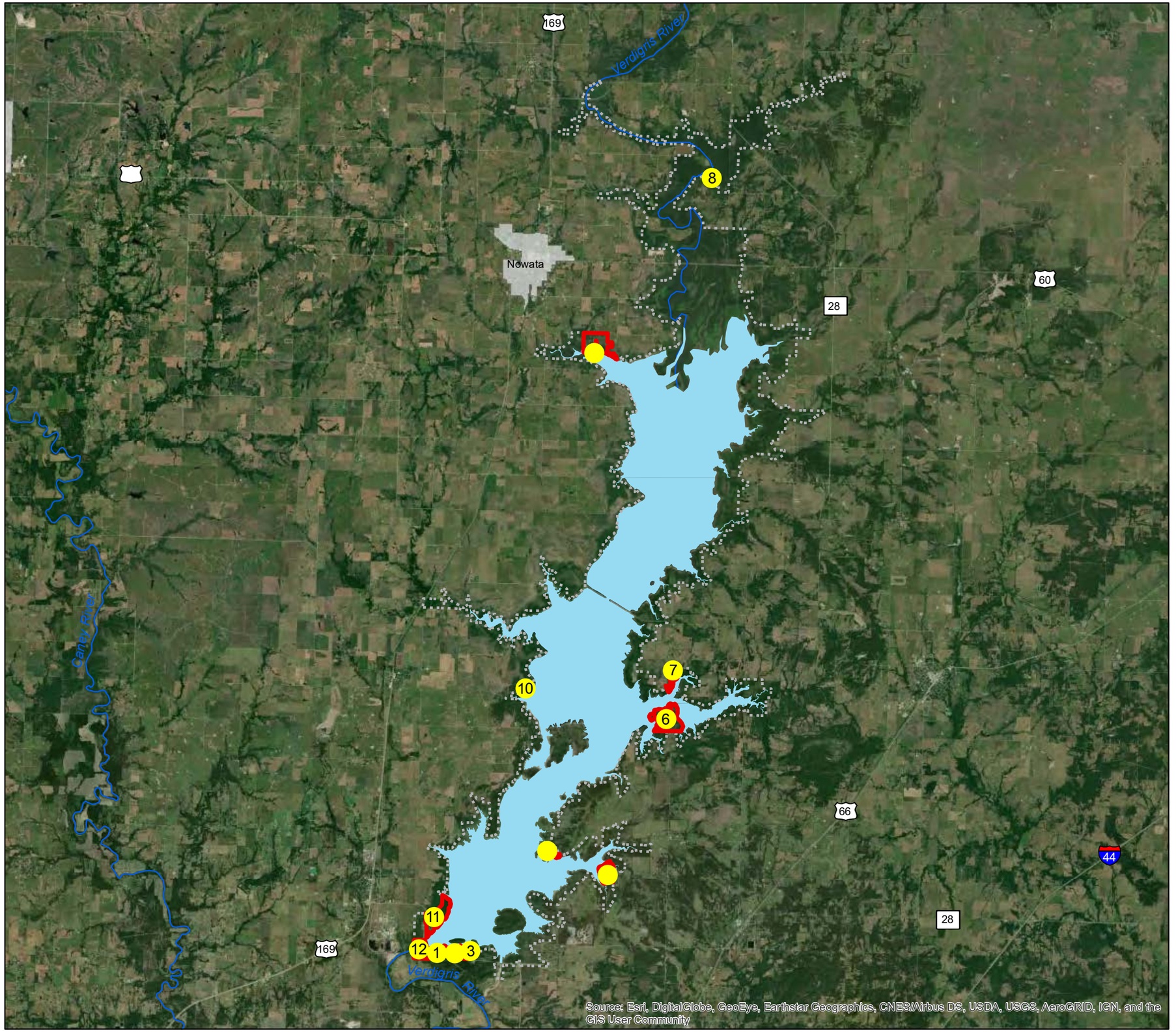
# OOLOGAH LAKE MASTER PLAN

## MANAGED RECREATIONAL AREAS

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-0A |





| RECREATION AREAS | | |
|---|---|---|
| **ID #** | **NAME** | **SHEET #** |
| | OVERLOOK | OL20MP-OR-01 |
| | REDBUD BAY | OL20MP-OR-02 |
| | REDBUD BAY MARINA | OL20MP-OR-02 |
| | BLUE CREEK PARK | OL20MP-OR-03 |
| | CLERMONT PARK | OL20MP-OR-04 |
| | SPENCER CREEK COVE | OL20MP-OR-05 |
| | WINGANON RAMP | OL20MP-OR-06 |
| | BIG CREEK RAMP | OL20MP-OR-07 |
| | DOUBLE CREEK COVE | OL20MP-OR-08 |
| | SUNNYSIDE RAMP | OL20MP-OR-09 |
| | HAWTHORN BLUFF | OL20MP-OR-10 |
| | VERDIGRIS RIVER PARK | OL20MP-OR-11 |

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

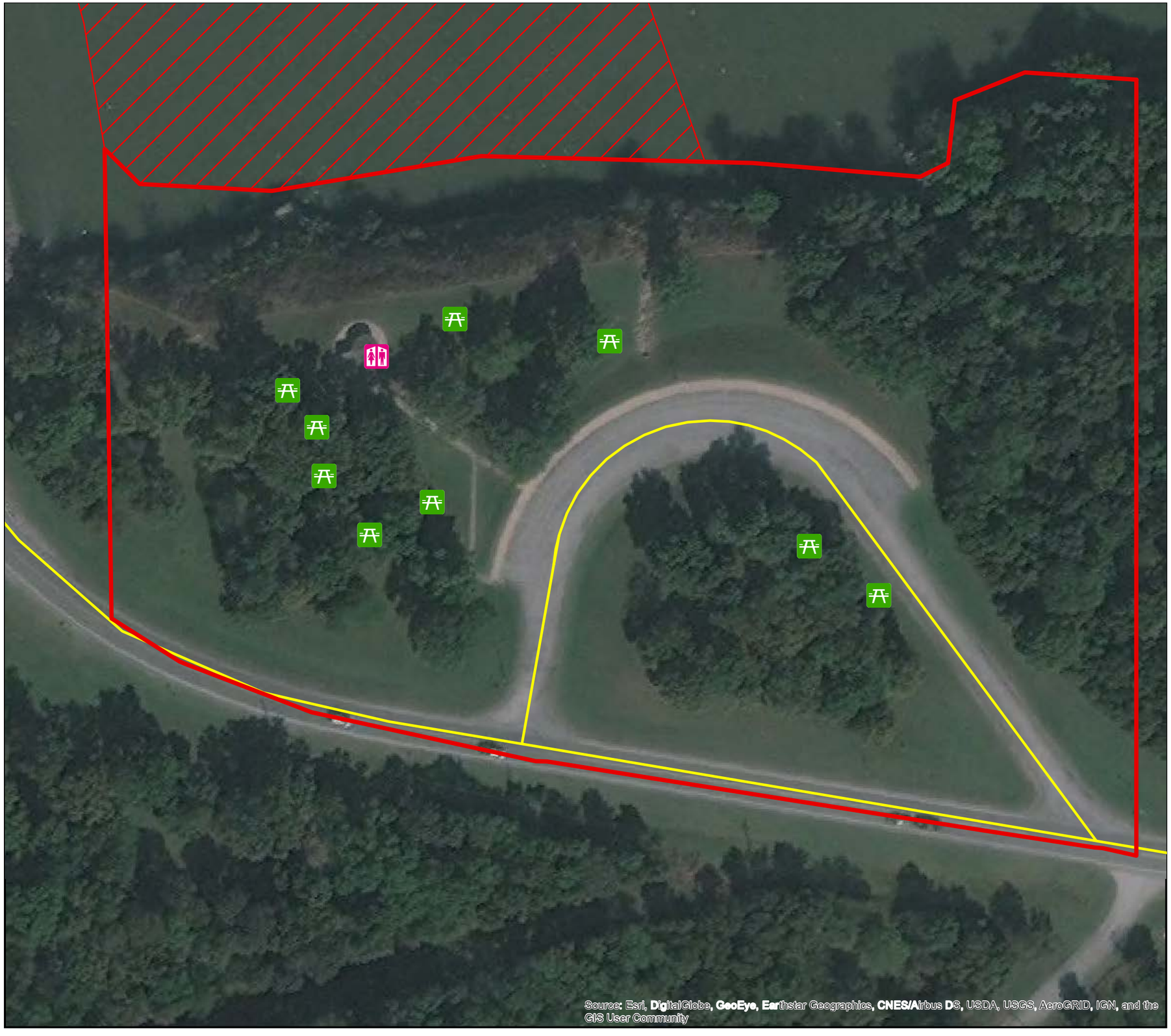
# OOLOGAH LAKE MASTER PLAN

## PARK PLATE INDEX

N

0 1 2 4 6 Miles

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-0B |




| ITEM | EXISTING |
|---|---|
| BOAT RAMP | |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | 9 |
| COMFORT STATION | |
| VAULT TOILET | |
| RESTROOMS | 1 |
| SHOWERS | |
| DUMP STATION | |

RESTROOM

PICNIC SITE

PARK LIMITS

WATER SURFACE: RESTRICTED

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (OVERLOOK)

N

0 50 100 150 200 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-01 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | 1 |
| GROUP CAMPSITES | |
| CAMPSITES | 42 |
| ELECTRICAL HOOK-UP | 42 |
| GROUP PICNIC SHELTER | 1 |
| PICNIC SITES | |
| VAULT TOILET | 1 |
| RESTROOMS | 1 |
| SHOWERS | 1 |
| DUMP STATION | |

BOAT RAMP

CAMPSITE

RESTROOM / SHOWER

COURTESY DOCK

GROUP PICNIC SHELTER

SELF PAY STATION

VAULT TOILET

PARK LIMITS

DESIGNATED NO WAKE AREA

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (REDBUD BAY AND MARINA)

N

0 130 260 390 520 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-02 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | 1 |
| GROUP CAMPSITES | |
| CAMPSITES | 56 |
| ELECTRICAL HOOK-UP | 24 |
| GROUP PICNIC SHELTER | 1 |
| PICNIC SITES | 4 |
| VAULT TOILET | 2 |
| RESTROOMS | 1 |
| SHOWERS | 1 |
| DUMP STATION | 1 |

- PICNIC SITE
- PLAYGROUND
- COURTESY DOCK
- BOAT RAMP
- ENTRANCE GATE
- CAMPSITE
- EQUESTRIAN PARKING
- GROUP PICNIC SHELTER
- RESTROOM / SHOWER
- SANITARY DUMP STATION
- VAULT TOILET
- PARK LIMITS
- DESIGNATED NO WAKE AREA
- FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (BLUE CREEK PARK)

N

0 200 400 600 800 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-03 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | 2 |
| VAULT TOILET | |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | |

BOAT RAMP

PICNIC SITE

PARK LIMITS

DESIGNATED NO WAKE AREA

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (CLERMONT PARK)

N

0 40 80 120 160 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-04 |


| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | 1 |
| GROUP CAMPSITES | |
| CAMPSITES | 69 |
| ELECTRICAL HOOK-UP | 30 |
| GROUP PICNIC SHELTER | 1 |
| PICNIC SITES | 11 |
| VAULT TOILET | 2 |
| RESTROOMS | 1 |
| SHOWERS | 1 |
| DUMP STATION | 1 |

COURTESY DOCK
PLAYGROUND
ENTRANCE GATE
BOAT RAMP
PICNIC SITE
CAMPSITE
TRAILHEAD
VAULT TOILET
RESTROOM / SHOWER
SANITARY DUMP STATION
SWIM BEACH
GROUP PICNIC SHELTER
PARK LIMITS
WATER SURFACE: RESTRICTED
DESIGNATED NO WAKE AREA
FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (SPENCER CREEK COVE)

N

0 300 600 900 1,200 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-05 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | |
| VAULT TOILET | |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | |

BOAT RAMP

PARK LIMITS

DESIGNATED NO WAKE AREA

FEE BOUNDARY

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (WINGANON RAMP)

N

0 100 200 300 400 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-06 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | 12 |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | |
| VAULT TOILET | 1 |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | |

BOAT RAMP

CAMPSITE

VAULT TOILET

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

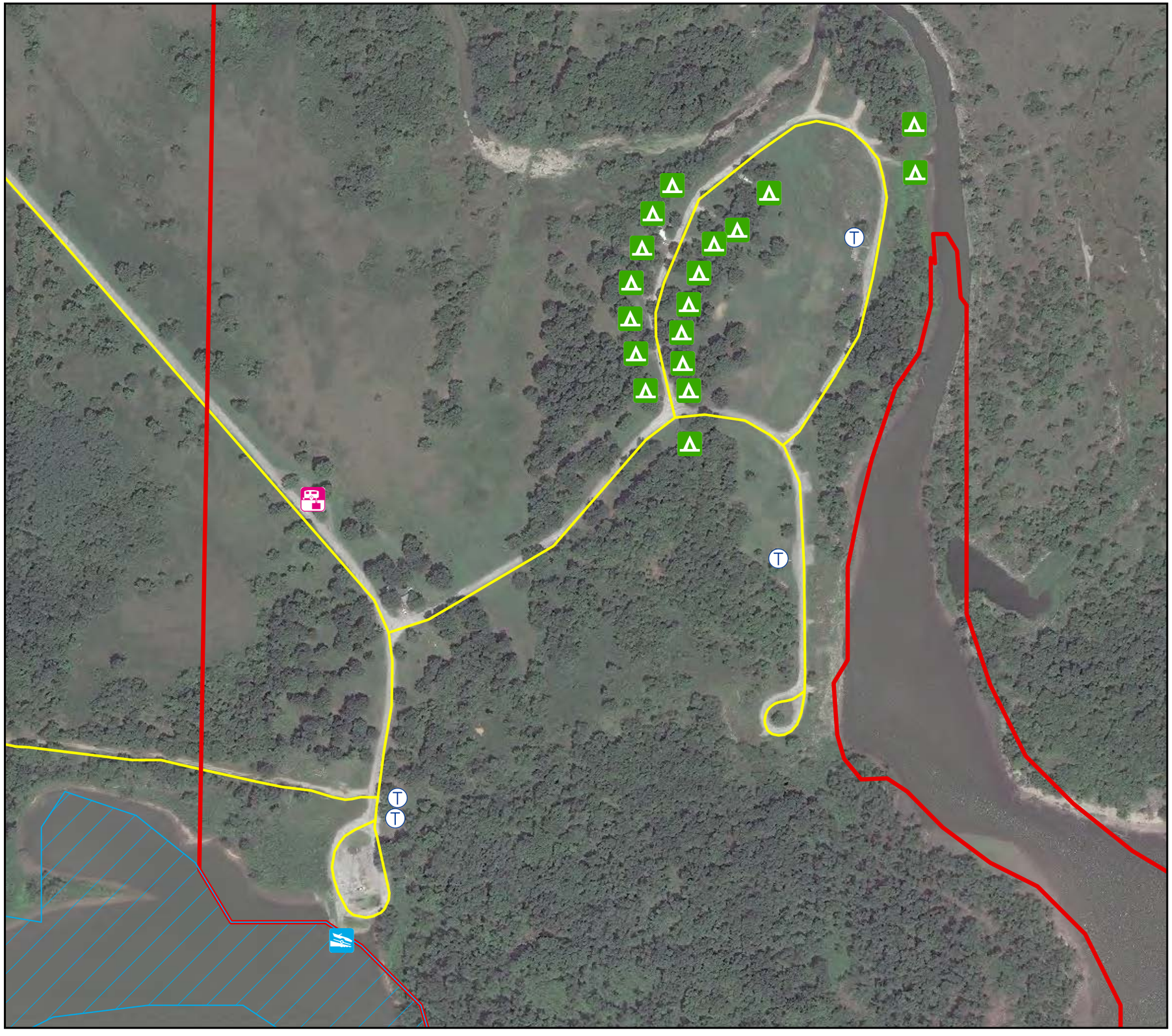
# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (BIG CREEK RAMP)

N

0 60 120 180 240 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-07 |



| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | 18 |
| ELECTRICAL HOOK-UP | 16 |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | |
| VAULT TOILET | 4 |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | 1 |

BOAT RAMP

CAMPSITE

SANITARY DUMP STATION

VAULT TOILET

PARK LIMITS

DESIGNATED NO WAKE AREA

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (DOUBLE CREEK COVE)

N

0 160 320 480 640 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-08 |

| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | |
| PICNIC SITES | |
| VAULT TOILET | |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | |

BOAT RAMP

DESIGNATED NO WAKE AREA

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

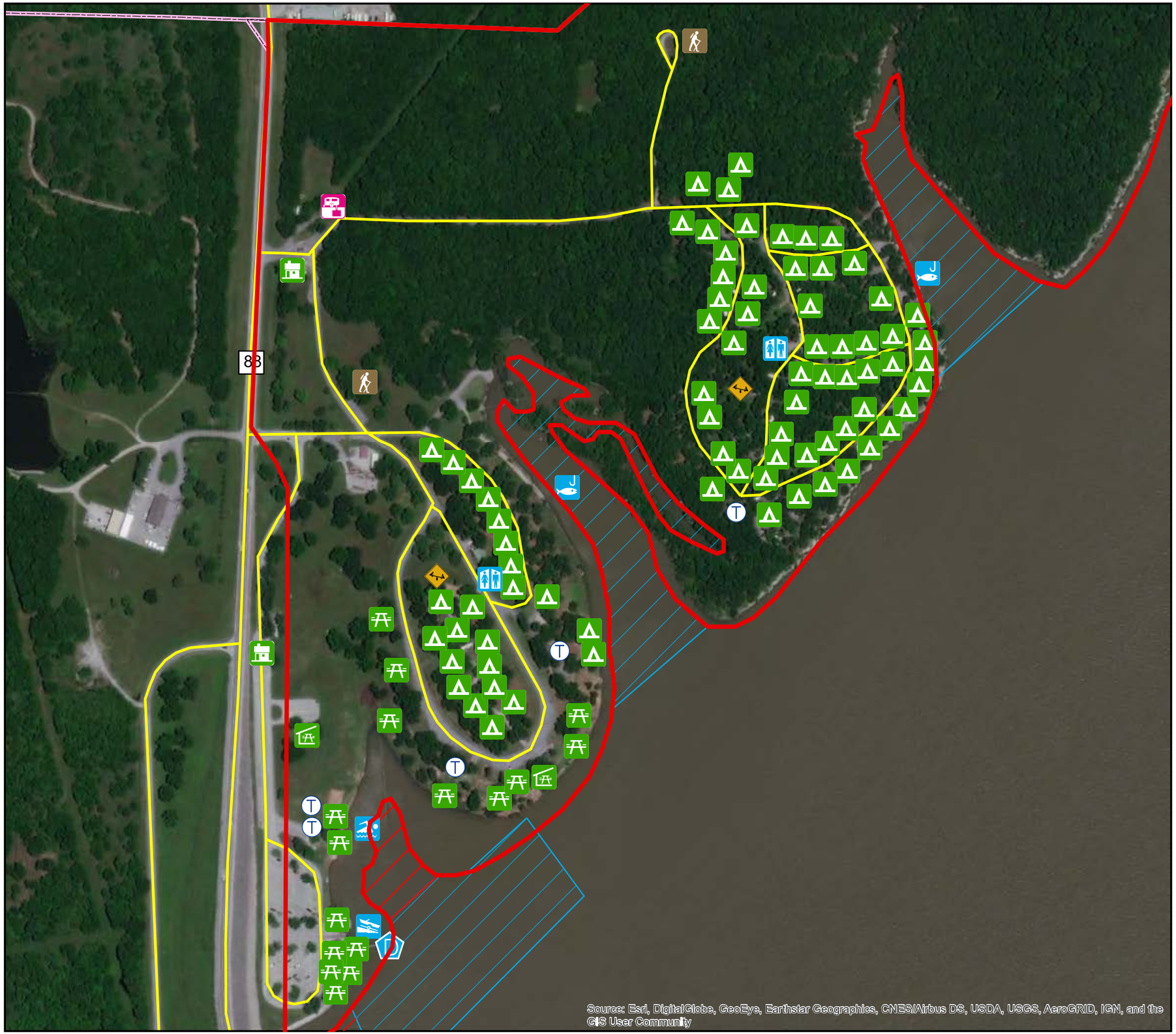
# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (SUNNYSIDE RAMP)

N

0 60 120 180 240 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-09 |




| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | 1 |
| GROUP CAMPSITES | |
| CAMPSITES | 93 |
| ELECTRICAL HOOK-UP | 67 |
| GROUP PICNIC SHELTER | 2 |
| PICNIC SITES | 16 |
| VAULT TOILET | 5 |
| RESTROOMS | 2 |
| SHOWERS | 2 |
| DUMP STATION | 1 |

PICNIC SITE
PLAYGROUND
TRAILHEAD
VAULT TOILET
GROUP PICNIC SHELTER
SANITARY DUMP STATION
RESTROOM / SHOWER
PARK LIMITS
WATER SURFACE: RESTRICTED
DESIGNATED NO WAKE AREA
FEE BOUNDARY

BOAT RAMP
CAMPSITE
COURTESY DOCK
ENTRANCE GATE
FISHING DOCK
SWIM BEACH

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

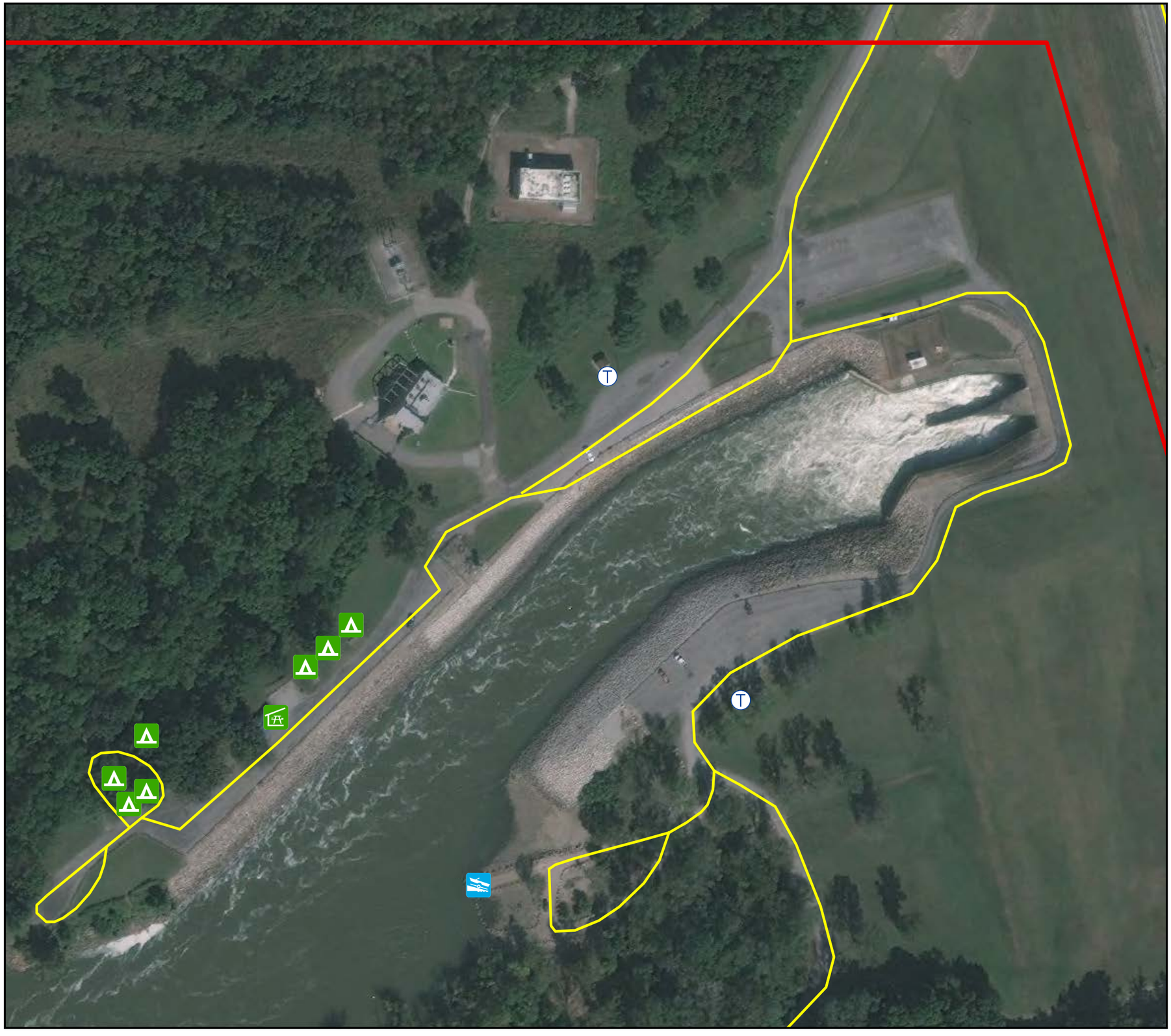
# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (HAWTHORN BLUFF)

N

0 230 460 690 920 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-10 |



| ITEM | EXISTING |
|---|---|
| BOAT RAMP | 1 |
| COURTESY DOCK | |
| GROUP CAMPSITES | |
| CAMPSITES | 7 |
| ELECTRICAL HOOK-UP | |
| GROUP PICNIC SHELTER | 1 |
| PICNIC SITES | |
| VAULT TOILET | 2 |
| RESTROOMS | |
| SHOWERS | |
| DUMP STATION | |

BOAT RAMP

CAMPSITE

GROUP PICNIC SHELTER

VAULT TOILET

PARK LIMITS

FEE BOUNDARY

**U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT**

OOLOGAH LAKE — VERDIGRIS RIVER, OKLAHOMA

# OOLOGAH LAKE MASTER PLAN

## RECREATIONAL AREAS (VERDIGRIS RIVER PARK)

N

0 75 150 225 300 Feet

| DATE: | MAP NO. |
|---|---|
| SEPTEMBER 2021 | OL20MP-OR-11 |

# APPENDIX B – NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTATION

Draft

# Environmental Assessment for the Oologah Lake Master Plan 2021

Arkansas River Basin: Verdigris Watershed
Rogers and Nowata Counties, Oklahoma

2021

US Army Corps of Engineers
Tulsa District

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## ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the potential environmental and socioeconomic impacts of the proposed 2021 Oologah Lake Master Plan revision. This EA will facilitate the decision process regarding the Proposed Action and alternatives.

| | |
|---|---|
| *SECTION 1* | *INTRODUCTION* of the Proposed Action summarizes the purpose of and need for the Proposed Action, provides relevant background information, and describes the scope of the EA. |
| *SECTION 2* | *PROPOSED ACTION AND ALTERNATIVES* examines alternatives for implementing the Proposed Action and describes the proposed alternative. |
| *SECTION 3* | *AFFECTED ENVIRONMENT* describes the existing environmental and socioeconomic setting.<br><br>*ENVIRONMENTAL CONSEQUENCES* identifies the potential environmental and socioeconomic effects of implementing the Proposed Action and alternatives.<br><br>*MITIGATION* summarizes mitigation actions required to enable a Finding of No Significant Impact for the Proposed Action. |
| *SECTION 4* | *CUMULATIVE IMPACTS* describes the impact on the environment that may result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions. |
| *SECTION 5* | *COMPLIANCE WITH ENVIRONMENTAL LAWS* provides a listing of environmental protection statutes and other environmental requirements. |
| *SECTION 6* | *IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES* identifies any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented. |
| *SECTION 7* | *PUBLIC AND AGENCY COORDINATION* provides a listing of individuals and agencies consulted during preparation of the EA. |
| *SECTION 8* | *REFERENCES* provides bibliographical information for cited sources. |
| *SECTION 9* | *ACRONYMS/ABBREVIATIONS* |
| *SECTION 10* | *LIST OF PREPARERS* identifies persons who prepared the document and their areas of expertise. |
| *ATTACHEMENT A* | National Environmental Policy Act (NEPA) Coordination and Scoping |

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## LIST OF ATTACHMENTS

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**Draft ENVIRONMENTAL ASSESSMENT**

**2021 Master Plan**

**Oologah Lake**
**Rogers and Nowata Counties, Oklahoma**

## SECTION 1:INTRODUCTION

This Environmental Assessment (EA) has been prepared by the U.S. Army Corps of Engineers (USACE) to evaluate the proposed 2021 Oologah Lake Master Plan (MP). A Master Plan is a programmatic document that is subject to evaluation under the National Environmental Policy Act (NEPA) of 1969, (Public Law [PL] 91-190). This EA is an assessment of potential impacts that could result with the implementation of either the No Action or Proposed Action and has been prepared in accordance with 33 Code of Federal Regulations (CFR) Part 230 and the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508), as reflected in the USACE Engineering Regulation, ER 200-2-2.

The MP is a strategic land use management plan that provides direction to the orderly development, administration, maintenance, preservation, enhancement, and management of all natural, cultural and recreational resources of a USACE water resource project, which includes all government-owned lands in and around a reservoir. It is a vital tool for responsible stewardship and sustainability of the project's natural and cultural resources, as well as the provision of outdoor recreation facilities and opportunities on Federal lands associated with Oologah Lake for the benefit of present and future generations. The MP identifies conceptual types and levels of activities, but does not include designs, project sites, or estimated costs. All actions carried out by USACE, other agencies, and individuals granted leases to USACE lands must be consistent with the MP. Therefore, the MP must be kept current in order to provide effective guidance in USACE decision-making. The original Oologah Lake MP was approved at an unknown date but was revised in 1959, which was then revised in 1968, and the last revision occurring in 1977.

### 1.1 PROJECT DESCRIPTION

Oologah Lake Dam is located at river mile (RM) 90.2 on the Verdigris River. The dam site is located in Rogers County, in northern Oklahoma. The lake extends from Nowata to Oologah, Oklahoma (Figure 1-1). Oologah Lake is located in the Verdigris Watershed in the Arkansas River Basin. The Arkansas River Basin is roughly elliptical in shape, with a total area of 8,303 square miles, of which 4,339 square miles are above the Oologah Dam and is divided as follows: 3,354 square miles in Kansas and 985 square miles in Oklahoma. The principal tributaries are the Fall and Elk Rivers that enter from the right bank in Kansas and the Caney River and Bird Creeks that enter from the right bank in Oklahoma downstream from Oologah Dam. The Verdigris River navigation system extends from the Arkansas River upstream about 50 miles to the Tulsa-Rogers County Port of Catoosa. Considerable channel widening and

straightening along with construction of Newt Graham and Chouteau Locks and Dams have improved the water carrying capability of the channel considerably. The valley floor varies from approximate elevation 510.0 near its confluence with the Arkansas River and the mouth of the main stem to approximate elevation 1000.0 in the upper reaches of the basin. The slope of the river near its source averages about 3.7 feet per mile and the navigation channel has a total rise of 42 feet in 50 miles.

The greater portion of the Verdigris River watershed is an undulating plain; however, the western boundary, formed by the Flint Hills in Kansas and the Osage Hills in Oklahoma, is rough and broken, with elevations rising to 1,600 feet, NGVD. The valley side slopes are relatively steep, with most of the valley proper in cultivation or pasture land. Wooded areas are prevalent along the channel and in the river bottom in the lower reaches of the stream. The channel is well defined, but winds and contains many sharp bends in its course through the valley.

Oologah Lake was authorized on June 28, 1938 with the primary missions of flood control and navigation as contained in the Flood Control Act of 1938 (Public Law [PL] 761, 76th Congress, 3d Session, and development was later authorized by the Rivers and Harbor Act of 24 July 1946 (PL 525, 79th Congress, 2d Session). Construction was performed in two stages. The first stage began in July 1950 on the main embankment and outlet works, an uncontrolled saddle spillway at the site of the final gated spillway, and an emergency overflow area at the site of the final dike embankment. Construction was placed on standby in October 1951 and resumed December 1955 on the gated spillway and dike embankment. The conservation pool was filled 29 July 1972.

Oologah Dam and Lake Project is an integral part of the USACE plan for flood control and water conservation in the Arkansas River Basin. The plan presently consists of thirty four major flood control projects, known as Great Salt Plains Dam, Heyburn Dam, Toronto Dam, Fall River Dam, Elk City Dam, Hulah Dam, Pensacola Dam, Markham Ferry Dam (Lake Hudson), Fort Gibson Dam, Birch Dam, Tenkiller Dam, Fort Supply Dam, Optima Dam, Canton Dam, Wister Dam, Big Hill Dam, Keystone Dam, Eufaula Dam, Council Grove Dam, Marion Dam, John Redmond Dam, Norman Dam, Sanford Dam, Cheney Dam, Kaw Dam, El Dorado Dam, Copan Dam, Skiatook Dam, Arcadia Dam, W.D. Mayo Lock Dam, Robert S. Kerr Lock and Dam Reservoir, Webbers Falls Lock and Dam, Chouteau Lock and Dam, and Newt Graham Lock and Dam. Oologah Lake controls 4,339 square miles of drainage area, 1,986 square miles of which are controlled by upstream reservoirs.

## 1.2 PURPOSE OF AND NEED FOR THE ACTION

The purpose of the Proposed Action is to ensure that the conservation and sustainability of the land, water, and recreational resources on Oologah Lake are in compliance with applicable environmental laws and regulations and to maintain quality lands for future public use. The proposed MP is intended to serve as a comprehensive land and recreation management plan with an effective life of approximately 25 years.

The MP must be kept current in order to provide effective guidance in decision-making that responds to changing regional and local needs, resource capabilities and

suitabilities, and expressed public interests consistent with authorized project purposes and pertinent legislation and regulations. The current Oologah Lake MP is over 40 years old and does not currently reflect ecological, socio-political, and socio-demographic changes that are currently affecting Oologah Lake, or those changes anticipated to occur through 2047. Changes in outdoor recreation trends, regional land use, population, current legislative requirements and USACE management policy have indicated the need to revise the plan. Additionally, increasing fragmentation of wildlife habitat, national policies related to climate change and growing demand for recreational access and protection of natural resources are all factors affecting Oologah Lake and project's region in general. In response to these continually evolving trends, the USACE determined that a full revision of the 1977 plan is needed.

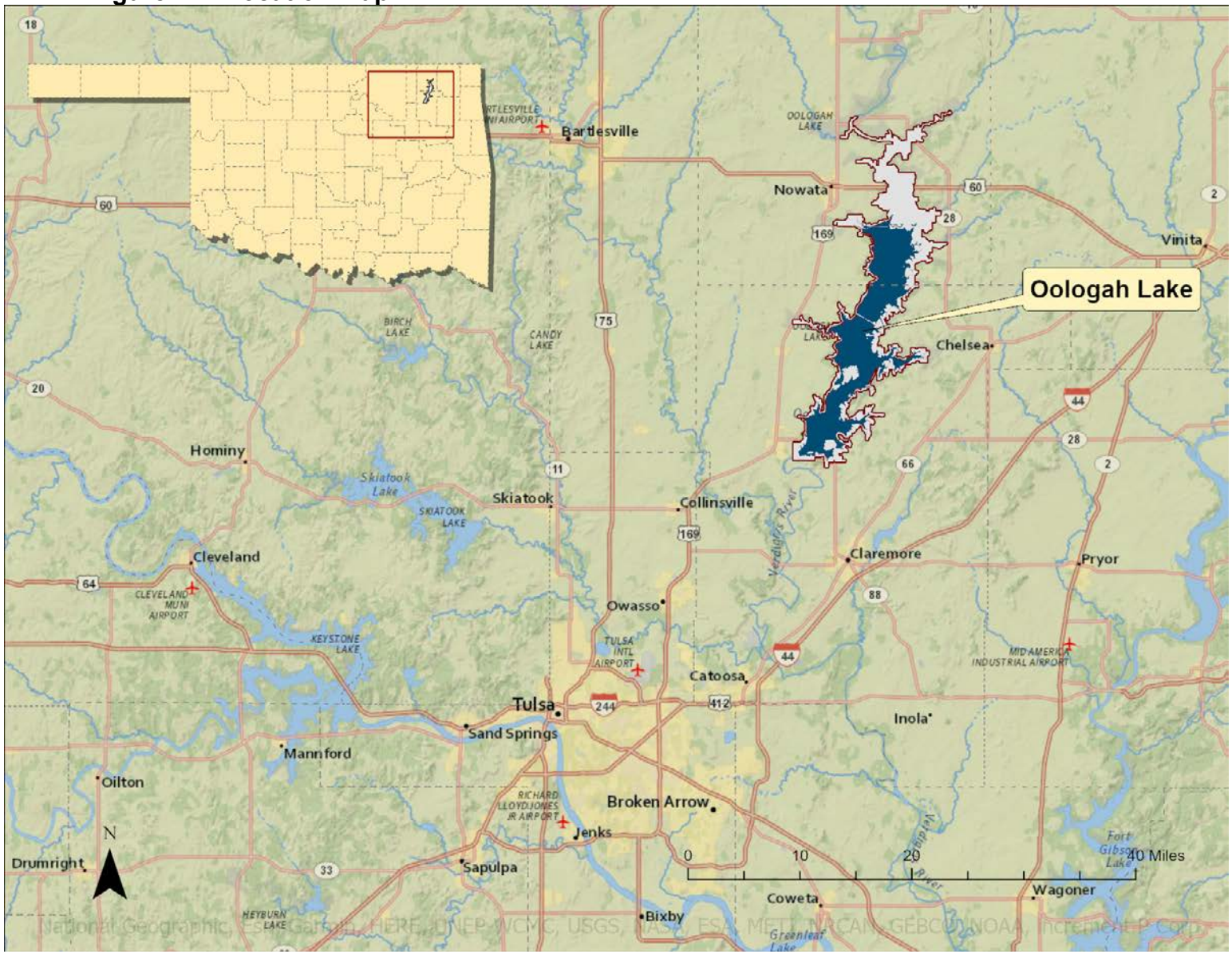
The following factors may influence reevaluation of management practices and land uses:

- Changes in national policies or public law mandates;
- Operations and maintenance budget allocations;
- Recreation area closures;
- Facility and infrastructure improvements;
- Cooperative agreements with stakeholder agencies (such as Oklahoma Department of Wildlife Conservation (ODWC) and the U.S. Fish and Wildlife Service [USFWS]) to operate and maintain public lands; and
- Evolving public concerns.

## 1.3 SCOPE OF THE ACTION

This EA was prepared to evaluate existing conditions and potential impacts of proposed alternatives associated with the implementation of the proposed Master Plan (MP). The alternative considerations were formulated with special attention given to revised land classifications, new resource management objectives, and a conceptual resource plan for each land classification category. The proposed MP is currently available and is incorporated into this EA by reference. This EA was prepared pursuant to the National Environmental Policy Act (NEPA).

**Figure 1-1. Location Map**



The application of NEPA to more strategic decisions not only meets the Council on Environmental Quality (CEQ) implementing regulations (CEQ 2005) and USACE regulations for implementing NEPA (USACE 1988), but also allows the USACE to consider the environmental consequences of its actions long before any physical activity is implemented. Multiple benefits can be derived from such early consideration. Effective and early NEPA integration with the master planning process can significantly increase the usefulness of the proposed MP to the decision maker.

## SECTION 2:PROPOSED ACTION AND ALTERNATIVES

The purpose and need of the proposed action is to revise the 1977 Master Plan so that it is compliant with current USACE regulations and guidance, incorporates public needs, and recognizes surrounding land use and recreational trends. As part of this process, which includes public outreach and comment, two alternatives were developed for evaluation, including a No Action Alternative and a Proposed Action Alternative. The alternatives were developed using land classifications that indicate the primary use for which project lands would be managed. USACE regulations specify five possible categories of land classification: Project Operations (PO), High Density Recreation (HDR), Mitigation, Environmentally Sensitive Areas (ESA), and Multiple Resource Managed Lands (MRML). MRML are divided into four subcategories: Low Density Recreation (MRML-LDR), Wildlife Management (MRML-WM), Vegetation Management (MRML-VM), and Inactive/Future Recreation (MRML-IFR) Areas.

USACE guidance recommends the establishment of resource goals and objectives for purposes of development, conservation, and management of natural, cultural, and man-made resources at a project. Goals describe the desired end state of overall management efforts, whereas resource objectives are specific task-oriented actions necessary to achieve the overall proposed Master Plan goals. Goals and objectives are guidelines for obtaining maximum public benefits while minimizing adverse impacts on the environment and are developed in accordance with 1) authorized project purposes, 2) applicable laws and regulations; 3) resource capabilities and suitabilities; 4) regional needs; 5) other governmental plans and programs; and 6) expressed public desires. The five project-wide management goals established for Oologah Lake that were used in determining the Proposed Action, as well as the nationwide USACE Environmental Operating Principles, are discussed in detail Chapter 3: Resource Goals and Objectives of the proposed 2021 Master Plan and are incorporated herein by reference (USACE, 2021).

The goals for Oologah Lake Master Plan include the following:

**GOAL A**. Provide the best management practices to respond to regional needs, resource capabilities and capacities, and expressed public interests consistent with authorized project purposes.

**GOAL B**. Protect and manage project natural and cultural resources through sustainable environmental stewardship programs.

**GOAL C**. Provide public outdoor recreation opportunities that support project purposes and public interests while sustaining project natural resources.

**GOAL D**. Recognize the unique qualities, characteristics, and potentials of the project.

**GOAL E**. Provide consistency and compatibility with national objectives and other State and regional goals and programs.

In addition to the above goals, USACE management activities are guided by USACE-wide Environmental Operating Principles as follows:

- Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.
- Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances.
- Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.
- Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
- Seek ways and means to assess and mitigate cumulative impacts to the environment; bringing systems approaches to the full life cycle of our processes and work.
- Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.
- Respect the views of individuals and groups interested in USACE activities; listen to them actively and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment.

Specific resource objectives to accomplish these goals can be found in Chapter 3 of the proposed MP.

USACE will not address dam operations or water management of Oologah Lake under either the No Action or Proposed Action alternatives. Water management, which includes flood risk management and dam operations, is established in the Water Control Master Manual Arkansas River Basin and the Oologah Lake Water Control Manual.

## 2.1 ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the USACE would not approve the adoption or implementation of the proposed MP. Instead the USACE would continue to manage Oologah Lake's natural resources as set forth in the 1977 MP. The 1977 Master Plan would continue to provide the only source of comprehensive management guidelines and philosophy. However, the 1977 Master Plan is out of date and does not reflect the current ecological, socio-political, or socio-demographic conditions of Oologah Lake or those that are anticipated to occur through 2047.

The No Action Alternative, while it does not meet the purpose and need, serves as a benchmark of existing conditions against which Federal actions can be evaluated, and, therefore, is included in this EA pursuant to CEQ regulations 40 CFR § 1502.14(d)).

## 2.2 ALTERNATIVE 2: PROPOSED ACTION

Under the Proposed Action, the USACE proposes to adopt and implement the proposed MP, which guides and articulates USACE responsibilities pursuant to Federal laws to preserve, conserve, restore, maintain, manage, and develop the land, water, and associated resources. The proposed MP would replace the 1977 MP and provide an up-to-date management plan that follows current Federal laws and regulations while sustaining the project's natural resources and providing recreational opportunities for the next 25 years. The Proposed Action would meet regional goals associated with good stewardship of land, water, and recreational resources; address identified recreational trends; and allow for continued use and development of project lands without violating national policies or pubic laws.

The proposed MP proposes to classify all Federal land lying above elevation 638.0 NGVD29 into management classification categories. These management classification categories would allow uses of Federal property that meet the definition of the assigned category and ensure the protection of natural resources and environmental stewardship while allowing maximum public enjoyment of the lake's resources.

The proposed land classification categories are defined as follows:

- Project Operations: Lands required for the dam, spillway, switchyard, levees, dikes, offices, maintenance facilities, and other areas used solely for the operation of Oologah Lake.
- High Density Recreation: Lands developed for the intensive recreational activities for the visiting public including day use and campgrounds. These areas could also be for commercial concessions and quasi-public development.
- Environmentally Sensitive Areas: Areas where scientific, ecological, cultural, or aesthetic features have been identified.
- Multiple Resource Management Lands (MRML): Allows for the designation of a predominate use with the understanding that other compatible uses may also occur on these lands.
    - MRML Wildlife Management: Lands designated for stewardship of fish and wildlife resources.

- Surface Water: Allows for surface water zones.
    - Restricted: Water areas restricted for Oologah Lake operations, safety, and security.
    - Designated No-Wake: Water areas to protect environmentally sensitive shoreline areas and recreational water access areas from disturbance and areas to protect public safety.
    - Open Recreation: Water areas available for year-round or seasonal water-based recreational use.

Table 2-1 shows the proposed classifications and acres contained in each classification, Table 2-2 shows the water surface classifications, and Table 2-3 provides the justification for the proposed reclassification.

**Table 2-1 Change from Prior Land Classification to Proposed Land Classification**

| Prior Land Classifications (1977 Plan) | Acres | | Proposed Land Classifications | Acres |
|---|---|---|---|---|
| **Operations and Maintenance** | 329 | | Project Operations | 413 |
| **Recreational Areas** | 2,345 | | High Density Recreation | 1,699 |
| **–** | | | Environmentally Sensitive Areas | 7,587 |
| **Wildlife Management USACE Managed** | 4,090 | | Multiple Resource Management – Wildlife Management | 12,317 |
| **Wildlife Management Oklahoma Managed** | 15,253 | | – | – |
| **Total Land Acres** | **22,017** | | **Total Land Acres** | **22,016** |

*Total Acreage differences from the 1977 total to the 2020 totals are due to improvements in measurement technology, deposition/siltation, and erosion.

**Table 2-2 Change from Prior Water Surface Classification to New Water Surface Classification**

| Prior Water Surface Classifications (1977 Plan) | Acres | | Proposed Water Surface Classifications | Acres |
|---|---|---|---|---|
| **Permanent Pool** | 28,133 | | Permanent Pool | 28,274 |
| **–** | – | | – Restricted | 23 |
| **–** | – | | – Designated No Wake | 288 |
| **–** | – | | – Open Recreation | 27,963 |
| **Flowage Easement** | 15,119 | | Flowage Easement | 16,056 |

**Table 2-3 Reclassification Proposals**

| Proposal | Acres | Justification |
|---|---|---|
| **From Recreational Area to Environmentally Sensitive Area** | 77 | Significant historic and cultural sites are located within the ESA, and this portion did not contain areas which would be designated as High Density Recreation. |
| **From Recreational Area to Wildlife Management Area** | 845 | These areas are not currently used for High Density Recreation and includes hunting and wildlife management, and some areas also contain less sensitive historic or cultural sites which should not be developed into HDR. |
| **From State Wildlife Management to Environmentally Sensitive Area** | 6,990 | These areas have historically been managed by the state for wildlife management including hunting and food plots. However, due to the presence of sensitive historic or cultural sites, these areas have been designated as ESAs. Hunting and other wildlife management practices can be performed within an ESA as long as they do not disturb the protected resources. Within an ESA, the protected resources including sensitive natural or cultural resources must be prioritized to any other function. |
| **From State Wildlife Management to Wildlife Management Area** | 8,263 | This change was to reflect current land classification since the current WM land classification does not account for managing entity. Areas managed by the state for wildlife management will not change due to this land classification change. |
| **From USACE Wildlife Management to Environmentally Sensitive Area** | 521 | These areas have historically been managed by USACE for wildlife management including hunting and food plots. However, due to the presence of sensitive historic or cultural sites, these areas have been designated as ESAs. Hunting and other wildlife management practices can be performed within an ESA as long as they do not disturb the protected resources. Within an ESA, the protected resources including sensitive natural or cultural resources must be prioritized to any other function. |
| **From USACE Wildlife Management to High Density Recreation** | 279 | These areas have been included in recreational leases, are currently being used as recreation, or are adjacent to current recreation areas, and have changed to reflect the current usage. |

| | | |
|---|---|---|
| **From USACE Wildlife Management to Project Operations** | 85 | A small portion of land currently being used for Project Operations has been changed to reflect current usage. Recreation and wildlife management activities can occur where permitted, but project operations and maintenance take priority to other incidental usage. |
| **From USACE Wildlife Management to Wildlife Management** | 3,209 | This change was to reflect current land classification since the current WM land classification does not account for managing entity. Areas managed by USACE for wildlife management will not change due to this land classification change. |
| **Water Surface Changes** | 311 | The 1977 Plan did not designate any of the water surface with any classification or designation. This Plan proposes to designate approximately 23 acres of water surface as Restricted. Furthermore, the Plan proposes to designate approximately 288 acres as No-Wake Areas for a total of 311 acres with changes.<br><br>The Restricted water surface at Oologah Lake includes the area around the intake gate control tower near the dam, around the water intake structures, just below the dam, upstream of the controlled spillway, and small areas around designated swimming beaches. Future management calls for one or more of the following management measures: placement of buoys; placement of signs near boat ramps; and describing the areas on maps available to the public.<br><br>Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve visitor safety near key recreation water access areas such as boat ramps, swim beaches, and marinas. The following measures to be taken in No-wake Areas: placement of buoys, placement of signs near boat ramps, and describing the areas on maps available to the public. |

**Note:** The land classification changes described in this table are the result of changes to individual parcels of land ranging from a few acres to more than 100 acres. Acreages were measured using GIS technology. The acreage numbers provided are approximate.

## 2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

Other alternatives to the Proposed Action were initially considered as part of the scoping process for this EA. However, none met the purpose of and need for the Proposed Action or the current USACE regulations and guidance. Furthermore, no other alternatives addressed public concerns. Therefore, no other alternatives are being carried forward for analysis in this EA. The following resources were excluded from further impact analysis because the No Action nor the Proposed Action would not have any impact on them: hazardous, toxic, and radioactive waste.

## SECTION 3:AFFECTED ENVIRONMENT AND CONSEQUENCES

This section of the EA describes the potential impacts of the No Action and Proposed Action alternatives, outlined in Section 2 of this document. For descriptions of existing conditions of various resources within the USACE Oologah Fee Boundary please refer to Chapter 2 of the proposed MP. Based on resources described in the proposed MP Ch. 2, each resource with potential to be impacted as a result of the No Action alternative or by the Proposed Alternative is evaluated below.

Impacts (consequence or effect) can be either beneficial or adverse and can be either directly related to the action or indirectly caused by the action. Direct effects are caused by the action and occur at the same time and place (40 CFR § 1508.8 [a]). Indirect effects are caused by the action and are later in time or further removed in distance but are still reasonably foreseeable (40 CFR § 1508.8 [b]). As discussed in this section, the alternatives may create temporary (less than 1 year), short-term (up to 3 years), long-term (3 to 10 years following the master plan revision), or permanent effects.

Whether an impact is significant depends on the context in which the impact occurs and the intensity of the impact (40 CFR § 1508.27). The context refers to the setting in which the impact occurs and may include society as a whole, the affected region, the affected interests, and the locality. Impacts on each resource can vary in degree or magnitude from a slightly noticeable change to a total change in the environment. For the purpose of this analysis, the intensity of impacts would be classified as negligible, minor, moderate, or major. The intensity thresholds are defined as follows:

- Negligible: A resource would not be affected or the effects would be at or below the level of detection, and changes would not be of any measurable or perceptible consequence.
- Minor: Effects on a resource would be detectable, although the effects would be localized, small, and of little consequence to the sustainability of the resource. Mitigation measures, if needed to offset adverse effects, would be simple and achievable.
- Moderate: Effects on a resource would be readily detectable, long-term, localized, and measurable. Mitigation measures, if needed to offset adverse effects, would be extensive and likely achievable.
- Major: Effects on a resource would be obvious and long-term, and would have substantial consequences on a regional scale. Mitigation measures to offset the adverse effects would be required and extensive, and success of the mitigation measures would not be guaranteed.

### 3.1 Land Use

Please refer to sections 2.16 and 2.17 of the proposed Oologah Lake MP for existing land use information in and around Oologah Lake.

### 3.1.1 Alternative 1: No Action

Under the No Action Alternative, USACE will not implement the proposed MP, and thus the land use management will not be updated to current needs and demands. The operation and maintenance of USACE lands at Oologah Lake will continue as outlined in the existing MP to the existent that current and future laws and regulations will permit. Management will continue to lag behind the current and future recreational needs and public preferences. As the regulatory environment continues to change, management at Oologah Lake will diverge from the plan. This divergence will create a patchwork of management requirements that will be inefficient for Oologah Lake staff to implement. The management will also increasingly lack transparency to the public, or alternately create more of a burden to staff to communicate how the lake management differs from that in the existing MP. Implementation of the No Action Alternative will have moderate, adverse, short and long term impacts on land use within and on USACE Oologah Lake project lands due to conflicting guidance and management of USACE lands.

### 3.1.2 Alternative 2: Proposed Action

The objectives for revising the Oologah Lake MP were to describe current and foreseeable land uses, taking into account expressed public opinion, regional trends, and USACE policies that have evolved to meet day-to-day operational needs. The proposed reclassifications in the proposed MP were developed to help fulfill regional goals associated with good stewardship of land and water resources that will allow for continued use and development of project lands.

While HDR is technically a new management classification, the bulk of the proposed 1,699 acres of HDR land is from areas previously classified as recreational area. Even though the acres are decreasing from 2,345 acres, recreational opportunities will not decrease. The change in acreages reflects current and foreseeable recreational trends for the area.

HDR is not the only new management classification introduced in the proposed MP. The establishment and reclassification of 7,587 acres as ESA would allow for greater protection of sensitive habitats, cultural resources, and aesthetic resources. Even though Wildlife Management is losing 7,511 acres to ESA, acres for hunting,fishing and other wildlife activities will remain the same because these activities can still be done within ESA areas.

On the waters of Oologah Lake, the proposed MP will add established surface water use categories in addition to the current ad hoc management of the lake. The proposed establishment of 23 acres as Restricted, 288 acres as No Wake, and 27,963 acres as Open Recreation to the water surface, respectively, will allow for delineated, and safer management of the lake's waters when the lake is at conservation pool. These classifications will help to improve safety of those recreating on and around Oologah Lake. This will be done by restricting boat access and speeds around certain parts of the lake, as well as establishing areas that boating can occur in. The Oologah Lake office will still maintain the authority to make ad hoc adjustments as needed by lake level, which will prevent the proposed classifications from being overly rigid or even ineffectual in various lake level conditions.

The current and foreseeable land use demand and patterns for Oologah Lake does not entail the need of utility corridors, which the proposed MP would not have any. However, if such a need would arise, current USACE policy dictates that all utilities must go around USACE property unless no other feasible alternative exists. If there is no feasible alternative that exists then the utility must go through the NEPA permitting process prior to approval and implementation.

The majority of the land use classifications in the proposed MP will maintain the functional management that is currently occurring. While the terminology updates appear substantial, they have been proposed after considerable public input, and seek to maintain the values the public holds highest at Oologah Lake. Additionally, the land reclassifications provide a balance between public use, both intensive and passive, and natural resources conservation. Therefore, the implementation of the Proposed Action will have moderate, long-term beneficial impacts to land use on fee-owned property at Oologah Lake, as the proposed land classes, goals, and objectives further refine areas for appropriate activities.

## 3.2 WATER RESOURCES

Please refer to section 2.6 of the proposed Oologah Lake MP for existing water resource information in and around Oologah Lake.

### 3.2.1 Alternative 1: No Action

There would be no impacts on water resources as a result of implementing the No Action Alternative, since there would be no change to the existing Master Plan. There are no known water resource related problems that the 1977 MP are helping to increase nor maintain.

### 3.2.2 Alternative 2: Proposed Action

The reclassifications and resource management objectives required for implementing the proposed MP will allow land management and land uses to be adjusted for current and reasonably foreseeable future changes in water resources. This can be seen in how the goals and objectives makes it mandatory that all decision making processes take into consideration their impacts on Oologah Lake flood/conservation pool levels. The land proposed land reclassifications takes into consideration of water resources even further by the establishment of 7,587 acres to ESA lands would help stabilize soils through the promotion of and restoration of native habitat. In turn, the habitat would help buffer and filter storm runoff before making its way into the lake. Minor, beneficial impacts to water quality may be realized during storm events as the natural areas may help reduce erosion and subsequent water turbidity. The establishment of 7,587 acres as ESA lands would not result any loss of upland areas and wetlands from erosion and sedimentation. That is because 7,511 of those acres are coming from areas already designated as wildlife management, whose vary nature already helps to protect those lands from erosion and sedimentation.

Additionally, 288 acres of surface waters are proposed to be classified as

designated No Wake. These areas are near shorelines where wave action can increase erosion. This proposed Designated No Wake classification would be expected to help prevent further erosion and further reduce water turbidity.

Therefore implementation of the proposed MP will have negligible positive short and long term impacts on water resources within and on USACE project lands.

## 3.3 CLIMATE, CLIMATE CHANGE AND GHG

Please refer to section 2.2 and 2.3 of the proposed Oologah Lake MP for existing climate, climate change and greenhouse gas (GHG) information in and around Oologah Lake.

### 3.3.1 No Action

The No Action Alternative would not result in any change in management of Oologah Lake project land. Implementation of the 1977 MP would have no impact (beneficial or adverse) on existing or future climate, climate change, and greenhouse gas (GHG) conditions. Current policy (Executive Orders [EO] 3834 and 13783, and related USACE policy) requires project lands and recreational programs be managed in a way that advances broad national climate change mitigation goals including, but not limited to, climate change resilience and carbon sequestration. These policies would continue to be implemented under this Alternative which are not addressed in the 1977 MP goals and objectives, which is further proof of the 1977 MP inability to meet current laws and regulations.

### 3.3.2 Proposed Action

The proposed MP would have negligible positive impacts to climate, climate change and GHG emissions in the region. The impacts would come from the MP promotion of land management practices and design standards that promote sustainability. Management under the proposed MP would also follow current policy to meet climate change goals as described for the No Action Alternative. Ground disturbing activities that arise from guidance from this document would go through the NEPA and design process prior to implementation. It is during that time that impacts to the climate would be analyzed for those ground disturbing activities. These actions would have negligible impacts on climate, climate change, and GHG.

## 3.4 AIR QUALITY

Please refer to section 2.4 of the proposed Oologah Lake MP for existing air quality information in and around Oologah Lake.

### 3.4.1 Alternative 1: No Action

The continual implementation of the 1977 MP will not result in any changes to current and reasonably foreseeable future air quality in the region. No new increase in vehicular traffic, mass permanent vegetation removal, or the building of mass industrial facilities occur. The No Action Alternative will remain compliant with the Clean Air Act

because the MP includes only guidelines and does not incorporate actions which produce criteria pollutants as explained in the previous sentence.

### 3.4.2 Alternative 2: Proposed Action

As with the No Action Alternative, the proposed MP will not result in any change to current and reasonably foreseeable air quality in the region. The Proposed Action does not propose any actions (i.e. ground disturbing activities) that directly or indirectly produce criteria pollutants (i.e. total emissions is 0); therefore, this action is compliant with the Clean Air Act and State Implementation Plan and is not subject to a conformity determination. Negligible air quality benefits may be realized through the proposed reclassification of 7,511 acres from wildlife management to ESA lands, and keeping 12,317 acres as MRML-WM lands. These areas contain natural vegetation communities that filter and sequester air pollutants.

## 3.5 TOPOGRAPHY, GEOLOGY, AND SOILS

Please refer to section 2.5 of the proposed Oologah Lake MP for existing topography, geology, and soils information in and around Oologah Lake.

### 3.5.1 Alternative 1: No Action

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions, so there would be no short- or long-term, minor, moderate, or major, beneficial, or adverse impacts on topography, geology, soils, or prime farmland as a result of implementing the No Action Alternative.

### 3.5.2 Alternative 2: Proposed Action

The proposed MP takes into consideration the various topographical, geological, and soils aspects of USACE Oologah Lake project lands in making land class changes, developing and implementing various goals and objectives. An example how the MP takes topography, geology, and soils into consideration is the reduction of HDR land (2,345 acres to 1,699 acres)to other land classes like ESA & MRML-WM. These land reclassifications will help to increase the long term preservation and stabilization of the soils within USACE Oologah Lake project lands. The establishment of 7,587 acres as ESA lands would not result any change to topographical, geological, and soils from erosion and sedimentation. That is because 7,511 of those acres are coming from areas already designated as wildlife management, whose vary nature already helps to protect those lands from erosion and sedimentation. Since it is not forecasted that there will not be a need for the establishment of utility corridors because of the lack of demand, not establishing the corridors will not have any impact on soil erosion as a result of soil exposure which would lead to erosive wind and water forces. The establishment of ESA, MRML-WM land classes as well as the implementation of resource objectives and goals discussed in Chapter 3 of the proposed MP and the rest of the proposed action would have minor, positive, long-term impacts on soil conservation, topography, and geology at Oologah Lake.

## 3.6 NATURAL RESOURCES

Please refer to section 2.9 of the proposed Oologah Lake MP for existing natural resources information in and around Oologah Lake.

### 3.6.1 Alternative 1: No Action

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions; therefore, no short- or long-term, major, moderate, or minor, beneficial, or adverse impacts on natural resources would be anticipated as a result of implementing the No Action Alternative.

### 3.6.2 Alternative 2: Proposed Action

The implementation of the reclassifications of land management classes, improvement of resource management objectives, and the overall improvement of the proposed MP will allow natural resources within USACE Oologah federal project lands to be better managed and accounted for. The better management will be from implementing the knowledge gained from the Wildlife Habitat Appraisal Procedure (WHAP) (Appendix C of the proposed MP) done for Oologah Lake, which helps to identify the high quality and unique areas. The implementation of proposed land reclassifications will allow project lands to continue and further support the USFWS and the ODWC missions associated with wildlife conservation and implementation of operational practices that will protect and enhance wildlife and fishery populations and habitat. The new resource objectives also allow for natural resources to be managed with consideration of how they will be impacted from the retention of flood waters. The conversion of 922 acres from Recreational Areas to ESA and MRML-WM lands helps to protect natural resources from various types of adverse impacts such as habitat fragmentation, especially in prime ecological areas. The loss of 7,511 acres of wildlife management areas to ESA will not change the wildlife activities available like hunting and fishing, because these activities will still be allowed on ESA lands. The lack of established utility corridors does not mean that habitat fragmentation is more likely to occur, because any utilities that are proposed to cross USACE Oologah federal fee boundary must still go through the NEPA process of approval. Therefore, the implementation of the Proposed Action will have moderate, long-term beneficial impacts to natural resources on fee-owned property at Oologah Lake, as the proposed land classes, goals, and objectives further refine areas for appropriate activities.

## 3.7 THREATENED AND ENDANGERED SPECIES

Please refer to section 2.11 of the proposed Oologah Lake MP for existing information on threatened and endangered species within the USACE fee owned boundary.

### 3.7.1 Alternative 1: No Action

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions; therefore, no short- or long-term, major, moderate, or

minor, beneficial, or adverse impacts on threatened and endangered species would be anticipated as a result of implementing the No Action Alternative.

### 3.7.2 Alternative 2: Proposed Action

The implementation of the proposed MP will allow for better cooperative management plans with the USFWS and ODWC that will help to preserve, enhance, and protect vegetation and wildlife habitat resources that are essential to various endangered and threatened species that may be found within USACE Oologah Lake federal project lands. To further management opportunities and beneficially impact habitat diversity, the reclassifications implemented in the proposed MP include 7,587 acres as ESAs. Under this reclassification, several land parcels previously classified as Recreational Areas and Wildlife Management Areas were converted to ESA in order to recognize those areas having the highest ecological, cultural, and aesthetic value and to ensure they are given the highest order of protection among possible land classifications. Resource objectives make it mandatory that threatened and endangered species are managed by various ecosystem management principles. Any future activities that could potentially result in impacts on federally listed species will be coordinated with USFWS through Section 7 of the Endangered Species Act. Under the Proposed Action, impacts to federally threatened and endangered species would be long-term, minor, and entirely beneficial. As a result, USACE has determined the proposed MP revisions will have no effect on federally threatened or endangered species that occur at Oologah Lake.

## 3.8 INVASIVE SPECIES

Please refer to section 2.12 of the proposed Oologah Lake MP for existing information on invasive species within the USACE fee owned boundary.

### 3.8.1 Alternative 1: No Action

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions, so Oologah Lake would continue to be managed according to the existing invasive species management practices. There would be no short- or long-term, minor, moderate, or major, beneficial, or adverse impacts from invasive species as a result of implementing the No Action Alternative.

### 3.8.2 Alternative 2: Proposed Action

The implementation of the reclassifications of land management classes, improvement of resource management objectives, and the overall improvement of the proposed MP will allow invasive species within USACE Oologah federal project lands to be better managed and accounted for. The better management will be from implementing the knowledge gained from the Wildlife Habitat Appraisal Procedure (WHAP) survey done for Oologah Lake, which helps to identify high value and unique areas that need further protection from invasive species so as to protect their value and uniqueness that invasive species may destroy or degrade. The conversion of 922 acres from Recreational Areas to ESA and MRML-WM lands helps to protect natural resources from various types of adverse impacts such as habitat fragmentation which increases the spread of invasive species and these areas also receive more invasive

species management efforts. The loss 7,511 acres of wildlife management area to ESA will help to further protect areas from invasive species by not allowing agricultural leases for hay and grazing from occurring which could otherwise inadvertently introduce invasive species to new areas for infestation. The resource objectives a make for the monitoring and reporting of invasive species as well as the ability to take action to prevent and/or reduce the spread of these species. The lack of utility corridors will not increase the spread of invasive species, because any proposed utility corridor will still need to go through the NEPA process of review. Therefore, under the Proposed Action, there will be short- and long-term minor, beneficial impacts on invasive species as a result of implementing the MP.

## 3.9 CULTURAL, HISTORICAL, AND ARCHAEOLOGICAL RESOURCES

Please refer to section 2.14 of the proposed Oologah Lake MP for existing information on cultural, historical, and archaeological resources within the USACE fee owned boundary.

### 3.9.1 Alternative 1: No Action

There would be no additional short- or long-term, minor, moderate, or major, beneficial, or adverse impacts on cultural, historical, or archaeological resources as a result of implementing the No Action Alternative, as there would be no changes to the existing Master Plan.

### 3.9.2 Alternative 2: Proposed Action

The implementation of the reclassifications of land management classes, improvement of resource management objectives, and the overall improvement of the proposed MP will allow cultural, historical, and archaeological resources within USACE Oologah federal project lands to be better managed and accounted for. Based on previous surveys at Oologah Lake, the required reclassifications, resource objectives, and resource plan will not change current cultural resource management plans or alter areas where these resources exist. All future activities will be coordinated with the State Historic Preservation Officer and federally recognized Tribes to ensure compliance with Section 106 of the NHPA, the Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act. Therefore, no potential adverse effects on cultural, historical, or archaeological resources will occur as a result of implementing the proposed MP. Beneficial impacts may occur as a result of the proposed MP as lands classified as PO, ESA, or MRML- WM would generally protect any historic properties within those lands against ground disturbing activities.

## 3.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Please refer to section 2.15 of the proposed Oologah Lake MP for existing socioeconomic and environmental justice information in and around Oologah Lake.

### 3.10.1 Alternative 1: No Action

The continual implementation of the 1977 MP will result in the existing beneficial socioeconomic impacts to continue, as visitors will continue to come to the lake from

surrounding areas. In addition to camping, many visitors purchase goods such as groceries, fuel, and camping supplies locally, eat in local restaurants, stay in local hotels and resorts, play golf at local golf courses, and shop in local retail establishments. These activities will continue to bring revenues to local companies, provide jobs for local residents, and generate local and state tax revenues. There will be no disproportionately high or adverse impacts on minority or low-income populations or children with the implementation of the No Action Alternative.

### 3.10.2 Alternative 2: Proposed Action

The implementation of the proposed MP land reclassifications, resources objectives, and resource plan reflect changes in land management and land uses that have occurred since 1977. Oologah Lake offers a variety of recreational opportunities for visitors. It is beneficial to the local economy through direct and indirect job creation and local spending by visitors. Beneficial impacts will be similar to the No Action Alternative. There will be no adverse impacts on economy in the area and no disproportionately high or adverse impacts on minority or low-income populations or children as a result of the Proposed Action.

## 3.11 RECREATION

Please refer to section 2.16 of the proposed Oologah Lake MP for existing recreation information in and around Oologah Lake.

### 3.11.1 Alternative 1: No Action

Under the No Action Alternative, there will be no short- or long-term, minor, moderate, or major, beneficial, or adverse impacts on recreational resources, as there will be no changes to the existing MP.

### 3.11.2 Alternative 2: Proposed Action

The USACE proposes to continue to lease recreation lands at Oologah Lake to non-federal partners, who are anticipated to maintain and improve existing facilities with potential plans for future expansion.

Oologah Lake is beneficial to the local visitors and also offers a variety of free recreation opportunities. Even though the amount of acreage available for High Density Recreation will decrease (2,345 acres to 1,699 acres) with implementation of the proposed MP, this land reclassification reflects changes in land management and land uses that have occurred since 1977 at Oologah Lake. Passive recreational activities would still be allowed as they are now within all lands regardless of the land classification. The resource objectives make it mandatory that all decisions made in regards to the lake take into consideration their impacts to recreation and monitored should adjustments be needed. Therefore, under the Proposed Action, there would be no adverse, short- or long-term impacts on recreation as numerous recreation opportunities would remain in and around Oologah Lake to accommodate various outdoor based recreation activities.

## 3.12 AESTHETIC RESOURCES

Please refer to section 2.13 of the proposed Oologah Lake MP for existing aesthetic resource conditions in and around Oologah Lake.

### 3.12.1 Alternative 1: No Action

There would be no short- or long-term, minor, moderate, or major, beneficial, or adverse impacts on visual resources as a result of implementing the No Action Alternative, as there would be no changes to the existing MP.

### 3.12.2 Alternative 2: Proposed Action

Oologah Lake currently plays a pivotal role in availability of parks and open space in Nowata and Rogers Counties and the greater Tulsa Metroplex. The amount of acreage classified for recreation would reduce from 2,345 to 1,699 acres for High Density Recreation with implementation of the proposed MP. This land reclassification reflects changes in land management and land uses that have occurred since 1977 at Oologah Lake. The conversion of these lands would have no effect on current or projected public use or visual aesthetics as views from natural and recreation areas would remain in place. The conversion of 922 acres from Recreational Areas to ESA and MRML-WM lands helps to further protect lands that are aesthetically pleasing and limit future development but all the while still keeping them available for passive recreation activity at Oologah Lake. Additionally, proposed resource objectives place an emphasis on increasing public education on recreation, nature, cultural resources, and ecological resources at Oologah Lake. Therefore, under the Proposed Action, there would be no short- and long-term minor, adverse impacts to aesthetic resources as a result of implementing the proposed MP.

## 3.13 HAZARDOUS MATERIALS AND SOLID WASTE

Please refer to section 2.7 of the proposed Oologah Lake MP for information concerning hazardous materials and solid waste in and around Oologah Lake fee owned boundary.

## 3.14 HEALTH AND SAFETY

Please refer to section 2.8 of the proposed Oologah Lake MP for information concerning health and safety in and around Oologah Lake fee owned boundary.

### 3.14.1 Alternative 1: No Action

Under the No Action Alternative, the Oologah MP would not be revised. No significant adverse impacts on human health or safety would be anticipated.

### 3.14.2 Alternative 2: Proposed Action

The implementation of the proposed MP would result in the classification of Restricted Surface Water (23 acres), Designated No-Wake areas (288 acres), and Open-Recreation (27,963). These classifications maintain and in some cases, improve

boating, non-motorized recreation, and swimming safety near the Oologah Lake Dam, water intake structures, and key recreational water access areas such as boat ramps and designated swimming areas.

The project would continue to have reporting guidelines in place should water quality become a threat to public health. Existing regulations and safety programs throughout the Oologah Lake project area would continue to be enforced to ensure public safety. The resource objectives make it mandatory that various factors that impact human safety at the lake are monitored and that actions are taken to address, eliminate or reduce those factors. Additionally, the objectives place an emphasis on educating the public on water safety and on flood risk management efforts at Oologah Lake. Therefore, under the Proposed Action, there would be short- and long-term minor, beneficial impacts on health and safety as a result of implementing the proposed MP.

## 3.15 SUMMARY OF CONSEQUENCES AND BENEFITS

Table 3-1 provides a tabular summary of the consequences and benefits for the No Action and Proposed Action alternatives for each of the 13 assessed resource categories.

**Table 3-1 Summary of Consequences and Benefits**

| Resource | Change Resulting from Revised Master Plan | Environmental Consequences | | Benefits Summary |
|---|---|---|---|---|
| | | No Action Alternative | Proposed Action | |
| Land Use | No effect on private lands. Emphasis is on protection of wildlife and environmental values on USACE land and maintaining current level of developed recreation facilities. | Fails to recognize recreation trends and regional natural resource priorities. | Recognizes recreation trends and regional natural resource priorities identified by ODWC, and public comments. | Land classification changes and new resource objectives fully recognize passive use recreation trends and regional environmental values such as protection of old growth forests. |
| Water Resources Including Groundwater, Wetlands, and Water Quality | Small change to recognize value of wetlands. | Fails to recognize the water quality benefits of good land stewardship and need to protect wetlands. | Promotes restoration and protection of wetlands and good land stewardship. | Specific resource objective promotes restoration and protection of wetlands. |
| Climate, Climate Change, and Greenhouse Gases | Minor change to recognize need for sustainable, energy efficient design. | Fails to promote sustainable, energy efficient design. | Promotes land management practices and design standards that promote sustainability. | Specific resource objectives promote national climate change mitigation goal. LEED standards for green design, construction, and operation activities will be employed to the extent practicable. |
| Air Quality | No change | No effect | No effect | No added benefit |
| Topography, Geology and Soils | Minor change to place emphasis on good stewardship of land and water resources. | Fails to stop activities that would increase soil erosion and change in topography. | Encourages good stewardship that would reduce existing and potential erosion. | Specific resource objectives that would help to reduce soil erosion and topography by stopping activities that would cause them to happen. |
| Natural Resources | Moderate benefits through land reclassification and resource objectives. | Fails to recognize ESAs, and regional priorities calling for protection of wildlife habitat. | Gives full recognition of sensitive resources and regional trends and priorities related to natural resources. | Reclassification of lands included 7,587 acres of ESA with emphases on giving those species present in those areas the most protection possible. |

| Resource | Change Resulting from Revised Master Plan | Environmental Consequences | | Benefits Summary |
|---|---|---|---|---|
| | | No Action Alternative | Proposed Action | |
| Threatened and Endangered Species, including OHNI species. | Minor change to recognize both federal and state-listed species. | Fails to recognize current federal and state-listed species. | Fully recognizes federal and state-listed species as well as SGCN listed by ODWC and Rare species listed by ODWC. | The MP sets forth the most recent listing of federal and state-listed species and addresses on-going commitments associated with USFWS Biological Opinions. |
| Invasive Species | Minor change to recognize several recent and potentially aggressive invasive species. | Fails to recognize current invasive species and associated problems. | Fully recognizes current species and the need to be vigilant as new species may occur. | Specific resource objectives specify that invasive species shall be monitored and controlled as needed. |
| Cultural Resources | Minor change to recognize current status of cultural resources. | Included cursory information about cultural resources that is inadequate for future management and protection. | Recognizes the presence of cultural resources and places emphasis on protection and management. | Reclassification of lands included 7,587 acres of ESA and specific resource objectives were included for protection of cultural resources. |
| Socioeconomics and Environmental Justice | No change | No effect | No effect | No added benefit |
| Recreation | Moderate benefits to outdoor recreation programs. | Fails to recognize current outdoor recreation trends. | Fully recognizes current outdoor recreation trends and places special emphasis on trails. | Specific management objectives focused on outdoor recreation opportunities and trends are included. |
| Aesthetic Resources | Minor benefits through land reclassification and resource objectives. | Fails to minimize activities that disturb the scenic beauty and aesthetics of the lake. | Promotes activities that limit disturbance to the scenic beauty and aesthetics of the lake. | Specific management objectives to minimize activities that disturb the scenic beauty and aesthetics of the lake. |

| Resource | Change Resulting from Revised Master Plan | Environmental Consequences | | Benefits Summary |
|---|---|---|---|---|
| | | No Action Alternative | Proposed Action | |
| Health and Safety | Minor change to promote public safety awareness. | Fails to emphasize public safety programs. | Recognizes the need for public safety programs. | Includes specific management objectives to increase water safety outreach efforts. Also, classifies 23 acres of water surface as restricted and 288 acres designated no-wake for public safety purposes. |

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## SECTION 4: CUMULATIVE IMPACTS

The most severe environmental degradation may not result from the direct effects of any particular action, but from the combination of effects of multiple, independent actions over time. As defined in 40 CFR 1508.7 (CEQ Regulations), a cumulative effect is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

By Memorandum dated June 24, 2005, from the Chairman of the CEQ to the Heads of Federal Agencies, entitled "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis", CEQ made clear its interpretation that "…generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions…" and that the "…CEQ regulations do not require agencies to catalogue or exhaustively list and analyze all individual past actions." This cumulative impacts analysis summarizes expected environmental impacts from the combined impacts of past, current, and reasonably foreseeable future activities affecting any part of the human or natural environments impacted by the Proposed Action.

### 4.1 PAST IMPACTS WITHIN THE ZONE OF INTEREST

Oologah Lake was originally authorized for construction in 1938 with the primary missions of flood control and navigation. Construction was performed in two stages. The first stage began in July 1950 on the main embankment and outlet works, an uncontrolled saddle spillway at the site of the final gated spillway, and an emergency overflow area at the site of the final dike embankment. Construction was placed on standby in October 1951 and resumed December 1955 on the gated spillway and dike embankment. The conservation pool was filled 29 July 1972. The total project area at Oologah Lake encompasses 22,016 acres and 28,274 acres of surface water at normal pool elevation of 638.0. The entire 50,290 acres were acquired in fee simple title by USACE with perpetual Flowage Easements on 16,056 acres.

### 4.2 CURRENT AND REASONABLY FORESEEABLE PROJECTS WITHIN AND NEAR THE ZONE OF INTEREST

Future management of the 16,056 acres of Flowage Easement Lands at Oologah Lake includes routine inspection of these areas to ensure that the Government's rights specified in the easement deeds are protected. In almost all cases, the Government acquired the right to prevent placement of fill material or habitable structures on the easement area. Placement of any structure that may interfere with the USACE flood risk management and water conservation missions may also be prohibited.

At the time of this publication there are not any ongoing nor foreseeable projects within Oologah federal fee boundary nor within the surrounding area.

National USACE policy set forth in ER 1130-2-550, Appendix H, states that USACE lands will, in most cases, only be made available for roads that are regional arterials or freeways (as defined in ER 1130-2-550). All other types of proposed roads, including driveways and alleys, are generally not permitted on USACE lands. The proposed expansion or widening of existing roadways on USACE lands will be considered on a case-by-case basis.

## 4.3 ANALYSIS OF CUMULATIVE IMPACTS

Impacts on each resource were analyzed according to how other actions and projects within the zone of interest might be affected by the No Action Alternative and Proposed Action. Impacts can vary in degree or magnitude from a slightly noticeable change to a total change in the environment. For the purpose of this analysis the intensity of impacts will be classified as negligible, minor, moderate, or major. These intensity thresholds were previously defined in Section 3.0. Moderate growth and development are expected to continue in the vicinity of Oologah Lake and cumulative adverse impacts on resources would not be expected when added to the impacts of activities associated with the Proposed Action or No Action Alternative. A summary of the anticipated cumulative impacts on each resource is presented below.

### 4.3.1 Land Use

A major impact would occur if any action is inconsistent with adopted land use plans or if an action would substantially alter those resources required for, supporting, or benefiting the current use. Land use around Oologah Lake has experienced major change, it is rapidly being developed from agricultural fields into urbanized communities. Under the No Action Alternative, land use would not change. Although the Proposed Action would result in the reclassification of project lands, the reclassifications were developed to help fulfill regional goals associated with good stewardship of land resources that would allow for continued use of project lands.

The current and foreseeable land use demand and patterns for Oologah Lake does not entail the need of utility corridors, which the proposed MP would not have any. However, if such a need would arise, current USACE policy dictates that all utilities must go around USACE property unless no other feasible alternative exists. If there is no feasible alternative that exists then the utility must go through the NEPA permitting process prior to approval and implementation.

### 4.3.2 Water Resources

A major impact would occur if any action is inconsistent with adopted surface water classifications or water use plans, or if an action would substantially alter those resources required for, supporting, or benefiting the current use. Oologah Lake was developed for flood control, water conservation, fish and wildlife, and recreation purposes. The reclassifications and resource objectives required to revise the Oologah Lake MP are compatible with water use plans and surface water classification; further, they were developed to help fulfill regional goals associated with good stewardship of water resources that would allow for continued use of water resources associated with Oologah Lake. Therefore, cumulative impacts on water resources within the area surrounding Oologah Lake, when combined with past and proposed actions in the region, are anticipated to be minor.

### 4.3.4 Climate, Climate Change, and GHG

Under the Proposed Action, current Oologah Lake project management plans and monitoring programs would not be changed. In the event that GHG emission issues become significant enough to impact the current operations at Oologah Lake, the proposed MP and all associated documents would be reviewed and revised as necessary. Therefore, implementation of the proposed MP along with the associated land reclassifications as well as goals and objectives, when combined with other existing and proposed projects in the region, would result in negligible cumulative positive impacts on climate, climate change and GHG.

### 4.3.5 Air Quality

No new projects are scheduled near nor within Oologah Lake federal fee boundary; therefore, limiting the amount of new emissions that could potentially affect air quality within the region. The Proposed Action would not adversely impact air quality within the area. Vehicle traffic along park and area roadways and routine daily activities in nearby communities contribute to current and future emission sources; however, the impacts associated with the reclassification of lands at Oologah Lake under the Proposed Action would be negligible. Seasonal prescribed burning could occur on Oologah Lake to help maintain the various prairies found throughout the fee boundary, but would have minor, negative impacts on air quality through elevated ground-level $O_3$ and particulate matter concentrations; however, these seasonal burns would be scheduled so that impacts are minimized. Implementation of the proposed MP, when combined with other existing and proposed projects in the region, could result in minor beneficial cumulative impacts on air quality.

### 4.3.6 Topography, Geology, and Soils

A major impact could occur if a proposed future action exacerbates or promotes long-term erosion, if the soils are inappropriate for the proposed construction and would create a risk to life or property, or if there would be a substantial reduction in agricultural production or loss of Prime Farmland soils. Cumulative impacts on topography, geology, and soils within the area surrounding Oologah Lake, when combined with past and proposed actions in the region, are anticipated to be negligible.

### 4.3.7 Natural Resources

The significance threshold for natural resources would include a substantial reduction in ecological processes, communities, or populations that would threaten the long-term viability of a species or result in the substantial loss of a sensitive community that could not be offset or otherwise compensated. Past, present, and future projects are not anticipated to impact the viability of any plant species or community, rare or sensitive habitats, or wildlife. The establishment of ESA, and MRML-WM areas, as well as resource objectives that favor protection and restoration of valuable natural resources will have beneficial cumulative impacts. No identified projects would threaten the viability of natural resources. Therefore, there would be moderate long-term beneficial impacts to natural resources within the fee-owned property at Oologah Lake resulting from the revision of the proposed MP when combined with past and proposed actions in the area.

### 4.3.8 Threatened and Endangered Species

The Proposed Action and No Action Alternative would not adversely impact threatened, endangered and Oklahoma Natural Heritage Inventory species within the area. Should federally listed species change in the future (e.g., delisting of the American Burying Beatle or other species or listing of new species), associated requirements will be reflected in revised land management practices in coordination with the USFWS. The USACE would continue cooperative management plans with the USFWS and ODWC to preserve, enhance, and protect critical wildlife habitat resources.

No new projects are proposed for USACE lands within the Oologah Lake project area, and past, present, and future projects are not anticipated to impact threatened and endangered species as they will coordinated with the appropriate resource agencies. Therefore, there would be moderate long-term beneficial impacts on threatened and endangered species within the fee-owned property at Oologah Lake resulting from the revision of the Oologah Lake 1977 MP when combined with past and proposed actions in the area.

### 4.3.9 Invasive Species

To the extent that funding will allow, USACE will continue its proactive, cooperative herbicide treatments with ODWC to control these species that affect not only the natural biological resources, but also recreational opportunities. Pesticide treatment for invasive ants will also continue.

Invasive species control has and will continue to be conducted on various areas across the project lands. Implementing Best Management Practices (BMP) will help reduce the introduction and distribution of invasive species, ensuring that proposed actions in the region will not contribute to the overall cumulative impacts related to invasive species.

The land reclassifications required to revise the 1977 MP are compatible with Oologah Lake invasive species management practices. Therefore, there would be minor long-term beneficial impacts on reducing and preventing invasive species within the area surrounding Oologah Lake.

### 4.3.10 Cultural, Historical, and Archaeological Resources

The Proposed Action would not affect cultural resources or historic properties, as the master plan revision does not involve any ground disturbing activities. However, ESA and Wildlife Management lands provide additional protection against ground disturbances. Additionally, the lack of Utility Corridors would not impact cultural resources in that any new utilities proposed to cross USACE Oologah federal fee boundary must still go through the NEPA and NHPA Section 106 process of approval which would reduce their impacts to them. Therefore, this action, when combined with other existing and proposed projects in the region, would not result in major cumulative impacts on cultural resources or historic properties.

### 4.3.11 Socioeconomics and Environmental Justice

The Proposed Action would not result in the displacement of persons (minority, low-income, children, or otherwise) as a result of implementing the reclassifications,

resources objectives, and resource plan proposed in the 2021 MP. Therefore, the effects of the Proposed Action on environmental justice and the protection of children, when combined with other ongoing and proposed projects in the Oologah Lake area, would not be considered a major cumulative effect.

### 4.3.12 Recreation

Oologah Lake provides regionally significant outdoor recreation benefits including a variety of recreation opportunities. Even though the amount of acreage available for High Density Recreation would decrease as a result of implementing the reclassifications, resources objectives, and resource plan proposed in the 2021 MP, these changes reflect changes in land management and historic recreation use patterns that have occurred since 1977 at Oologah Lake. The conversion of these lands would have no effect on current or projected public use. Therefore, the Proposed Action, when combined with other existing and proposed projects in the region, would result in negligible beneficial cumulative impacts on area recreational resources.

### 4.3.13 Aesthetic Resources

No impacts on visual resources would occur as a result of implementing the reclassifications, resources objectives, and resource plan proposed in the 2021 MP. The Proposed Action, especially the classification of ESAs, in conjunction with other projects in the region, would result in minor beneficial cumulative impacts on the visual resources in the Oologah Lake area.

### 4.3.14 Hazardous Materials and Solid Waste

No hazardous material or solid waste concerns would be expected with implementation of the proposed MP; therefore, when combined with other ongoing and proposed projects in the Oologah Lake area, there would be no major cumulative effects on hazardous materials and solid waste.

### 4.3.15 Health and Safety

No health or safety risks would be created by the Proposed Action. The effects of implementing the proposed MP, when combined with other ongoing and proposed projects in the Oologah Lake area, would not be considered a major cumulative effect.

## SECTION 5: COMPLIANCE WITH ENVIRONMENTAL LAWS

This EA has been prepared to satisfy the requirements of all applicable environmental laws and regulations, and has been prepared in accordance with the CEQ's implementing regulations for NEPA, 40 CFR Parts 1500 – 1508, and the USACE ER 200-2-2, *Environmental Quality: Procedures for Implementing NEPA*. The revision of the proposed MP is consistent with the USACE's Environmental Operating Principles. The following is a list of applicable environmental laws and regulations that were considered in the planning of this project and the status of compliance with each:

Fish and Wildlife Coordination Act of 1958, as amended – The USACE initiated public involvement and agency scoping activities to solicit input on the proposed MP revision process, as well as identify reclassification proposals, and identify significant issues related to the Proposed Action. Information provided by USFWS and ODWC on fish and wildlife resources has been utilized in the development of the proposed MP.

Endangered Species Act of 1973, as amended – Current lists of threatened or endangered species were compiled for the proposed MP. There would be no adverse impacts on threatened or endangered species resulting from the revision of the 1977 MP. However, beneficial impacts, such as habitat protection, could occur as a result of the revision of the proposed MP by classification of ESA and MRM-WM.

Executive Order 13186 (Migratory Bird Habitat Protection) – Sections 3a and 3e of EO 13186 direct Federal agencies to evaluate the impacts of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative impacts on migratory birds. The 1977 MP revision will not result in adverse impacts on migratory birds or their habitat. Beneficial impacts could occur through protection of habitat as a result of the proposed MP revision.

Migratory Bird Treaty Act, as amended – The Migratory Bird Treaty Act of 1918 extends Federal protection to migratory bird species. The nonregulated "take" of migratory birds is prohibited under this act in a manner similar to the prohibition of "take" of threatened and endangered species under the Endangered Species Act. The timing of resource management activities would be coordinated to avoid impacts on migratory and nesting birds.

CWA of 1977, as amended – The Proposed Action is in compliance with all state and Federal CWA regulations and requirements and is regularly monitored by the USACE and ODEQ for water quality. A state water quality certification pursuant to Section 401 of the CWA is not required for the proposed MP. There will be no change in the existing management of the reservoir that would impact water quality.

National Historic Preservation Act (NHPA) of 1966, as amended – Compliance with the NHPA of 1966, as amended, requires identification of all properties in the project area listed in, or eligible for listing in, the NRHP. All previous surveys and site salvages were coordinated with the Oklahoma State Historic Preservation Officer. Known sites are mapped and avoided by maintenance activities. Areas that have not undergone cultural resources surveys or evaluations will need to do so prior to any earthmoving or other potentially impacting activities.

Clean Air Act of 1977, as amended – The USEPA established nationwide air quality standards to protect public health and welfare. Existing operation and management of

the reservoir is compliant with the Clean Air Act and will not change with the proposed MP revision.

Farmland Protection Policy Act (FPPA) of 1980 and 1995 – The FPPA's purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. There are Prime Farmland and farmland of state importance on Oologah Lake project lands, but these will not be significantly impacted.

Executive Order 11990, Protection of Wetlands, as amended – EO 11990 requires Federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in executing Federal projects. The Proposed Action complies with EO 11990.

Executive Order 11988, Floodplain Management, as amended – This EO directs Federal agencies to evaluate the potential impacts of proposed actions in floodplains. The operation and management of the existing project complies with EO 11988.

CEQ Memorandum dated August 11, 1980, Prime or Unique Farmlands – Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The Proposed Action would not impact Prime Farmland present on Oologah Lake project lands.

Executive Order 12898, Environmental Justice – This EO directs Federal agencies to achieve environmental justice to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review. Agencies are required to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The revisions in the proposed MP will not result in a disproportionate adverse impact on minority or low-income population groups.

## SECTION 6: IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

NEPA requires that Federal agencies identify "any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented" (42 U.S.C. § 4332). An irreversible commitment of resources occurs when the primary or secondary impacts of an action result in the loss of future options for a resource. Usually, this is when the action affects the use of a nonrenewable resource or it affects a renewable resource that takes a long time to regenerate. The impacts for this project from the reclassification of land would not be considered an irreversible commitment because subsequent MP revisions could result in some lands being reclassified to a prior, similar land classification. An irretrievable commitment of resources is typically associated with the loss of productivity or use of a natural resource (e.g., loss of production or harvest). No irreversible or irretrievable impacts on Federally protected species or their habitat is anticipated from implementing revisions to the proposed MP.

## SECTION 7: PUBLIC AND AGENCY COORDINATION

In accordance with 40 CFR §§1501.7, 1503, and 1506.6, the USACE initiated public involvement and agency scoping activities to solicit input on the revision of the 1977 MP, as well as identifying reclassification proposals and significant issues related to the Proposed Action. The USACE began its public involvement process with a public scoping meeting to provide an avenue for public and agency stakeholders to ask questions and provide comments. This public scoping meeting was held on February 27, 2020 at the “At Home RV Park and Event Center” in Oologah, Oklahoma. The USACE, Tulsa District, placed advertisements on the USACE webpage, social media, and print publications prior to the public scoping meeting.

Because of the COVID-19 virus pandemic and concerns over public safety, the draft release for public comment and information meeting to present the draft of the proposed MP is cancelled and replaced with an online video and other information resources that will summarize the MP and will be posted on the Tulsa District website. Public review and comment period on the draft proposed MP and EA will begin on September 30, 2021 and end on November 1, 2021.

At the close of the 30-day public review period, public comments received will be incorporated and formally addressed in Appendix F of the MP. Attachment A includes the ads published in the local newspaper, the agency coordination letters, and the distribution list for the coordination letters. The EA is being coordinated with agencies having legislative and administrative responsibilities for environmental protection.

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## SECTION 8: REFERENCES

Council on Environmental Quality (CEQ). 2005. Executive Office of the President. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*.

United States Army Corps of Engineers (USACE). 2021. Oologah Lake Master Plan, Arkansas River Basin, Rogers and Nowata Counties, Oklahoma. USACE, Tulsa District.

USACE. 1988. *Engineering Regulation 200-2-2, Procedures for Implementing NEPA*. Washington, DC.

USACE. 1996. Oologah Verdigris River, Oklahoma Water Control Manual.

## SECTION 9: ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| % | Percent |
| ° | Degrees |
| ac-ft | acre-feet |
| AQCR | Air Quality Control Region |
| BMP | Best Management Practice |
| BP | Before Present |
| CAP | Climate Action Plan |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| CO2e | CO2-equivalent |
| CRMP | Cultural Resources Management Plan |
| CWA | Clean Water Act |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| EMS | Ecological Mapping System (TPWD) |
| EO | Executive Order |
| EP | Engineer Pamphlet |
| ER | Engineer Regulation |
| ERS | Environmental Radiation Surveillance |
| ESA | Environmentally Sensitive Area |
| F | Fahrenheit |
| FAA | Federal Aviation Administration |
| FONSI | Finding of No Significant Impact |
| GHG | Greenhouse Gas |
| gpm | gallons per minute |
| HDR | High Density Recreation |
| HTRW | Hazardous, Toxic, Radioactive Wastes |
| IFR | Inactive/Future Recreation |
| IPAC | Information for Planning and Consultation (USFWS) |
| LDR | Low Density Recreation |
| MP | Master Plan |
| MRML | Multiple Resource Management Lands |
| msl | mean sea level |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act |
| NGVD | National Geodetic Vertical Datum |
| NHPA | National Historic Preservation Act |
| NO | Nitrogen Oxide |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NRRS | National Recreation Reservation Service |
| NWI | National Wetlands Inventory (USFWS) |
| ODWC | Oklahoma Department of Wildlife Conservation |
| $O_3$ | Ozone |
| OAQPS | Office of Air Quality Planning and Standards |
| Pb | Lead |
| PCB | Polychlorinated Biphenyls |
| PCPI | Per Capita Personal Incomes |

| | |
|---|---|
| PL | Public Law |
| $PM_{2.5}$ | Particulate Matter Less than 2.5 Microns |
| $PM_{10}$ | Particulate Matter Less than 10 Microns |
| PO | Project Operations |
| RM | River Mile |
| ROD | Record of Decision |
| RPEC | Regional Planning and Environmental Center |
| SGCN | Species of Greatest Conservation Need |
| $SO_2$ | Sulfur Dioxide |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TDS | Total Dissolved Solids |
| TPWD | Texas Parks and Wildlife Department |
| U.S. | United States |
| U.S.C. | U.S. Code |
| USACE | U.S. Army Corps of Engineers |
| USCG | U.S. Coast Guard |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| USGCRP | U.S. Global Change Research Group |
| VOC | Volatile Organic Compounds |
| WHAP | Wildlife Habitat Appraisal Procedures |
| WM | Wildlife Management |
| VM | Vegetation Management |
| ZOI | Zone of Interest |

## SECTION 10: LIST OF PREPARERS

Paul E. Roberts - Biologist, Fort Worth District, Regional Planning and Environmental Center. 7 years of USACE experience.

Blake Westmoreland – Biologist, Regional Planning and Environmental Center, Fort Worth District. 4 years of USACE experience.

**Attachment A: NEPA COORDINATION AND PUBLIC SCOPING**

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# Attachment A-
# National Environmental Policy Act (NEPA) Coordination and Scoping

# Public Meeting will address Oologah Lake Master Plan

**TULSA, OK, UNITED STATES**
**02.20.2020**
**Story by Brannen Parrish**
**U.S. Army Corps of Engineers, Tulsa District**



The Tulsa District, U.S. Army Corps of Engineers will host an informational meeting related to the Oologah Lake Master Plan at the Home RV Park and Event Center in Oologah, Oklahoma, Feb. 27 from 6 - 8 p.m.

The purpose of the meeting is to inform the public about master plans and explain how they assist in potential revisions.

The current master plan was published in 1977.

No formal presentation will take place but Tulsa District park rangers and staff will be available to answer questions and provide visitors with maps and other visual information related to the process of revising the master plan.

The Home RV Park and Event Center is located at 8013 E. Hwy 88, Oologah, OK 74053.

A master plan is a strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the water resource development project. In general, it defines how the resources will be managed for public use and resource conservation.

Master plans do not address detailed technical operational aspects of the lake related to flood risk management, the water conservation missions of the project, or the shoreline management program which specifies what private uses are permitted along the shoreline.

The master plan study area will include Oologah Lake and all adjacent recreational and natural resources properties under federal control.

After the meeting, information from the event, including the existing plan, will be made available via the Tulsa District website at https://www.swt.usace.army.mil/Missions/Recreation/Master-Plans/.

Comments must be submitted in writing and may be submitted in-person at the workshop or by post to:

Bobby J. Parkey
Oologah Lake Manager
8400 East Hwy 88,
Oologah, OK 74053.

Or email comments to: CESWT-OD-NO@usace.army.mil

Any revision will address land classifications, new natural and recreational resource management objectives, recreation facility needs, and special topics such as invasive species management and threatened and endangered species habitat.

## NEWS INFO

| | |
|---|---|
| Date Taken: | 02.20.2020 |
| Date Posted: | 02.20.2020 10:35 |
| Story ID: | 363489 |
| Location: | TULSA, OK, US |

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| Web Views: | 127 |
| Downloads: | 0 |



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*No keywords found.*

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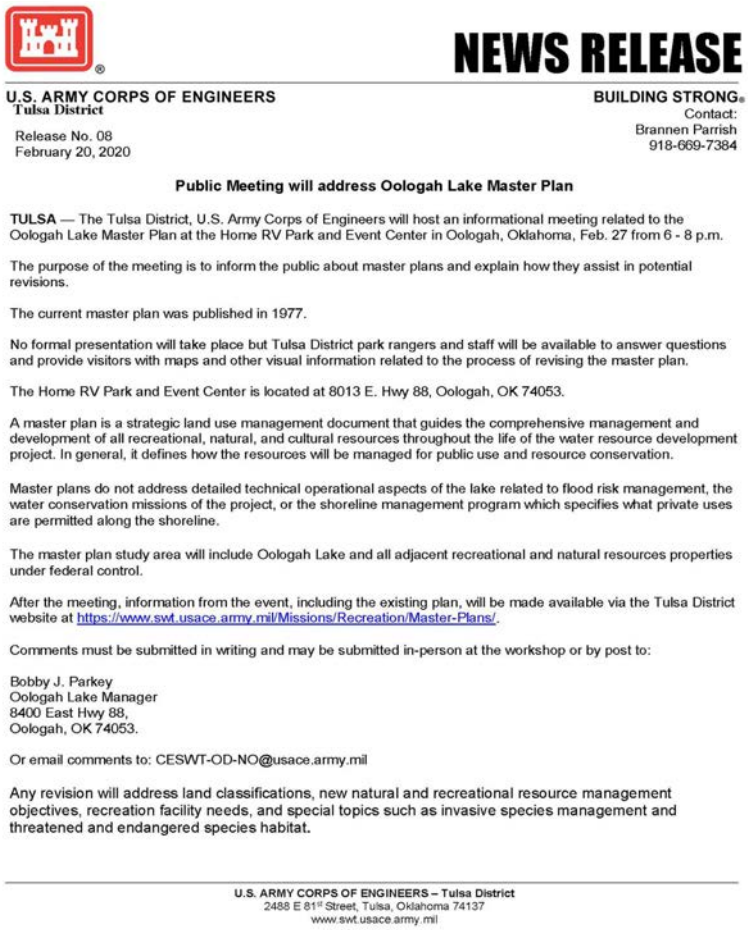

NEWS RELEASE

U.S. ARMY CORPS OF ENGINEERS
Tulsa District

Release No. 08
February 20, 2020

BUILDING STRONG®
Contact:
Brannen Parrish
918-669-7384

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Master plans do not address detailed technical operational aspects of the lake related to flood risk management, the water conservation missions of the project, or the shoreline management program which specifies what private uses are permitted along the shoreline.

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Any revision will address land classifications, new natural and recreational resource management objectives, recreation facility needs, and special topics such as invasive species management and threatened and endangered species habitat.

U.S. ARMY CORPS OF ENGINEERS – Tulsa District
2488 E 81st Street, Tulsa, Oklahoma 74137
www.swt.usace.army.mil

**Tulsa District, U.S. Army Corps of Engineers**
February 27, 2020 ·

***REMINDER****
Tulsa District U.S. Army Corps of Engineers will host an informational meeting this evening from 6-8 p.m. regarding the Oologah Lake Master Plan. The meeting will be held at The Home RV Park and Event Center, located at 8013 E Hwy 88, Oologah, OK. **#Oologah #Oklahoma #TulsaDistrict #USACE**

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Most Relevant

**Sean Moore**

**Tulsa District, U.S. Army Corps of Engineers**
February 27, 2020 ·

If you attended the Fort Gibson Shoreline Management Plan public meeting and were unable to get a comment form because the team ran out please visit the site below to download the form and read any documents related to the plan.

The Tulsa District, U.S. Army Corps of Engineers will host an informational meeting related to the Oologah Lake Master Plan at the Home RV Park and Event Center in Oologah, Oklahoma, Feb. 27 from 6 - 8 p.m.
https://www.dvidshub.net/…/public-meeting-will-address-oolo…

For comment forms or other information related to the Master Plans visit.
https://www.swt.usace.army.mil/Mis…/Recreation/Master-Plans/

SWT.USACE.ARMY.MIL

**Tulsa District Recreation – Shoreline Management Plans**

The official public website of the Tulsa District, U.S. Army Corps of Engineers. For website corrections, write to ceswt-pa@swt03.usace.army.mil

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT
2488 EAST 81st STREET
TULSA, OKLAHOMA 74137-4290

February 6, 2020

**Public Notice**

**Public Meeting for Oologah Lake Master Plan Revision,**
**Oologah Lake, Verdigris River Basin**
**Nowata and Rogers Counties, Oklahoma**

The Tulsa District, U.S. Army Corps of Engineers (USACE) is revising the Oologah Lake Master Plan. An open house public meeting will be held from **6:00 pm to 8:00 pm** on **February 27, 2020 at "At Home RV Park and Event Center" 8013 E. Hwy 88, Oologah, OK 74053**. The meeting will provide attendees with information regarding the revision content and process, and provide a general schedule. Attendees can view current land use classification maps and ask USACE staff questions. A 30-day comment period will follow the meeting from February 28, 2020 through March 28, 2020 in which the public can send comments, suggestions, and concerns.

A Master Plan is defined by USACE as the strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the water resource development project. In general, it defines "how" the resources will be managed for public use and resource conservation.

Revision of the Master Plan will not address in detail the technical operational aspects of the lake related to flood risk management, the water conservation missions of the project, or the shoreline management program which specifies what private uses are permitted along the shoreline. The Master Plan study area will include Oologah Lake proper and all adjacent recreational and natural resources properties under federal control.

The current Master Plan, dated October of 1977, is in need of revision to address changes in regional land use, population, outdoor recreation trends, and USACE management policy. Key topics to be addressed in the revised Master Plan include revised land use classifications, new natural and recreational resource management objectives, recreation facility needs, and special topics such as invasive species management and threatened and endangered species habitat. **Public participation is critical to the successful revision of the Master Plan.** Information provided at the open house public meetings, including the existing Master Plan, may be viewed on the Tulsa District website at the following link beginning February 27, 2020: https://www.swt.usace.army.mil/

Comments can be submitted in writing and can be given to USACE staff at the open house public meetings, or mailed to: Bobby J. Parkey, Oologah Lake Manager; 8400 East Hwy 88, Oologah, OK 74053, Phone: 918-443-2250. Comments can also be submitted via email to: CESWT-OD-NO@usace.army.mil

Sincerely,

Amanda M. McGuire
Chief, Environmental Branch
Regional Planning and Environmental Center

HOT INFO **The following Master Plans are currently under review. Council Grove & Marion Draft Finals are available.**

## Online Review of Master Plans

The Tulsa District, US Army Corps of Engineers (USACE) is hosting an online review to provide information and receive public input to begin the process of revising the Master Plan for Council Grove, El Dorado, Elk City, & Marion Reservoirs. Normally, USACE would conduct a face-to-face public workshop to announce the start of the revision and to request comments from the public. However, precautions associated with the COVID-19 virus have made it necessary to conduct the public involvement process online instead of hosting a face-to-face workshop. Please watch the following video presentations or download the PDF copy to read the presentation. The PDF copy and video presentation provide the same information.

Please note, Oologah's Master Plan update is also in process and listed below. The public meeting was previously held on February 27 and supporting documents can be found below.

## Master Plans

**What is a Master Plan?**

The Master Plan is the strategic land use management document that guides the comprehensive management and development of all project recreational, natural, and cultural resources throughout the life of the water resources project. Revision of the Master Plan will not address in detail the technical operational aspects of the reservoir related to the water supply or flood risk management missions of the project.

**What a Master Plan is not.**

The Master Plan does not entail facility designs, daily project administration details or any technical discussion regarding flood risk management, water quality, water supply, shoreline management, water level management, hydropower or navigation. Many of these topics are covered in the many other Operational Plans each lake develops separately from the master plan.

**Why Revise a Master Plan?**

Most Master Plans at Tulsa lakes are the original document when the lake was built. Over the span of 40+ years, many changes have taken place including major utility and highway construction, urbanization, and evolving recreational uses. The Plan and the land classifications are in need of revision to address changes in regional land use, population, outdoor recreation trends, and USACE management policy. Key topics to be addressed in the revised Master Plan include revised land classifications, new natural and recreational resource management objectives, recreation facility needs, and special topics such as invasive species management and protection of sensitive wildlife habitat. Public participation is critical to the successful revision of the Master Plan.

**The Master Planning Process**

## Master Plans Policy & Procedures

This link will take you to the established guidance, procedures and policies for the management of recreation programs and activities, and for the operation and maintenance of U.S Army Corps of Engineers recreation facilities and related structures, at civil work water resource projects.

Plans & OMP's

## Oologah Lake, Verdigris River, Oklahoma

Design Memorandum No. 15B, Master Plan

The following maps were presented at the public meeting on February 27, 2020. Please be aware that the file is large and may take awhile to load.

News Release

Public Meeting Maps

Presentation

Comment Instructions

Comment Form **Comment period ended 27 March 2020.**

**Oologah Lake Home Page**

## Council Grove, Grand (Neosho) River, Kansas

Design Memorandum No. 2B, Master Plan

Council Grove Draft Master Plan (9.07MB)

Comment Form & Instructions (380KB) **Comment period ended 9 May 2021.**

Presentation (389KB)

**Council Grove Lake Home Page**

**VIDEO: Council Grove Draft Master Plan Public Participation Presentation**

## El Dorado Lake, Walnut River, Kansas

Design Memorandum No. 26, Master Plan

Map (2MB)

Comment Form & Instructions (370KB) **Comment period ended 26 June 2020.**

Presentation (3MB)

**VIDEO: El Dorado Master Plan Revision Public Participation Presentation**

**--June 2021 Public Review of Draft Master Plan--**

News Release

Notice of Availability

Draft Master Plan (21.2MB)

Comment Form and Instructions **Comment period ended July 11, 2021**

Presentation (3.48MB)

**VIDEO: El Dorado Draft Master Plan Public Participation Presentation**

**El Dorado Lake Home Page**

## Elk City Lake, Elk River, Kansas

Design Memorandum No. 6B, Master Plan

Map (2MB)

Comment Form & Instructions (1MB) **Comment period ended 26 June 2020.**

Presentation (3MB)

**VIDEO: Elk City Master Plan Revision Public Participation Presentation**

**- August 2021 Public Review of Draft Master Plan -**

News Release

Notice of Availability

Draft Master Plan (11.6 MB)

Comment Form and Instructions **Comment period ends 23 September 2021**

Presentation (3.86 MB)

**VIDEO: Elk City Draft Master Plan Public Participation Presentation**

**Elk City Lake Home Page**

## Marion Lake, Cottonwood River, Kansas

News Release

Marion Draft Master Plan (9.07MB)

Comment Form & Instructions (387KB) **Comment period ended 9 May 2021.**

Presentation (389KB)

**Marion Lake Home Page**

**VIDEO: Marion Draft Master Plan Public Participation Presentation**

## Hugo Lake, Kiamichi River, Oklahoma

Design Memorandum No. 3B
Public Use Plan 16.5MB Operational Appendices 29.75MB

Land Classification Map with imagery

Land Classification Map street view

News Release

Comment Form & Instructions **Comment period ended 26 June 2021**

**The Presentation below is best viewed on the following internet browsers (Google Chrome, Firefox and Microsoft Edge). Please copy and paste the following url into one of the above browsers.**

**https://storymaps.arcgis.com/stories/e6117acd693d4d64a9b8fc91196b3e13**

**Hugo Lake Home Page**

Tweet

**USACE, Tulsa**
@usacetulsa

The Tulsa District, U.S. Army Corps of Engineers will host an informational meeting related to the **Oologah** Lake **Master Plan** at the Home RV Park and Event Center in **Oologah**, Oklahoma, Feb. 27 from 6 - 8 p.m.


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# APPENDIX C – WILDLIFE DOCUMENTS

IPaC Report – USFWS

SGCN List LIST – ODWC

Rare Species Listing – ODWC

WHAP REPORT – USACE

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: August 25, 2021
Consultation Code: 02EKOK00-2021-SLI-0919
Event Code: 02EKOK00-2021-E-07543
Project Name: Oologah Lake

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Non-federal entities conducting activities that may result in take of listed species should consider seeking coverage under section 10 of the ESA, either through development of a Habitat Conservation Plan (HCP) or, by becoming a signatory to the General Conservation Plan (GCP) currently under development for the American burying beetle. Each of these mechanisms provides the means for obtaining a permit and coverage for incidental take of listed species during otherwise lawful activities.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit through our Project Review step-wise process http://www.fws.gov/southwest/es/oklahoma/OKESFO%20Permit%20Home.htm.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

# Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Oklahoma Ecological Services Field Office**
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

# Project Summary

Consultation Code: 02EKOK00-2021-SLI-0919
Event Code: 02EKOK00-2021-E-07543
Project Name: Oologah Lake
Project Type: LAND - MANAGEMENT PLANS
Project Description: The Oologah Master Plan (Rogers and Nowata Counties, Oklahoma) is the long-term strategic land use management document that guides the comprehensive management and development of all the project's recreational, natural, and cultural resources within the federal fee boundary. Under the guidance of ER-1130-2-550 Change 7, the Plan guides the efficient and cost-effective development, management, and use of project lands. It is a dynamic tool that provides for the responsible stewardship and sustainability of the project's resources for the benefit of present and future generations. The Plan works in tandem with the Operational Management Plan (OMP), which is the implementation tool for the resource objectives and development needs identified in the Master Plan. The Master Plan guides and articulates the USACE responsibilities pursuant to federal laws. Efforts are under way to revise the current Lake Master Plan. The Master Plan revision will update land classifications, plan for the modernization of existing parks, and inform the management of wildlife and other resource lands within USACE managed property at Oologah Lake for the next 25 years.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.5930393,-95.5623405632198,14z


Counties: Nowata and Rogers counties, Oklahoma

# Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## Mammals

| NAME | STATUS |
|---|---|
| Northern Long-eared Bat *Myotis septentrionalis*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9045 | Threatened |

## Birds

| NAME | STATUS |
|---|---|
| Piping Plover *Charadrius melodus*<br>Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/6039 | Threatened |
| Red Knot *Calidris canutus rufa*<br>There is **proposed** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/1864 | Threatened |
| Whooping Crane *Grus americana*<br>Population: Wherever found, except where listed as an experimental population<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/758 | Endangered |

## Clams

| NAME | STATUS |
|---|---|
| Neosho Mucket *Lampsilis rafinesqueana* | Endangered |
| There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3788 | |
| Rabbitsfoot *Quadrula cylindrica cylindrica* | Threatened |
| There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5165 | |

## Insects

| NAME | STATUS |
|---|---|
| American Burying Beetle *Nicrophorus americanus* | Threatened |
| Population: Wherever found, except where listed as an experimental population<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/66 | |

## Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

| NAME | STATUS |
|---|---|
| Rabbitsfoot *Quadrula cylindrica cylindrica* | Final |
| https://ecos.fws.gov/ecp/species/5165#crithab | |

# USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

# Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

| NAME | BREEDING SEASON |
|---|---|
| Bald Eagle *Haliaeetus leucocephalus*<br>This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.<br>https://ecos.fws.gov/ecp/species/1626 | Breeds Oct 15 to Aug 31 |
| Kentucky Warbler *Oporornis formosus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds Apr 20 to Aug 20 |

| NAME | BREEDING SEASON |
|---|---|
| Prothonotary Warbler *Protonotaria citrea*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds Apr 1 to Jul 31 |
| Red-headed Woodpecker *Melanerpes erythrocephalus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds May 10 to Sep 10 |

## Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

**Probability of Presence (■)**

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

**Breeding Season (■)**

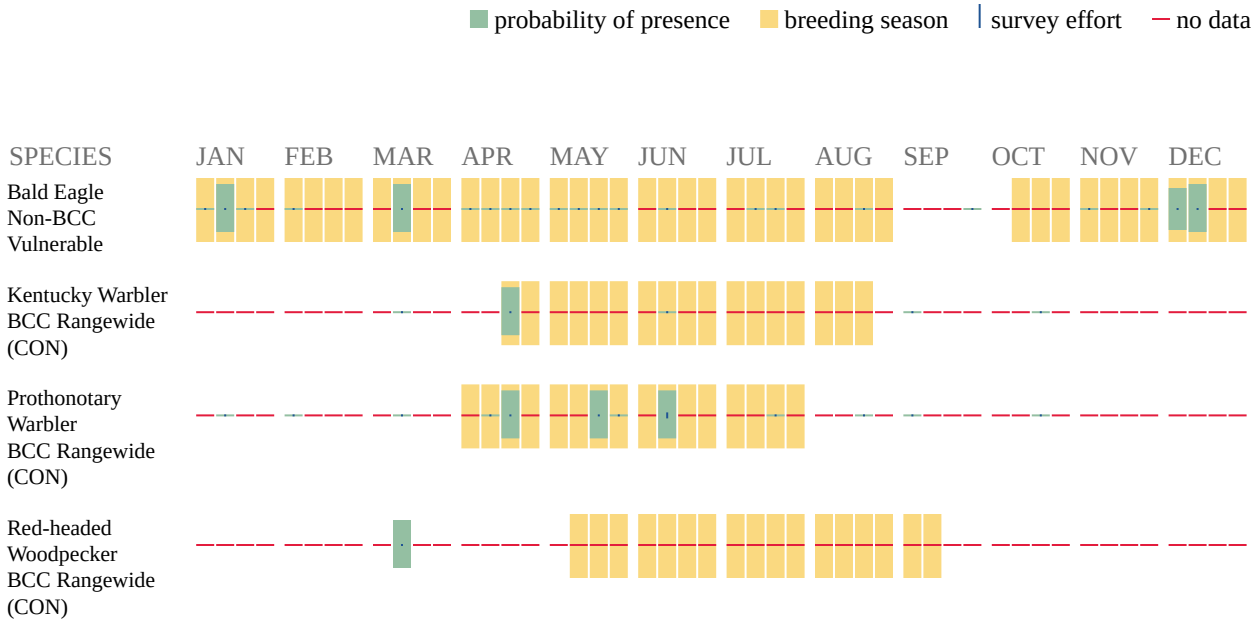
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

**Survey Effort** (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

**No Data** (–)
A week is marked as having no data if there were no survey events for that week.

**Survey Timeframe**
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

---




Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

## Migratory Birds FAQ

**Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

**What does IPaC use to generate the migratory birds potentially occurring in my specified location?**
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

**What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?**
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

**How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?**
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

**What are the levels of concern for migratory birds?**

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

**Details about birds that are potentially affected by offshore projects**
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

**What if I have eagles on my list?**
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

**Proper Interpretation and Use of Your Migratory Bird Report**
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of

certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

# Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

LAKE

- L1UBHh
- L1UBHx
- L2USCh

FRESHWATER EMERGENT WETLAND

- PEM1A
- PEM1Ah
- PEM1C
- PEM1Ch
- PEM1F
- PEM1Fh

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1/EM1A
- PFO1/SS1A
- PFO1/SS1Ah
- PFO1/SS1C
- PFO1/SS1Ch
- PFO1/SS1F
- PFO1/SS1Fh
- PFO1/SS6F
- PFO1/UBFh
- PFO1A
- PFO1Ah
- PFO1C
- PFO1Ch
- PFO1Fh
- PFO5/UBHh

- PFO6/UBF
- PFO6F
- PSS1/EM1C
- PSS1/EM1Ch
- PSS1/EM1F
- PSS1/EM1Fx
- PSS1/UBF
- PSS1/UBFh
- PSS1/UBFx
- PSS1A
- PSS1C
- PSS1Ch
- PSS1F
- PSS6/UBF
- PSS6F

FRESHWATER POND

- PUBF
- PUBH
- PUBHh
- PUBHx

RIVERINE

- R2UBH
- R4SBC
- R5UBF

How to Keep Your Bird Feeder Open for Business

Celebrate #MothWeek by Sharing Your Sightings

# WILDLIFE DIVERSITY

FIELD GUIDE WILD SIDE NEWS



## Threatened and Endangered Species

### Federally Threatened

American Burying Beetle
Arkansas River Shiner
Leopard Darter
Neosho Madtom
Northern Long-eared Bat
Ozark Cavefish
Rabbitsfoot
Rufa Red Knot

### State Threatened

Blackside Darter

### Federally Endangered

Gray Bat
Indiana Bat
Neosho Mucket
Ouachita Rock Pocketbook
Ozark Big-eared Bat
Piping Plover
Red-cockaded Woodpecker
Scaleshell
Whooping Crane
Winged Mapleleaf

### State Endangered

Longnose Darter
Oklahoma Cave Crayfish

grasses and forbs, a decrease in the abundance of highly palatable native forbs and in some areas an increase in woody plant cover.

The current patterns of fire are very different in the Flint Hills and Osage Plains sections of the region. Historically, fires probably occurred at two to five year intervals and occurred primarily in the late summer, fall and winter. In the present time in the Flint Hills, prescribed fires are set annually in the spring over large areas of prairie rangeland in order to stimulate a flush of new herbaceous vegetation for livestock. In contrast, fire suppression has characterized much of the Osage Plains for decades. The combination of continuous grazing and fire suppression has increased woody plant cover, especially along fence rows and right-of-ways.

Recognized plant associations within this habitat type include:

Big Bluestem – Switchgrass Grassland
Big Bluestem – Little Bluestem – Indiangrass Grassland
Switchgrass – Eastern Gamagrass Grassland
Little Bluestem – Indiangrass Grassland
Little Bluestem – Big Bluestem Grassland

(Vegetation associations are based on Hoagland 2000; see Appendix C for reference.)

The species of greatest conservation need that occupy the tallgrass prairie habitat type in substantial or manageable numbers are listed in the following table. A narrative description is provided for each species' status within the region that is based upon the existing literature and the professional judgment of the technical experts that were consulted. Each species' population trend was based upon an evaluation of the existing statewide or regional data over the past fifty years. The species are sorted alphabetically within larger taxonomic groups: amphibians, birds, fish, invertebrates, mammals, and reptiles for easy reference. Symbols for trends are: D = declining, S = stable, U = unknown and I = increasing.

| Group | Species of Greatest Conservation Need Common or Scientific Name | Status within the Region | Trend in Population Size |
|---|---|---|---|
| Amph | Crawfish Frog | uncommon and locally occurring around breeding ponds in prairie landscapes in the eastern half of the region | U |
| Bird | American Golden Plover | common spring and fall migrant throughout the region; uses recently burned or hayed prairies as well as wet meadows and wetlands | U |
| Bird | Barn Owl | uncommon year-round resident; found locally in agricultural landscapes where suitable buildings provide roosting and nesting sites | U |
| Bird | Bell's Vireo | uncommon summer resident; found in plum and other deciduous thickets within prairies | D |
| Bird | Buff-breasted Sandpiper | rare spring and fall migrant throughout the region; uses recently burned or hayed prairies as well as wet meadows and wetlands | D |
| Bird | Greater Prairie-Chicken | uncommon and locally occurring in large tallgrass prairie landscapes; most of the population occurs in the counties along the Kansas state line | D |
| Bird | Harris's Sparrow | common winter resident; found in areas of woody thickets within prairies | U |
| Bird | Henslow's Sparrow | rare summer resident; small numbers nest in scattered tracts of tallgrass prairie where tall standing dead vegetation exists in the spring | U |
| Bird | LeConte's Sparrow | common spring and fall migrant; uncommon winter resident; occurs in tracts of tallgrass prairie with relatively tall standing vegetation | U |

| Group | Species of Greatest Conservation Need Common or Scientific Name | Status within the Region | Trend in Population Size |
|---|---|---|---|
| Bird | Loggerhead Shrike | uncommon year-round resident; occurs in prairie landscapes where sparse trees provide nesting and perching sites | D |
| Bird | Northern Bobwhite | common year-round resident in prairies with scattered brush and thickets that provide cover | D |
| Bird | Prairie Falcon | rare winter resident; a few birds winter in the region on open prairies | U |
| Bird | Short-eared Owl | common winter resident in large tracts of grassland with dense standing vegetation; rare nesting species in the Flint Hills | U |
| Bird | Smith's Longspur | uncommon winter resident; occurs in grazed prairies and early succession grasslands | U |
| Bird | Sprague's Pipit | uncommon spring and fall migrant; occurs in heavily grazed or disturbed prairies | U |
| Bird | Swainson's Hawk | rare summer resident; a few pairs appear to nest in the southern edge of the region near the Arkansas River | U |
| Bird | Upland Sandpiper | common spring and fall migrant throughout the region; common nesting species in grasslands in the northern half of the region | I |
| Invert | American Burying Beetle | uncommon but widespread in the Flint Hills section; rare and locally occurring in the prairies of the Osage Plains; federally listed as an endangered species | U |
| Invert | Arogos (Iowa) Skipper | locally common in native tallgrass prairie and open oak woodlands region wide | U |
| Invert | Byssus Skipper | rare and locally occurring in ungrazed or lightly grazed prairie; dependent upon Eastern Gama Grass as a larval host plant | U |
| Invert | Dotted Skipper | rare and locally-occurring in prairies in the Flint Hills | U |
| Invert | Loamy-ground Tiger Beetle | common but locally-occurring in tallgrass prairies; distribution incompletely documented | U |
| Invert | Prairie Mole Cricket | uncommon and locally-occurring in large tracts of native tallgrass prairie across the region | D |
| Invert | Rattlesnake Master Borer Moth | rare species whose presence is difficult to document because of its short adult lifespan; in Oklahoma it has been documented only from Osage County; federal candidate species | U |
| Invert | Regal Fritillary | rare; found in the northern half of the region | U |
| Invert | Shadow Gloss Snail | uncommon and locally-occurring; distribution has been incompletely documented | U |
| Invert | Wax Coil Snail | locally common in the Flint Hills sections; some questionable identifications exist | U |
| Mamm | Eastern Harvest Mouse | rare and locally occurring; to date, populations have been documented at a few sites in tallgrass prairie and open oak woodland habitats | U |
| Rept | Massasauga | uncommon; found in prairies along the Kansas state line | U |
| Rept | Texas Horned Lizard | rare and locally occurring at a few sites in the Flint Hills section of the region | D |

APPENDIX C

WILDLIFE HABITAT APPRAISAL PROCEDURE (WHAP) SUMMARY REPORT

OOLOGAH LAKE MASTER PLAN

ROGERS AND NOWATA COUNTIES, OKLAHOMA

US Army Corps of Engineers ®
Tulsa District

October 2020

# Table of Contents

# Introduction

Habitat assessments were conducted at Oologah Lake on September 21-24th, 2020 using Texas Parks and Wildlife Department's (TPWD) Wildlife Habitat Appraisal Procedure ([WHAP] TPWD 1995). WHAP survey point locations were haphazardly preselected based on aerial imagery from existing Geographical Information Systems (GIS) data by the project delivery team (PDT) and the staff from the Oologah Lake Office. A total of 74 WHAP points were surveyed, all within U.S. Army Corps of Engineers (USACE) fee boundary (Figures 1-4).

The purpose of this report is to describe wildlife habitat quality within the USACE Oologah Lake fee-owned property in Rogers and Nowata Counties, Oklahoma. This report is being prepared by the USACE Regional Planning and Environmental Center to provide habitat quality information and inform land classifications as part of the Oologah Lake Master Plan revision process.

# Study Area

The study area for the WHAP consists of approximately 50,150 acres of USACE fee owned property at Oologah Lake, located northeast of the city of Tulsa, Oklahoma and is near to the cities of Nowata, Oologah, and Claremore. USACE property at Lake Oologah is located within the Central Irregular Plains Ecoregion as defined by the Environmental Protection Agency (EPA). The Lake's serves as a water source for the Tulsa metropolitan area and is supplied primarily by the Verdigris River, which is part of the Mississippi River watershed.

# Methodology

An interagency team of biologists, engineers, and USACE Park Rangers conducted the habitat surveys on September 21-24$^{th}$, 2020. TPWD's WHAP protocol was used to analyze and describe existing habitats.

The WHAP requires evaluating representative sites of each cover type present within an area of interest. For this project, a search area of 0.1 acre (circle with radius of 37.2 feet) was used at each WHAP site to compile a list of plant species occurring at each site and to complete the Biological Components Field Evaluation Form (https://tpwd.texas.gov/publications/pwdpubs/media/pwd_rp_w7000_0145.pdf). Field data collected on the form at each WHAP site included the following components:

1. Site Potential
2. Temporal Development of Existing Successional Stage
3. Uniqueness and Relative Abundance
4. Vegetation Species Diversity
5. Vertical Vegetation Stratification
6. Additional Structural Diversity
7. Condition of Existing Vegetation

At each site, a 1/10th acre plot was evaluated, and points were assigned to all applicable components based on field conditions. A habitat quality score, where values range from 0.0 (low

quality) to 1.0 (high quality), was then calculated for each site by adding together all points and multiplying by 0.01. Habitat quality was then determined for all sites within the same habitat type.

Photographs were taken at each site and are included as Attachment B. The TPWD developed the WHAP to allow a qualitative, holistic evaluation of wildlife habitat for particular tracts of land statewide without imposing significant time requirements in regard to field work and compilation of data (TPWD 1995). The WHAP was not designed to evaluate habitat quality in relation to specific wildlife species.

The WHAP is based on the following assumptions:

1. Vegetation structure including species composition and physiognomy is itself sufficient to define the habitat suitability for wildlife;

2. A positive relationship exists between vegetation diversity and wildlife species diversity;

3. Vegetation composition and primary productivity directly influence population densities of wildlife species.

As designed, the WHAP is intended to be used for the following applications:

1. Evaluating impacts upon wildlife populations from specific development project alternatives.

2. Establishing baseline data prior to anticipated or proposed changes in habitat conditions for specific areas.

3. Comparing tracts of land that are candidates for land acquisition or mitigation.

4. Evaluating general habitat quality and wildlife management potential for tracts of land over large geographical areas, including wildlife planning units.

The WHAP protocol can be used to assess a wide range of habitats; however, it was originally developed to assess and develop mitigation requirements for loss of bottomland hardwoods and other aquatic habitats. Scores can screw higher for these habitats based on how the scoring is allotted to each WHAP habitat component. Upland forest and grassland habitat types cannot reach a score indicative of high-quality habitat, although they may exhibit high quality features. Subsequently, high quality upland habitat may not be identified or can be overlooked.

Grasslands, in particular, fall into this category. Consider the Site Potential component with a maximum score of 0.25 points, it allocates more points based on higher hydrologic connectivity. In order to receive the highest score for this component, the area must exhibit at least one of the following: at least periodically support predominately hydrophytic vegetation, is predominately undrained hydric soil and supports or is capable of supporting hydrophytic vegetation, and/or is saturated with water or covered by shallow water during 1-2 months during the growing season of each year. In a grassland setting, when conditions become conducive to hydrophytic plant growth, a successional shift from a grassland to herbaceous wetlands, swamps, or riparian forest is likely to occur. Therefore, grasslands would almost always be limited to a maximum score of 0.12 points (uplands with thick surface layer).

Similarly, grasslands would be limited to a maximum of 0.12 points for the Temporal Development of Existing Successional Stage component, whereas other forested habitats could receive the full 0.25 points.

These two components alone regularly exclude grassland habitat from receiving 0.26 points on the WHAP scale. In order to identify the maximum score each habitat type can receive, USACE environmental staff scored each criterion given ideal conditions for riparian/bottomland hardwood forest (BHF), upland forest (includes all non-riparian/BHF forests), grassland, swamp, and marsh habitats. The maximum values scores, shown in Table 1, were then used to normalize

scores for habitats that are prevented from reaching the maximum WHAP score primarily due to arbitrary low scores in the two WHAP components described above. Normalizing habitat scores will identify high quality habitat that would otherwise not be detected.

**Table 1. Maximum Total Score per Habitat Type**

| Cover Type | Component Number | | | | | | | | Maximum Total Score |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 7B | |
| Swamp | 20 | 20 | 20 | 20 | 5 | 5 | 5 | 5 | 1.00 |
| Marsh | 25 | 20 | 20 | 20 | NA | 5 | 10 | NA | 1.00 |
| Riparian/BHF | 25 | 20 | 20 | 15 | 5 | 5 | 5 | 5 | 1.00 |
| Upland Forest | 12 | 20 | 20 | 15 | 5 | 5 | 5 | 5 | 0.87 |
| Grassland | 12 | 12 | 20 | 6 | 3 | 5 | 5 | 5 | 0.68 |

Swamp, marsh, and riparian/BHF habitats can all achieve the maximum score, therefore, no normalization of scores were made for these habitat types. Upland forests and grasslands, however, can only reach within 0.13 and 0.32 points of the maximum WHAP score, even in ideal conditions.

To evaluate all habitat types on an even scoring basis, upland forest and grassland scores were normalized by dividing their original scores by the maximum possible score for their respective habitat types. For example, if a grassland site received an initial score of 0.42, it would be divided by the maximum total points a grassland site can receive, 0.68. The normalized total score used for further analysis for the grassland site would be 0.61.

This adjustment allows habitat type scores to be analyzed and compared to their corresponding habitat type maximum total score. Rather than, for instance, a grassland being evaluated on a bottomland hardwood scoring scale.

All WHAP scores analyzed and discussed from here forward reflect the normalized total scores. As mentioned above, swamp, marsh, and riparian/BHF habitats were not normalized as they can already achieve maximum scores. Grassland scores were normalized by dividing initial scores by 0.68, while all upland forest scores were normalized by dividing the initial score by 0.87.

# Habitat

The Oklahoma Biodiversity Task Force was created to write a comprehensive report on the State's biological and ecological assets. In 1996, the report was published and describes the Central Irregular Plains ecoregion:

- The ecoregion the study is located in is historically known to be mostly tallgrass prairie, dominated by big and little bluestem, Indian grass, Switchgrass, Sunflower, Indian Blanket, Blazing Star, with Persimmons in drainage areas.

- Upland forests in the ecoregion occur nearer to water, and are dominated by Post Oak, Blackjack Oak, and Black Hickory; they are also known to have dominant prairie plants grow in unshaded portions of the forest floor. Sumac, Coralberry, and Persimmon are commonly found growing along the edges of these forests.

- Floodplain areas in the ecoregion are known to support forests of Elm, Oak, Hackberry, Cottonwood, and Sycamore. These forested areas tend to have less understory growth due to their potential to flood and heavy shading. Unshaded areas tend to have Sumac, Elderberry, and Strawberry bushed along with grasses and herbaceous plants. In more inundated areas, sedges, buttonbush, and willows occur along floodplain edges and in floodplain wetlands.

Using GIS data from the Oklahoma Ecological Systems Classification and mapping project (OESC), the most common habitat types were calculated within the USACE fee boundary at Lake Oologah. This was done by taking the cell count for each habitat type and multiplying it by the cell size (100 square meters) and then converting the resulting approximate area into acres. These habitat types were merged into simpler habitat types that can be used to easily classify the WHAP points for the survey and are detailed in Table 3. The simplification of habitat types also assists with the score normalization discussed in the Methodology section.

**Table 2. OESC Habitat Type Acreage at Oologah Lake**

| Count (cell) | OESC Habitat Type | Area (m2) | Area (Acre) |
|---|---|---|---|
| 1211534 | Open Water | 121,153,400 | 29937.61 |
| 315172 | South Central Interior: Bottomland Hardwood Forest | 31,517,200 | 7788.06 |
| 192378 | Ruderal Deciduous Woodland | 19,237,800 | 4753.76 |
| 84517 | South Central Interior: Bottomland Herbaceous Wetland | 8,451,700 | 2088.46 |
| 74978 | Crosstimbers: Post Oak - Blackjack Oak Forest and Woodland | 7,497,800 | 1852.74 |
| 54888 | Ruderal Deciduous Shrubland and Young Woodland | 5,488,800 | 1356.31 |
| 39919 | Osage Plains: Tallgrass Prairie/Pasture | 3,991,900 | 986.42 |
| 28698 | Eastern Great Plains: Herbaceous Wetland | 2,869,800 | 709.14 |
| 12885 | Urban Low Intensity | 1,288,500 | 318.39 |
| 11606 | Crosstimbers: Post Oak - Blackjack Oak Slope Forest | 1,160,600 | 286.79 |
| 10412 | South Central Interior: Riparian Hardwood Woodland | 1,041,200 | 257.29 |
| 6651 | South Central Interior: Bottomland Shrubland and Young Woodland | 665,100 | 164.35 |
| 6047 | Row Crops | 604,700 | 149.42 |
| 3578 | South Central Interior: Riparian Shrubland and Young Woodland | 357,800 | 88.41 |

| Count (cell) | OESC Habitat Type | Area (m2) | Area (Acre) |
|---|---|---|---|
| 2337 | South Central Interior: Riparian Herbaceous Wetland | 233,700 | 57.75 |
| 1315 | Disturbed Soil Pasture | 131,500 | 32.49 |
| 1257 | Crosstimbers: Pasture/Prairie | 125,700 | 31.06 |
| 1121 | South Central Interior: Bottomland Barrens | 112,100 | 27.70 |
| 554 | South Central Interior: Bottomland Eastern Redcedar Woodland and Shrubland | 55,400 | 13.69 |
| 498 | Crosstimbers: Young Post Oak - Blackjack Oak Woodland | 49,800 | 12.31 |
| 454 | Barren | 45,400 | 11.22 |
| 39 | South Central Interior: Bottomland Mixed Evergreen - Hardwood Forest | 3,900 | 0.96 |
| 21 | Ruderal Eastern Redcedar Woodland and Shrubland | 2,100 | 0.52 |
| 15 | South Central Interior: Riparian Barrens | 1,500 | 0.37 |
| 11 | Urban High Intensity | 1,100 | 0.27 |
| 2 | Quarry | 200 | 0.05 |

**Table 3. Number of Sites Sample by Habitat Type**

| Habitat Group | Number of Sites Sampled |
|---|---|
| Marsh | 8 |
| Riparian/BHF | 12 |
| Grassland | 17 |
| Upland Forest | 37 |
| **Grand Total** | **74** |

The OESC used habitat descriptions provided by NatureServe, Hoagland (2000) and Bruner (1931) in order to classify habitat. These descriptions were meant to be broad and depict typical vegetative assemblages across vast areas as the observable vegetation communities can vary based on local conditions. The habitat types found within the fee-boundary of USACE property at Lake Oologah are as follows:

Barren:
This type consists of areas that were largely unvegetated at the time of satellite remote sensing data collection (circa 2012).

Crosstimbers: Pasture/Prairie:
This type is mapped essentially from the southern border to the northern border of Oklahoma, and across the east to west extent of the Crosstimbers and transition zone to central Oklahoma. In the modern landscape, non-native and grazing-tolerant species dominate most areas. Common species include Bermudagrass, field brome, western (Cuman) ragweed, and tall fescue. More lightly-grazed areas or hay meadows may have species such as little bluestem, silver bluestem, switchgrass, big bluestem, sideoats grama, and yellow Indiangrass. Woody species such as post oak, pecan, blackjack oak, winged elm, eastern redcedar, honeylocust, Osage orange, and common persimmon may be components.

Crosstimbers: Post Oak - Blackjack Oak Slope Forest
This type is mapped on slopes >20% and composition is similar

to Crosstimbers: Post Oak – Blackjack Oak Forest, although these stands tend to have more canopy and more often contain older trees. Common components include post oak, blackjack oak, black hickory, green ash, winged elm, redbud, and rough dogwood.

Crosstimbers: Post Oak - Blackjack Oak Forest and Woodland:
This type is mapped on typical woodland soils across a wide swath of central Oklahoma. Woodland quality and successional state varies within the type. Common dominants include post oak, blackjack oak, black hickory, black oak, winged elm, pecan, and Shumard oak. Eastern redcedar is a common component. Understory species may include coralberry, eastern redbud, rough dogwood, common persimmon, and gum bumelia.

Crosstimbers: Young Post Oak - Blackjack Oak Woodland:
This type represents pastures and woodland edges with sparse successional vegetation, including shrubs and trees. Common woody species include blackjack oak, post oak, winged elm, sumac species, hackberry species, common persimmon, honeylocust, gum bumelia, and pecan. Herbaceous areas have species such as Bermudagrass, field brome, tall fescue, purpletop tridens, little bluestem, and silver bluestem. Vines such as eastern poison ivy and greenbriar species are common.

Disturbed Soil Pasture:
This type is mapped over soils defined as disturbed by digital soil surveys (e.g. slickspots, pits). Non-native and disturbance species such as Bermudagrass, tall fescue, Johnsongrass, winged elm, and honeylocust are common components.

Eastern Great Plains: Herbaceous Wetland
This type circumscribes all varieties of herbaceous wetlands. Common components include sedge and rush species, spikerush species, cattails, smartweeds, and moist-soil grasses.

Osage Plains: Tallgrass Prairie/Pasture:
This type circumscribes a variety of mainly grazed grasslands, but some native hay meadows are also represented. In the modern landscape, non-native and grazing-tolerant species such as Bermudagrass, tall fescue, field brome, western (Cuman) ragweed, prairie broomweed, and sericea lespedeza are common. Some areas have native tallgrass elements such as little bluestem, switchgrass, big bluestem, heath aster, and Canada goldenrod. Woody elements may include common persimmon, eastern redcedar, sugar hackberry, elm species, and honeylocust.

Quarry:
This type is mapped where evidence of quarries, with bare ground, was present, only in the eastern half of the state.

Row Crops:
This type includes all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops and tame hay fields are generally mapped as prairie/pasture types.

Ruderal Deciduous Woodland:
This type is mapped on prairie soils across much of the state and consists mainly of relatively closed woodlands that vary a great deal in composition. Common woody species may include hackberry species, green ash, other ash species, elm species, honeylocust, black locust, catalpa, western soapberry, pecan, oak species, winged elm, and Osage orange. Eastern redcedar may be a component.

Ruderal Deciduous Shrubland and Young Woodland:
This type is mapped on prairie soils across much of the state and consists of mainly successional young woodlands or shrublands, although some more natural communities may occur. Common components vary from region to region, and may include honeylocust, winged elm, black locust, post oak, blackjack oak, pecan, Chickasaw plum, western soapberry, common persimmon, green ash, sumac species, hackberry species, elm species, and Osage orange. Eastern redcedar is not a major component of these communities but may be present.

Ruderal Eastern Redcedar Woodland and Shrubland:
This type is mapped on prairie soils across much of the state, and consists of shrublands or woodlands where eastern redcedar is the most important species. Common woody components vary by region, and may include hackberry species, winged elm, other elm species, ash species, post oak, honeylocust, black locust, western soapberry, lotebush, post oak, and Osage orange.

South Central Interior: Bottomland Hardwood Forest:
This type is mapped on bottomland soils across a variety of hydrologic regimes and various stages of disturbance. Common canopy dominants may include pecan, green ash, slippery elm, sycamore, sugar hackberry, honeylocust, boxelder, Shumard oak, bur oak, black willow, and American elm. Vines such as eastern poison ivy, grape species, peppervine species, Virginia creeper, and greenbriar species may be conspicuous components. Herbaceous species many include species such as Virginia wildrye, Indian woodoats, longleaf woodoats, Johnsongrass, Bermudagrass, and sedge species.

South Central Interior: Bottomland Herbaceous Wetland:
This type is mapped on bottomland soils across a variety of hydrologic regimes and may circumscribe a variety of herbaceous wetlands. Common components include sedge and rush species, spikerush species, cattails, smartweeds, and moist-soil grasses.

South Central Interior: Riparian Hardwood Woodland
This type is mapped along first and second order streams within narrow buffers, and is represented by vegetation influenced by a variety of water regimes and human impacts. Common canopy dominants may include pecan, post oak, Shumard oak, green ash, slippery elm, sycamore, sugar hackberry, honeylocust, boxelder, bur oak, black willow, and American elm.

South Central Interior: Bottomland Shrubland and Young Woodland:
This type is mapped on bottomland soils across a variety of hydrologic regimes and various stages of disturbance. Common shrubs or small trees include

willow species, common buttonbush, green ash, winged elm, gum bumelia, sugar hackberry, boxelder, possumhaw, honeylocust, and black walnut. Vines such as eastern poison ivy, grape species, peppervine species, Virginia creeper, and greenbriar species may be conspicuous components. Herbaceous species many include species such as field brome, Bermudagrass, little barley, Johnsongrass, Virginia wildrye, and sedge species.

South Central Interior: Riparian Shrubland and Young Woodland:
This type is mapped along first and second order streams within narrow buffers, and is represented by vegetation influenced by a variety of water regimes and human impacts. Common shrubs or small trees include willow species, common buttonbush, green ash, slippery elm, winged elm, gum bumelia, sugar hackberry, boxelder, possumhaw, honeylocust, post oak, pecan, and black walnut. Vines such as eastern poison ivy, grape species, peppervine species, Virginia creeper, and greenbriar species may be conspicuous components. Herbaceous species many include species such as field brome, Bermudagrass, tall fescue, little barley, Johnsongrass, Virginia wildrye, and sedge species.

South Central Interior: Riparian Herbaceous Wetland
This type is mapped along first and second order streams within narrow buffers and may circumscribe a variety of herbaceous wetlands. Common components include sedge and rush species, spikerush species, cattails, smartweeds, and moist-soil grasses.

South Central Interior: Bottomland Barrens:
This type is mapped where barrens occurred in river bottoms at the time of data collection, and may include sand or mud bars, riverbeds, and other barren or sparsely vegetation areas.

South Central Interior: Bottomland Eastern Redcedar Woodland and Shrubland:
This type is mapped on bottomland soils where eastern redcedar is the prevailing dominant. Other components may include species such as green ash, gum bumelia, hackberry species, willow species, and elm species. Shortleaf or loblolly pine may be the dominant in the Ouachita region.

South Central Interior: Bottomland Mixed Evergreen - Hardwood Forest:
This type is mapped on bottomland soils across a variety of hydrologic regimes and may circumscribe a variety of herbaceous wetlands. Common components include sedge and rush species, spikerush species, cattails, smartweeds, and moist-soil grasses.

South Central Interior: Riparian Barrens:
This type is mapped where barrens occurred in narrow riparian areas at the time of data collection, and may include sand gravel bars, riverbeds, bare rock, and other barren or sparsely vegetation areas.

Urban Low Intensity:
This type includes areas that are built-up or partially cleared of vegetation but not entirely covered by impervious cover, and includes most of the non-industrial

areas within cities and towns.

Urban High Intensity:
This type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.

# Results and Discussion

The total habitat score for each point surveyed is a representation of multiple habitat attributes including vegetative diversity and structure, site soil potential, successional stage, and uniqueness of that habitat across the landscape. Data analysis highlights are discussed below, while detailed data for each point surveyed can be found in Appendix A: Oologah Lake WHAP Summary Results at the end of this report.

Upland Forest (N=37) and Grassland (N=17) were the most abundant habitat types surveyed. Upland forest scores ranged from 0.41 to 0.95, whereas Grassland scores ranged from 0.38 to 0.88. The lower end scores may be reflective of flooding events in the last two to three years that do not allow for more plant diversity and higher quality overall, and results in plant mortality. Flooding of Federal lands is a common occurrence at Corps lakes and this phenomenon is seen in other WHAPs.

Figures 9-12 show the range of total scores for all points surveyed (N = 74), with any points removed that were skipped due to inaccessibility or multiple points occurring in the same area. Figures 13 and 14 show points that scored greater than or equal to 0.7 and 0.8, respectively.

Overall, Marsh and grassland habitats exhibited the highest average total score (0.68 and 0.61). It is likely that the Marsh habitats scored higher on average due to their smaller sample size (N=8), and that Marshes typically score higher due to increased site potential; taking that into consideration, upland forests (N=37) had an average score of 0.61. The overall average score for the WHAP was 0.61.

It is likely that the higher average scores seen in grasslands, which includes prairie habitat, are attributable with being historically consistent with the ecoregion, exhibiting thick upland soil layers with excellent herbaceous diversity, the inclusion of drupe or berry-bearing woody species, and providing forage, bedding, and habitat material for wildlife.

Upland forest habitat sampled in this WHAP can also be compared to typical historical habitat for the ecoregion; they are mostly dominated by the same tree species with some prairie herbaceous plants growing in unshaded portions. Most of the points (23 out of 37) were identified as ruderal, or young, woodlands. This identification was made using the OESC GIS data overlaid onto the survey points and then comparing the habitat while surveying. Young woodlands tend to exist in areas of disturbance, such as flooding, and contain berry and drupe species that are important to wildlife as well as scattered mature and young trees that may offer shelter to wildlife. The average diversity of woody species and number of woody species was medium (4.08 and 3.70), and the average amount of herbaceous plants scored at 3.16. These averages together, indicate that the upland forest sites, on average, contained approximately 4 groups of woody species, 10 total woody species, and 4-7 herbaceous species.

**Table 4. Average, Maximum, and Minimum Total Scores per Habitat Type**

| Habitat Type | Average Total Score | Maximum Total Score | Minimum Total Score |
|---|---|---|---|
| Upland Forest | 0.61 | 0.95 | 0.41 |
| Grassland | 0.64 | 0.88 | 0.38 |
| Riparian/BHF | 0.54 | 0.68 | 0.41 |
| Marsh | 0.68 | 0.85 | 0.53 |

Beyond vegetative diversity, the three major metrics within the WHAP scoring criteria that allocate points are for site potential, successional stage, and uniqueness and relative abundance. Table 5 shows these metrics' average score per habitat type.

**Table 5. Average Site Potential, Successional Stage, and Uniqueness and Relative Abundance per Habitat Type**

| Habitat Type | Average Site Potential | Average Successional Stage | Average Uniqueness and Relative Abundance |
|---|---|---|---|
| Upland Forest | 12.35 | 9.53 | 9.32 |
| Grassland | 11.18 | 5.00 | 8.24 |
| Riparian/BHF | 11.83 | 9.50 | 10.83 |
| Marsh | 25.00 | 8.13* | 15.00 |

*Marsh uses a different metric for successional stage; average score is the marsh metric for successional stage

Site potential allocates more points based on soil substrates characteristics and hydrologic connectivity that can support hydrophytic habitats, such as marshes, swamps, and bottomland hardwood forests that are often considered to be higher quality, more diverse habitat. This allows areas to score higher even though a recent disturbance, such as fire or flood, may have removed most of the vegetation. Areas scoring high in site potential but low in other metrics can be targeted for management efforts as these areas' vegetation community response should be favorable, thus increasing habitat value.

Successional stage refers to the age of the vegetative community. Older, mature forests, as do climax prairies, score higher than younger pole stands or disturbed grasslands as they provide more diverse forage, cover, and niche habitats. These scores are expected to increase across the board except in areas around the lake that may not have the soil types to support hydrophytic vegetation and are flooded frequently enough to limit upland forest or grassland growth and development.

Uniqueness and Relative Abundance takes into consideration the rarity of a habitat or vegetative community and its abundance in the region. Ongoing urban expansion, agricultural disturbance, and flooding reduces the amount of historically typical habitat seen in the study area. As these factors continue to disturb the surrounding area, it is likely that the habitat at Oologah Lake will increase in overall wildlife value and uniqueness.

Riparian forests are typically found in highly productive soils and consist of vegetation communities that persist and even thrive when exposed to frequent or extended periods of flooding. As such, these areas typically exhibit the highest average site potential, successional stage, and uniqueness and relative abundance scores, but in this study, they were marginally

outranked in site potential and successional stage by the more diverse upland forests. Riparian forests, did however, exhibit the highest average uniqueness and relative abundance for non-wetland sites.

Two additional sites were added, listed as points 111 and 112, upon the recommendation of the Ranger staff at Lake Oologah. Points 111 and 112 were identified as Canebrake habitat and are known to provide unique habitat for selective species such as the Swamp Hare. These sites did not score particularly high (both score 0.59), but it is worth noting their value as unique habitat to the Oologah Lake ecosystem.

Only 6 out of the 74 points surveyed had a score of 0.80 or above (with score adjustment), indicating very high-quality habitat. Points 32, 65, 29, and 72 were upland forests, point 36 was a grassland site, and point 80 was a marsh site. These points scored high on successional stage and uniqueness and relative abundance compared to the other points.

In summary, combining the WHAP analytical analysis, continued urban development, and spatial distribution of higher scoring points, the Central Northern side of the Lake was identified as having higher quality in relation to the remaining lands administered by USACE at Oologah Lake. This area includes the 6 points that scored 0.8 or above for the entire WHAP, as well as points that scored 0.6 or higher.

## Recommendations

Based on the WHAP survey results, areas to consider for the Wildlife Management or Environmentally Sensitive Areas land classifications include those areas having the highest scores and scores that were above average across all habitat types ($\bar{x}$=0.61). Oologah Lake exhibits diverse habitat, with high quality habitat found in each type.

As time passes and urbanization and anthropogenic factors continue to disturb habitat in the surrounding area, it is likely that habitat at Lake Oologah will become more valuable to wildlife. Any conservation and beneficial land management practices currently in place, such as prescribed fire, should continue.

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Oologah Lake WHAP Summary Result Figures:

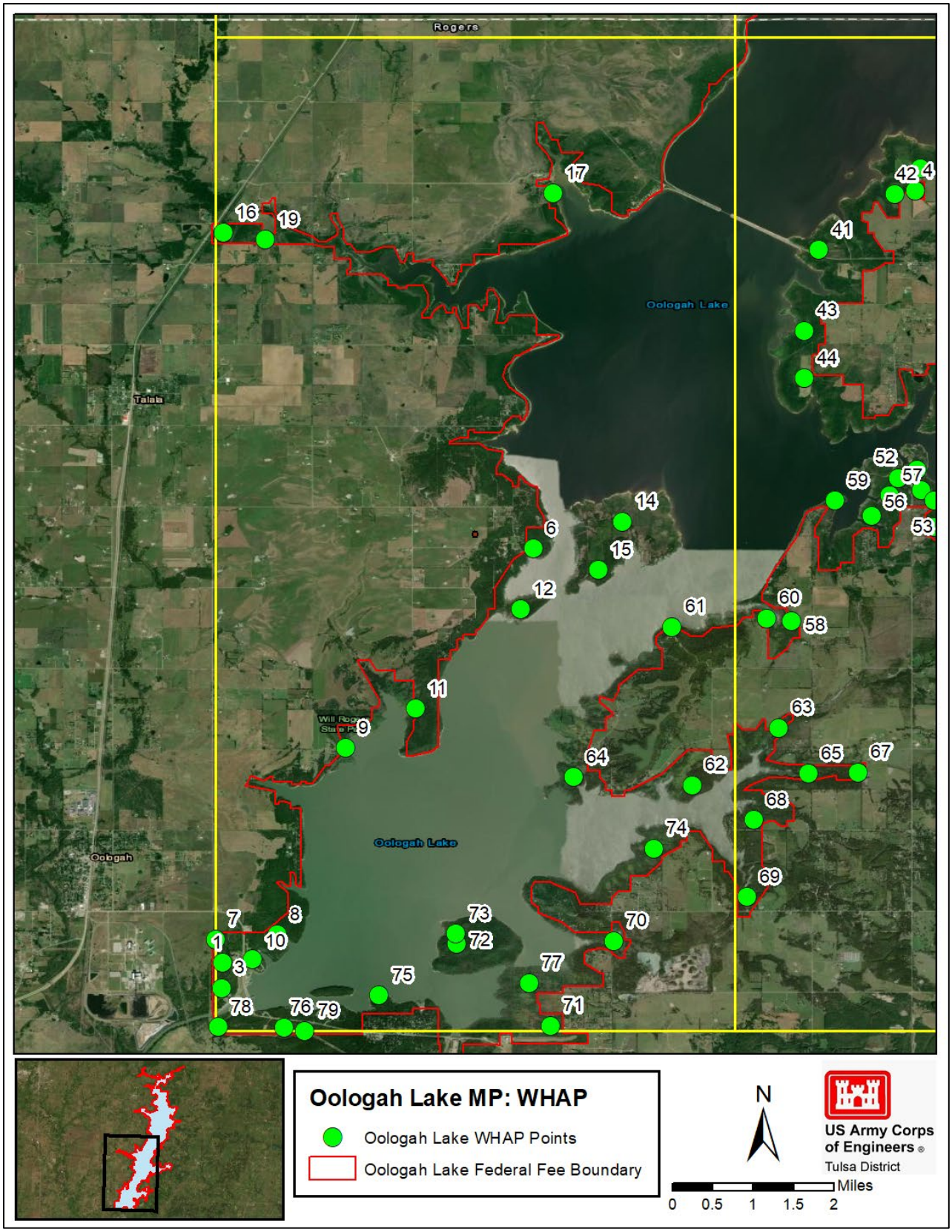
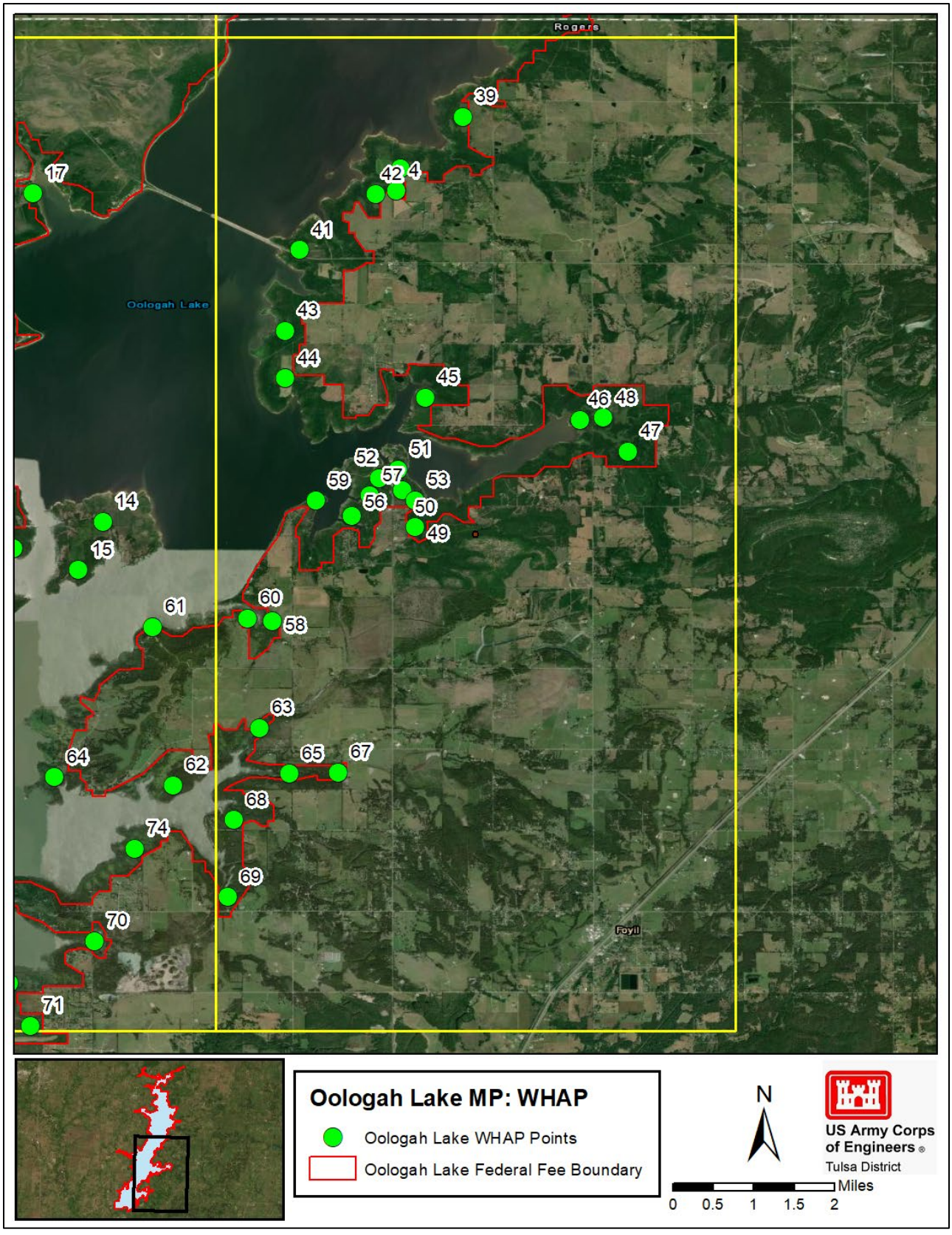



**Figure 1. Distribution of WHAP Points at Oologah Lake**

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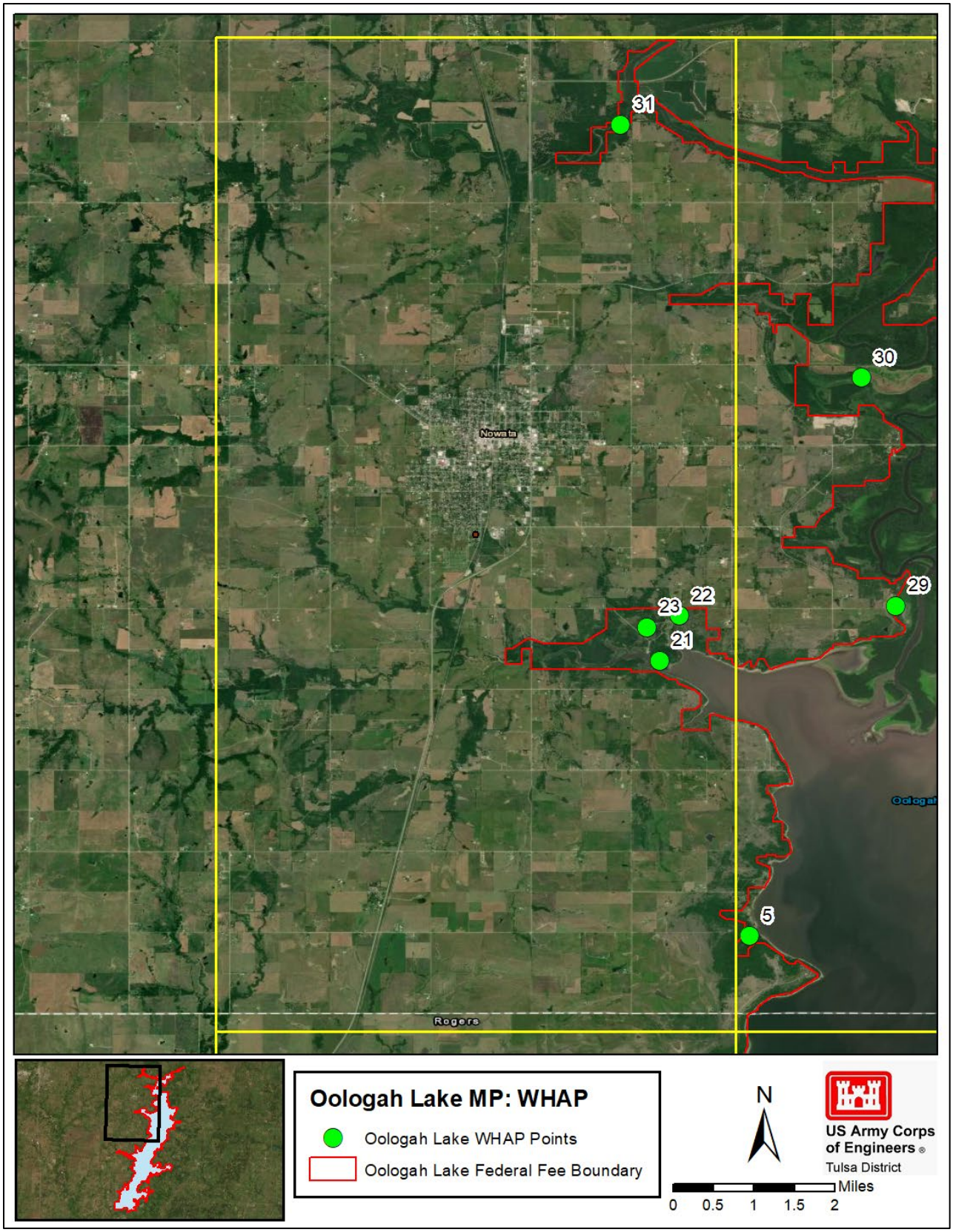


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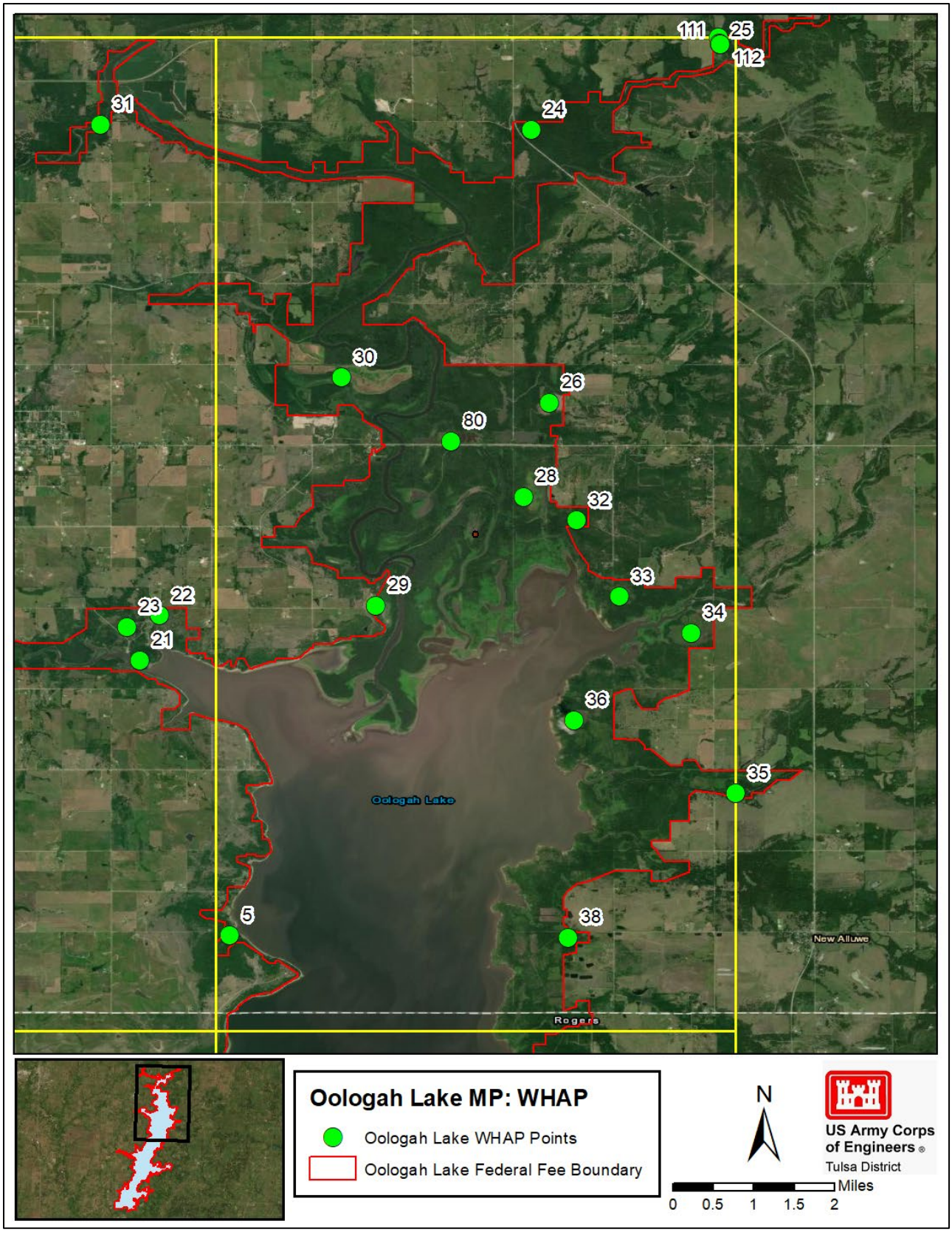


**Figure 4. Distribution of WHAP Points at Oologah Lake**

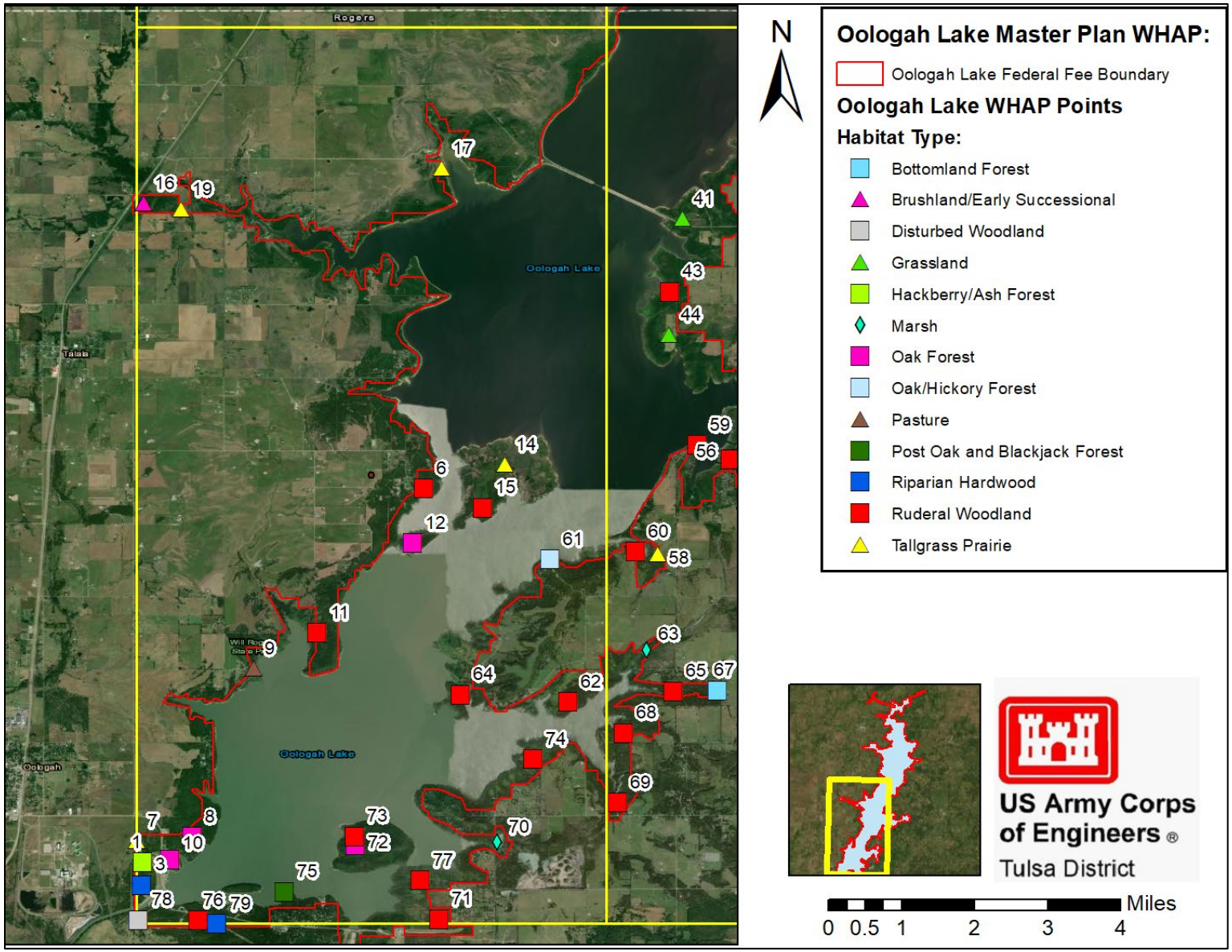


**Figure 5. Habitat Distribution of WHAP Points at Oologah Lake**

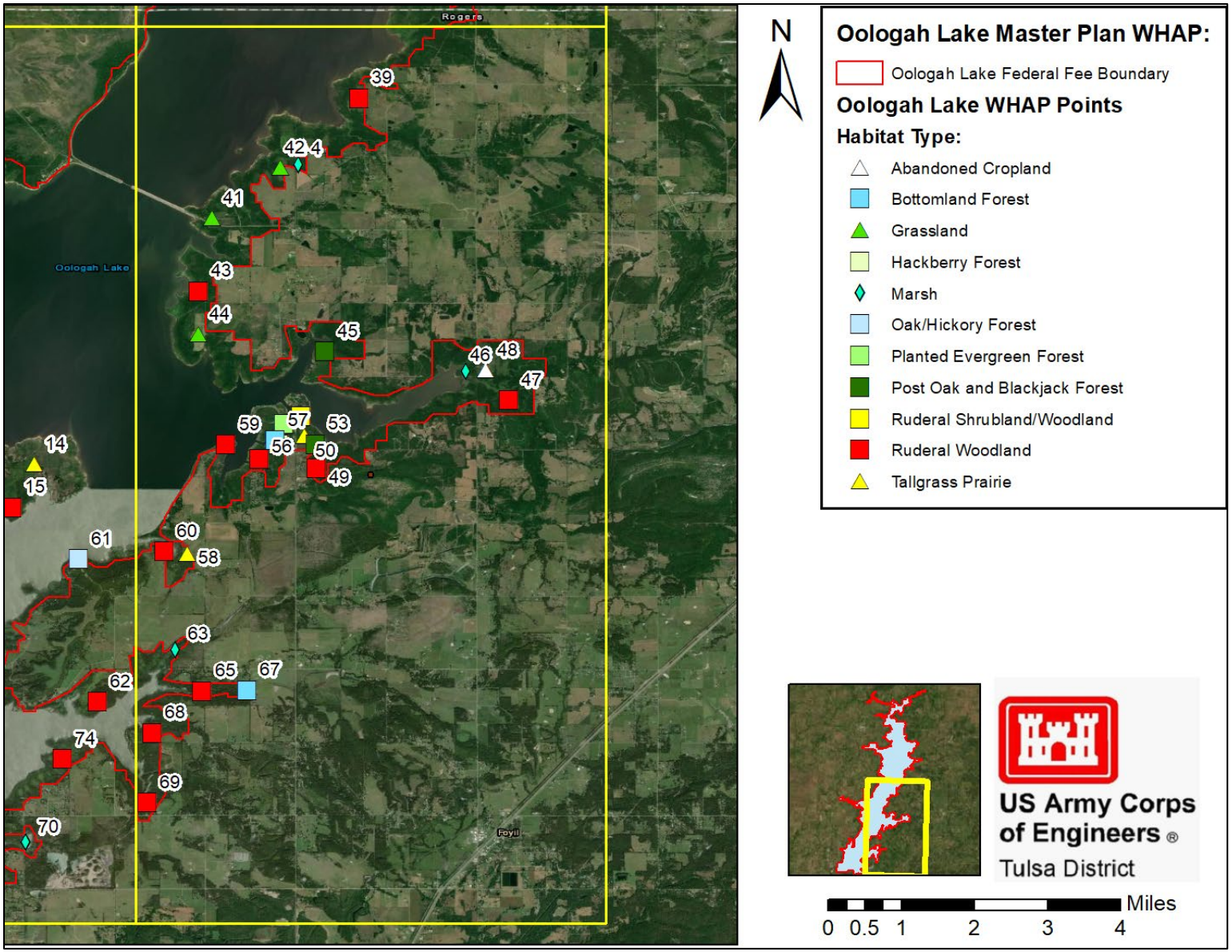


**Figure 6. Habitat Distribution of WHAP Points at Oologah Lake**

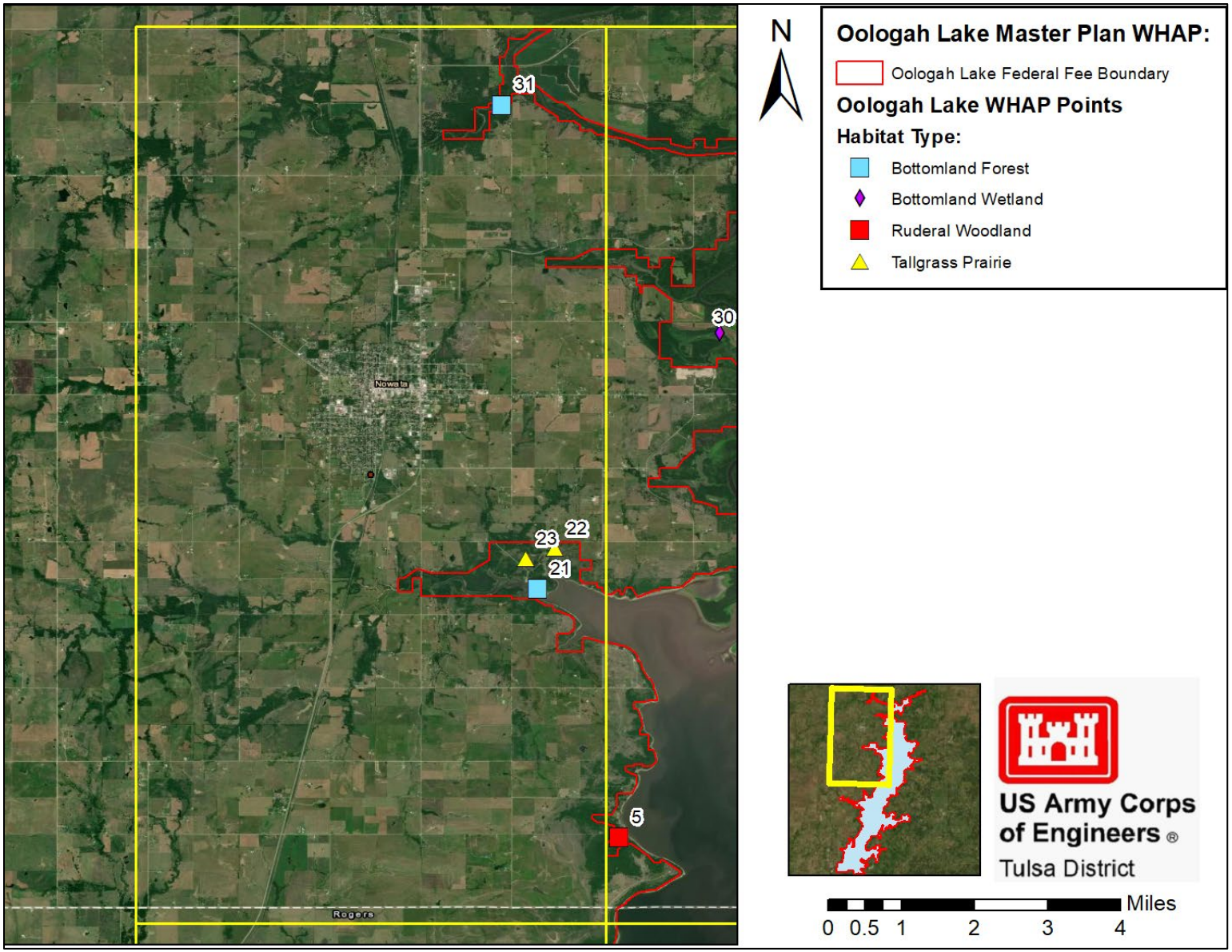


**Figure 7. Habitat Distribution of WHAP Points at Oologah Lake**

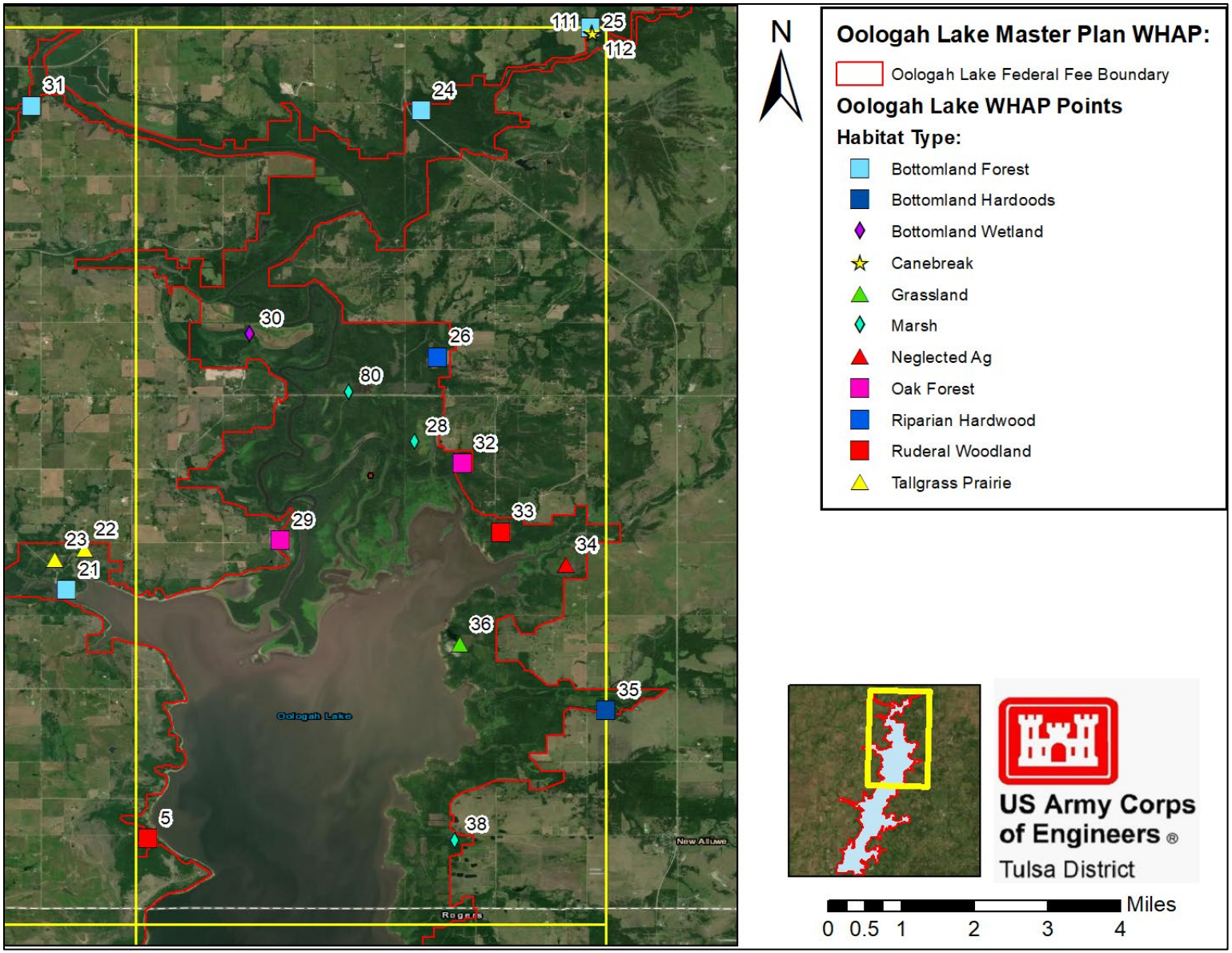


**Figure 8. Habitat Distribution of WHAP Points at Oologah Lake**

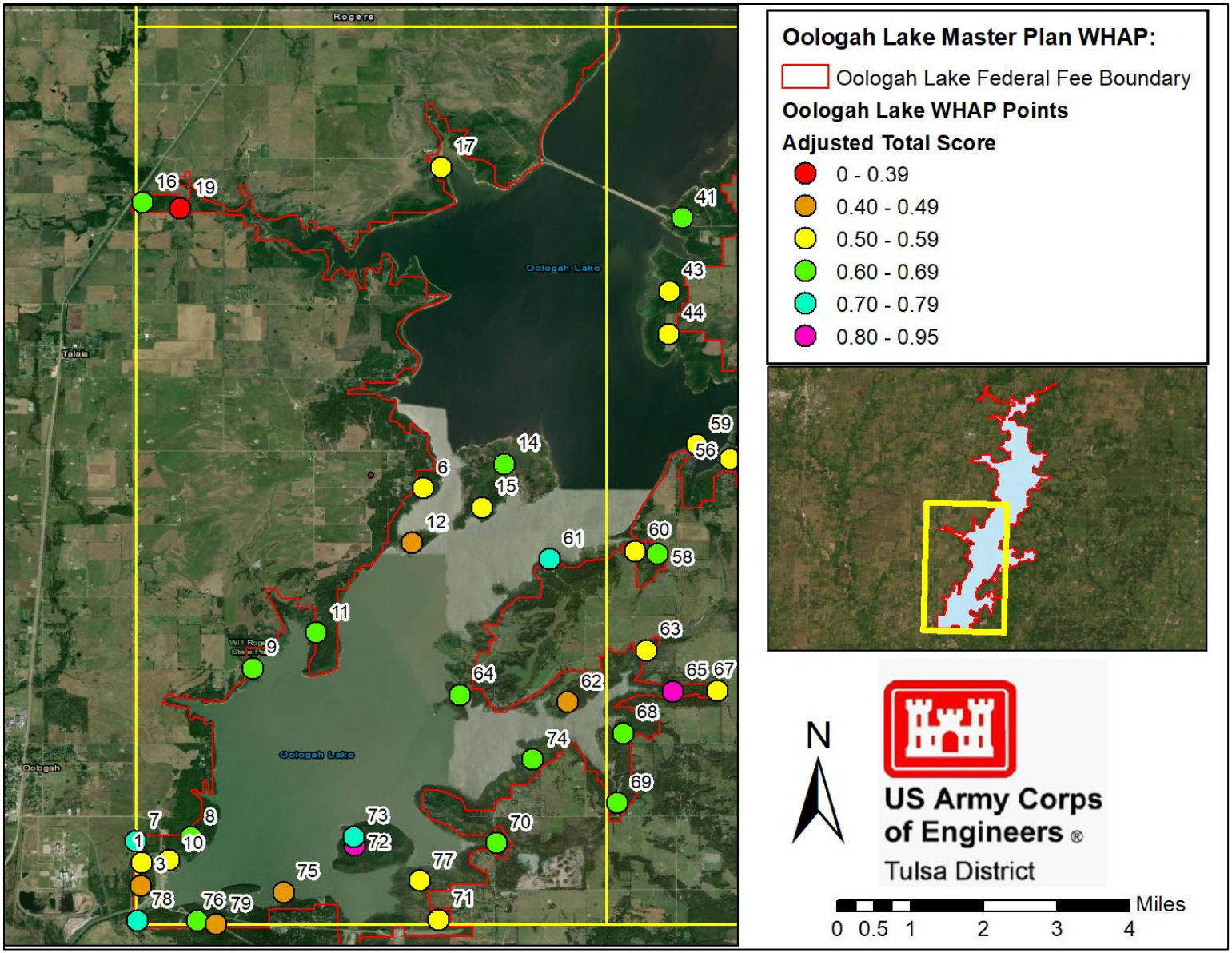


**Figure 9. Range of Total Adjusted Score for WHAP Points at Oologah Lake**

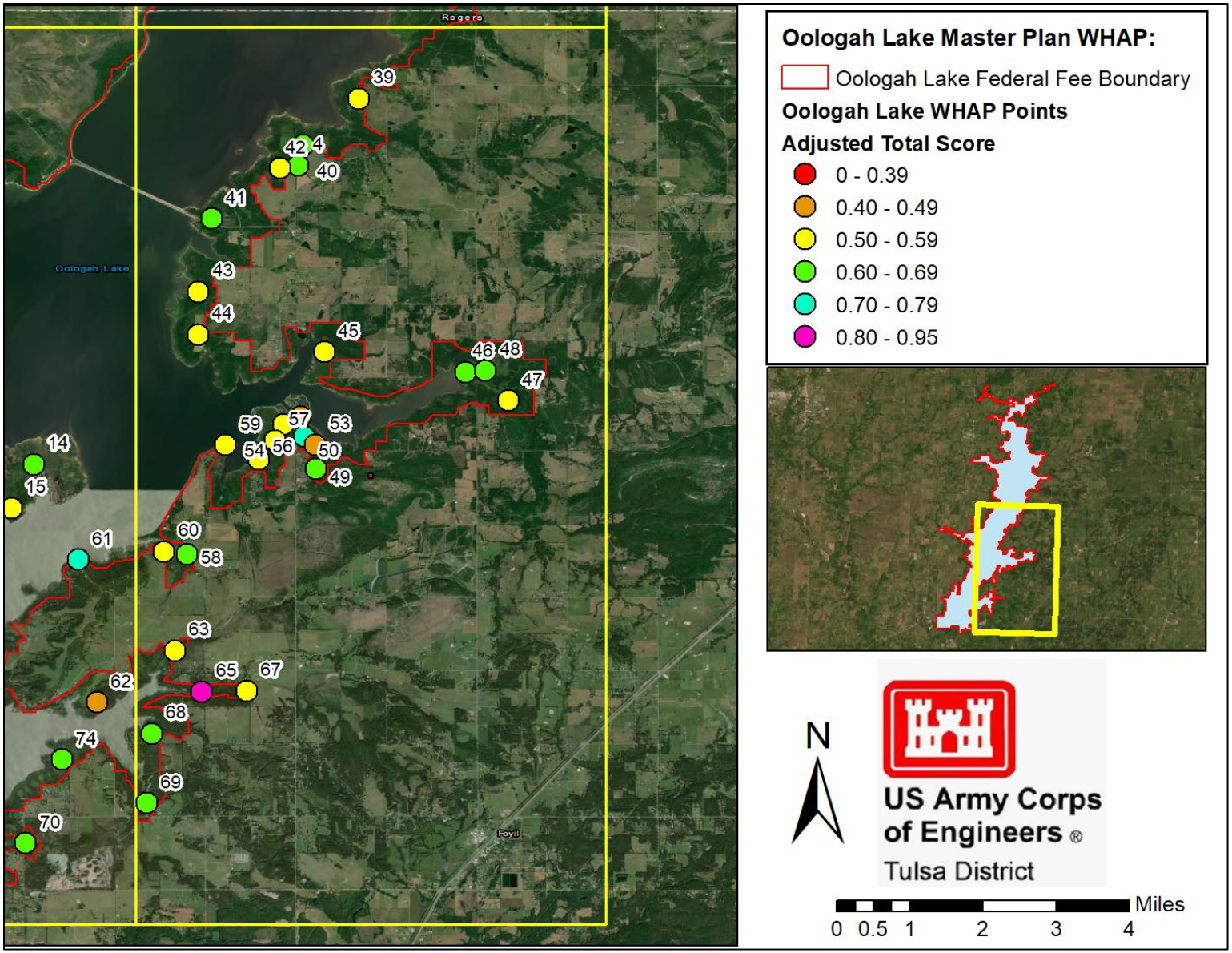


**Figure 10. Range of Total Adjusted Score for WHAP Points at Oologah Lake**

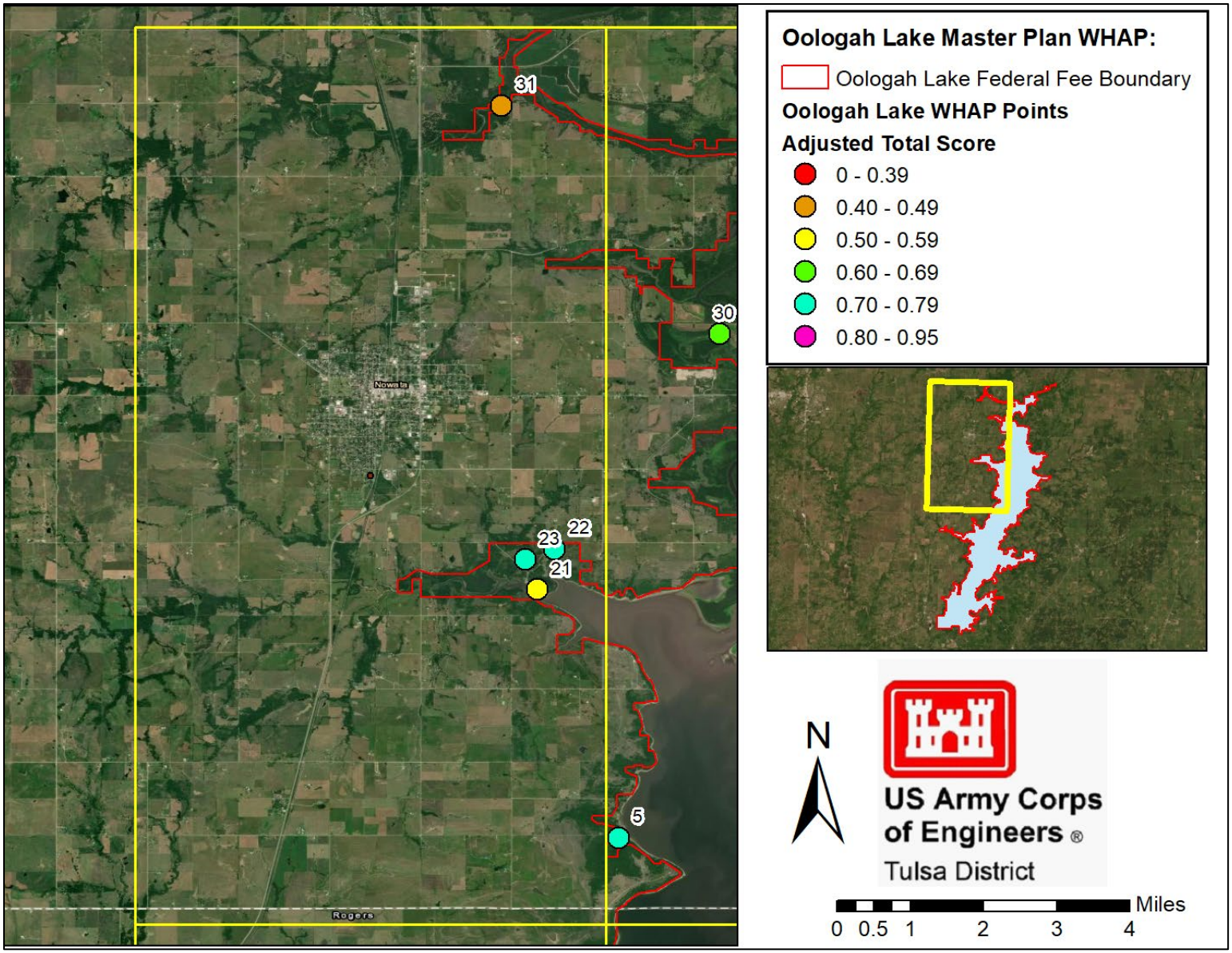


**Figure 11. Range of Total Adjusted Score for WHAP Points at Oologah Lake**

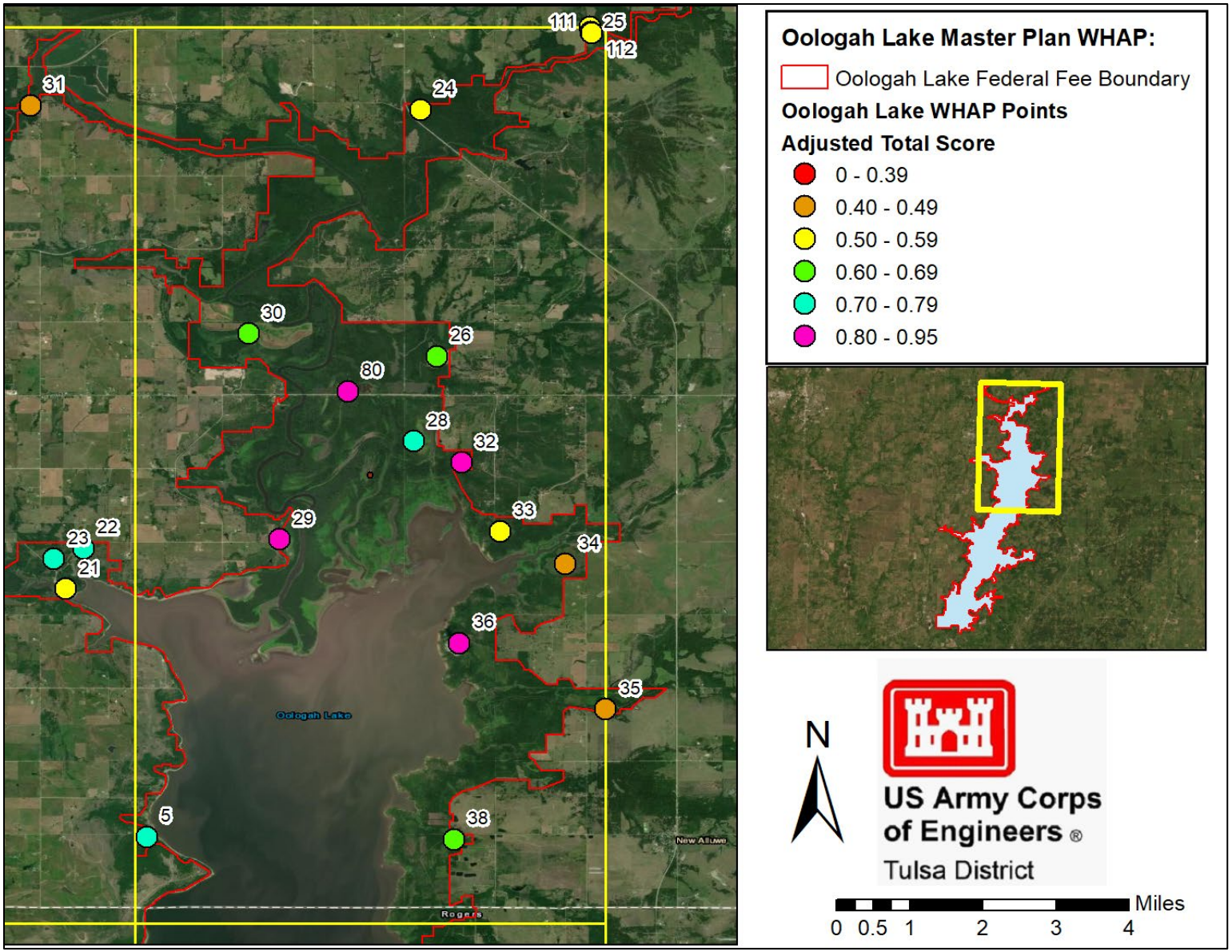


**Figure 12. Range of Total Adjusted Score for WHAP Points at Oologah Lake**

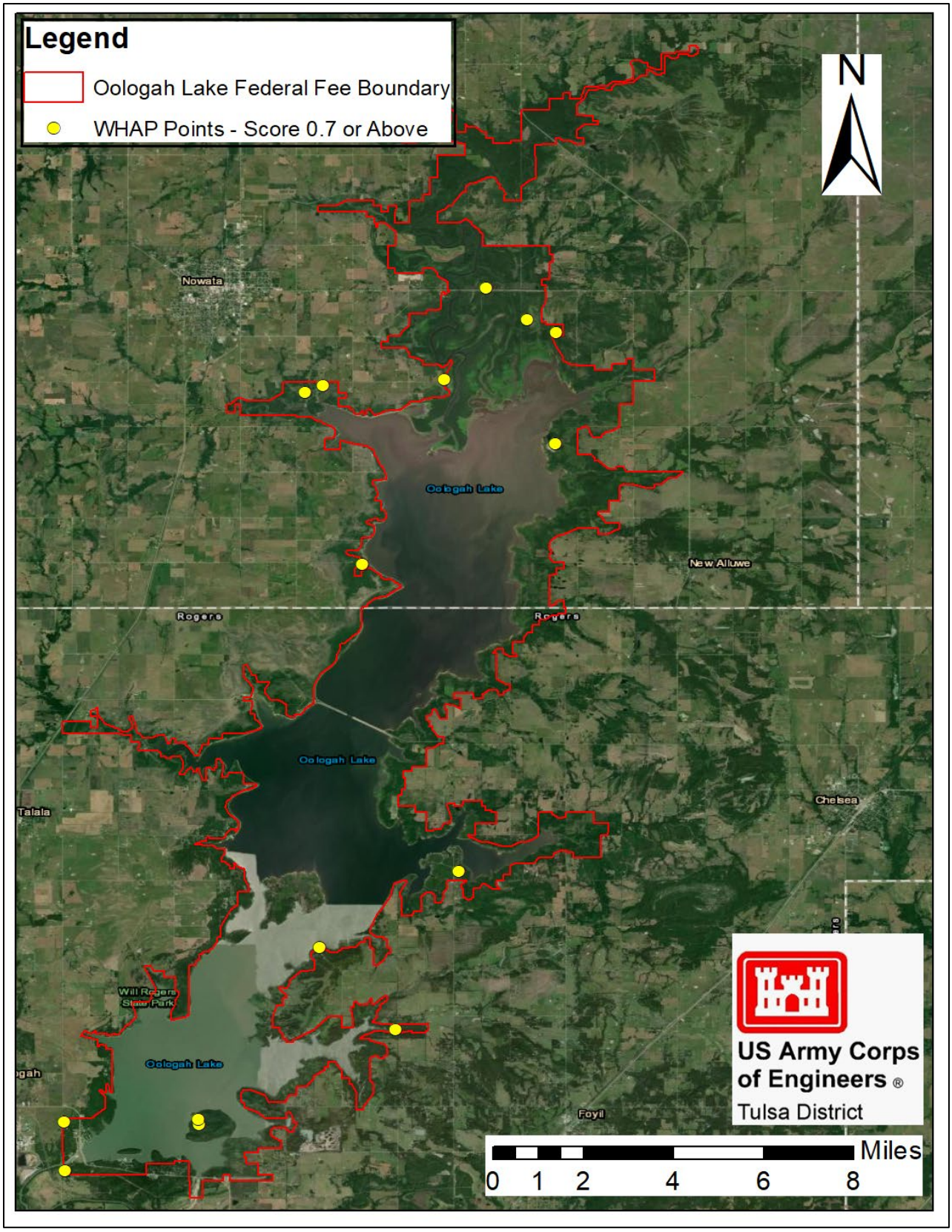


**Figure 13. WHAP Points with Total Adjusted Score 0.7 or Higher**

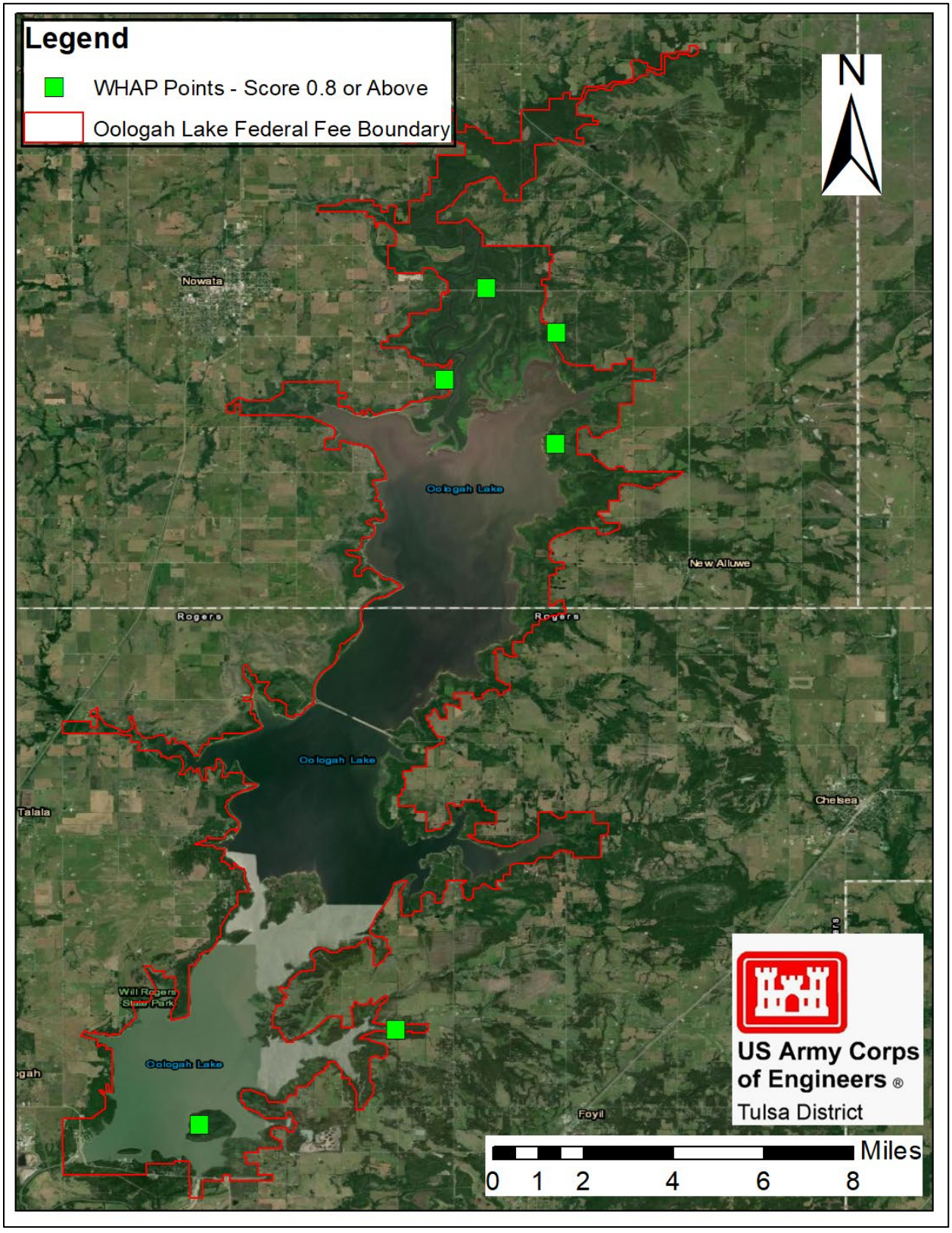


**Figure 14. WHAP Points with Total Adjusted Score 0.8 or Higher**

# Attachment A: Oologah Lake WHAP Results Summary

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Hackberry/Ash Forest | Upland Forest | 0.56 | Hackberry, Blackberry, Privet, Virgnia Creeper, Rubrus Sp. | Chinese Bush Clover, Honey Locust | Blackjack Oak | | Elm, Ash | | | Buckbrush | Multiflora Rose, Boneset, Scribner's Panicum, Canadian Rye, Rosette Grass, Big Bluestem, White Avens, Ragweed | |
| 3 | Riparian Hardwood | Riparian/BHF | 0.49 | Smilax, Coralberry, Posion Ivy, Hackberry, Dogwood, Grapevine, Fragrant Sumac, Virginia Creeper | Redbud, Honey Locust | Red Oak | Pignut Hickory | | Eastern Redcedar | | | Wild Oats, Tall Thistle, Goldenrod, Virginia Wild Rye | |
| 4 | Marsh | Marsh | 0.65 | Blackberry, Balloon Vine, Purple Passionflower | | Black Willow | Pecan | | | | | Sumpweed, Boneset, Field Thistle, Horseweed, Aster sp., Cocklebur, Annual Sunflower, Carolina Smartweed, Creeping Water Primrose, Vervain, Halberd-leaf Rosemallow, Pluchea odorata | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Ruderal Woodland | Upland Forest | 0.75 | Persimmon, Greenbriar, Poison Ivy, Purple Passionflower, Trumpet Creeper | Honey Locust | Post Oak, Chinquapin Oak, Black Jack Oak | Pecan | American Elm | | | | Boneset, Rosette Grass, Ragweed, Fowl Mannagrass, Sumpweed, Goldenrod, Sedge, Dotted Smartweed, Swamp Smartweed, Panic Grass, Thistle, Mulberryweed | |
| 6 | Ruderal Woodland | Upland Forest | 0.54 | Hackberry, Muscadine, Greenbriar | | | Pecan | American Elm | | | | Cordgrass, Swamp Smartweed, Marsh Elder, Pennywort, White Grass | |
| 7 | Tallgrass Prairie | Grassland | 0.76 | Blackberry, Purple Passionflower | Chinese Bushclover | | | | | | Purpletop | Wavy-leaf thistle, Pitcher Sage, Sideoats Gramma, Indian Grass, Boneset, Queen Ann's Lace, Little Bluestem, Goldenrod, Aster sp., Beardtongue, Vervain, Horse nettle, Wild Oats, Lead Plant | |
| 8 | Oak Forest | Upland Forest | 0.61 | Hackberry, Smilax, Coralberry, Posion Ivy, Grapevine | Eastern Redbud | Red Oak, Chinquapin Oak | Hickory, Walnut | Green Ash, Elm | | | Osage Orange | Inland Sea Oats, Wood Sedge, Ragwort, Tick Trefoil, Polygonatum sp. | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Pasture | Grassland | 0.66 | Blackberry | Honey Locust, Chinese Bush Clover | | Pecan | | | | Buttonbrush | Boneset, Sumpweed, Western Ragweed, Pennsylvania Smartweed, Bermuda Grass, Annual Broomweed, Yellow Foxtail, Cocklebur, Horseweed, Bidens sp., Annual Sunflower | |
| 10 | Oak Forest | Upland Forest | 0.59 | Hackberry | White Clover, Japanese Clover | Black Oak | | | | Sycamore | | Bermuda Grass, Dandelion, Sorrel, Crab Grass | |
| 11 | Ruderal Woodland | Upland Forest | 0.64 | Persimmon, Buttonbush | Black Locust, Lespedeza sp. | | Pecan | | | | | Boneset, Rossette Grass, Marsh Elder, Swamp Smartweed, Cordgrass | |
| 12 | Oak Forest | Upland Forest | 0.45 | Hackberry, Sugarberry, Greenbriar, Poison Ivy | Chinese Bush Clover | | | Green Ash | | | | Smartweed, Canadian Rye, Cordgrass, Rosette Grass, Marsh Elder, Croton, Boneset | |
| 14 | Tallgrass Prairie | Grassland | 0.62 | Winged Sumac, Persimmon, Rubrus sp. | Chinese Bush Clover | | | | | | | Aster sp., Three-seed Mercury, Foxtail, Canadian Rye, Horse Weed, Broom Weed | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Ruderal Woodland | Upland Forest | 0.56 | Hackberry, Greenbriar, Virginia Creeper, Poison Ivy, Coralberry, Purple Passionflower, Fragrant Sumac | Redbud, Chinese Bush Clover | | | Red Cedar | | | | Thistle, Sedge, Canadian Rye, Three-seed Mercury, Virginia Rye, Mugwort, White Sage Brush, Sneezeweed, Rattlesnake Master, Rosette Grass, Northern Sea Oats, Branched Rose Burn, Crane Fly Orchid, Prairie Coriopsis Slough Sedge | |
| 16 | Brushland/Early Successional | Grassland | 0.66 | Blackberry, Poison Ivy, Dogwood | Honey Locust, Redbud, Chinese Bush Clover | | | Eastern Redcedar | | | Buckbrush | Sumpweed, Boneset, Multiflora Rose, Frost Aster, Western Ragweed, Panicum Grass, Johnson Grass, Curleydock, Tall Fescue, Switchgrass, Prairie, June Grass, Shining Sumac, Texas Croton, Goldenrod, Rye | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Tallgrass Prairie | Grassland | 0.51 | Persimmon | Japanese Clover | | | | | | Purpletop | Tridens, Rosette Grass, Wooly Croton, Crabgrass, Cudweed, Bitter Sneezeweed, Late Boneset, Flat Sedge, Marsh Bristlegrass, Horseweed, Boneset, Spearmint, Juniper-leaf Rustweed, One-seed Croton | |
| 19 | Tallgrass Prairie | Grassland | 0.38 | | | | | | | | | Annual Broomweed, Texas Croton, Bermuda Grass, Cocklebur, Levenworth's Eryngo, Little Bluestem, Pink Purslane | |
| 21 | Bottomland Forest | Riparian/BHF | 0.59 | | | Willow Oak | Pecan | | | | Cottonwood | Swamp Smartweed, Dotted Smartweed, False Nettle, Ground Cherry, Swamp Bristlegrass, Devil's Beggartick, Flat Sedge, Water Purslane, Pokeweed, Wingleaf Primrose | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | Tallgrass Prairie | Grassland | 0.78 | Fragrant Sumac, Sand Blackberry | Chinese Bush Clover, Japanese Bush Clover, Honey Locust | | | Red Cedar | | | | Thistle, Little Blue Stem, Goldenrod, Boneset, Ragweed, Purple Lovegrass, Prairie Iron Weed, Indian Grass, Yellow Oxalis, Milkweed, Canadian Rye, Wild Indigo, Lead Plant, Marsh Brittle Grass, Swamp Rose, Bearded Beggar Tick, Prairie Rosenweed, Rosette Grass, Side Oats Gramma, Heath Aster | |
| 23 | Tallgrass Prairie | Grassland | 0.74 | Blackberry | Chinese Bush Clover | | | | | | | Boneset, Grass Leaved Rush, Wild Carrot, Indian Grass, Prairie Rosenweed, Broom Sedge, Rosette Grass, Marsh Bristlegrass, Ragweed, Nightshade, Swamp Rose, Longspike Tridens, Dallis Grass | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | Bottomland Forest | Riparian/BHF | 0.50 | Hackberry, Poison Ivy, Virginia Creeper, Greenbriar | | Pin Oak, Chinquapin Oak | Pecan | Green Ash | | | Cottonwood | Dotted Smartweed, Sedge, Wild Petunia, White Cutgrass, Devil's Beggartick, Trumpet Creeper, Butterweed | |
| 25 | Bottomland Forest | Riparian/BHF | 0.55 | Poison Ivy, Hackberry, Virginia Creeper, Greenbriar, Vitis sp. | | | Black Walnut | Elm, Box Elder | | | | Rye, Carolina Smartweed, Pennsylvania Smartweed, Lemon Bee Balm, Cocklebur, Boneset, False Nettle | |
| 26 | Riparian Hardwood | Riparian/BHF | 0.68 | Blackberry, Vitis sp. | | | Hickory | | | | | Sumpweed, Bidens sp., Cocklebur, Boneset, Pennsylvania Smartweed, Carolina Smartweed, Mentha longifolia, Johnson Grass, Giant Ragweed, Fish on a Fishing Pole, Germander, Asiatic Day Flower, Lemon Beebalm | |
| 28 | Marsh | Marsh | 0.78 | | | | | | | | Buttonbush, Willow | Arrowhead, Scarlet Toothcup, Pondweed | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | Oak Forest | Upland Forest | 0.86 | Sugarberry, Greenbriar, Coralberry, Paw Paw, Virginia Creeper, Posion Ivy, Muscadine, Hackberry | Redbud | Shumard Oak, Chinquapin Oak | Bitternut Hickory | White Ash | | | | White Avens, Dew Drop | |
| 30 | Bottomland Wetland | Marsh | 0.63 | Balloon Vine | | | | Box Elder | | | Buttonbush, Willow, Cottonwood | Slough Sedge, Swamp Smartweed, White Aster, Pale Smartweed, Palmer's Amaranth, Camphor Weed, Devil's Beggar Ticks, Lance Leaf Frog Fruit, Cocklebur, Flat Sedge, Three-Way Sedge | |
| 31 | Bottomland Forest | Riparian/BHF | 0.49 | Hackberry, Poison Ivy, Virginia Creeper, Greenbriar, Riverbank Grape | Honey Locust | Pin Oak, Chinquapin Oak | Bitternut Hickory, Pecan | Elm, Green Ash | Red Cedar | | | Canadian Rye, Raven's Foot-Sedge, Wild Petunia | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | Oak Forest | Upland Forest | 0.95 | Trumpet Creeper, Anglepod, Box Elder, Ballon Vine, Smilax, Gourd, Hackberry | | Red Oak | Pecan | American Elm | | | | Spotted Nutweed, Pennsylvania Smartweed, Beggars Tick, White Avens, Cocklebur, Sedge | |
| 33 | Ruderal Woodland | Upland Forest | 0.53 | Persimmon, Poison Ivy, Purple Passionflower | Honey Locust, Chinese Bush Clover | | | Ash | | | Purple Top | Queen Ann's Lace, False Boxglove, Boneset, Smartweed, Aster sp., Rosette Grass, Kikuyu Grass, Foxtail, American Germander, Smartweed | |
| 34 | Neglected Ag | Grassland | 0.47 | Posion Ivy, Rubus sp., Purple Passionflower | Chinese Bush Clover | | | Ash, Elm | | | | Switchgrass, Horse Nettle, Wooley Croton, Annual Ragweed, Boneset, Beggars Tick, Rossette Grass, Coneflower, American Germander, Johnson Grass, Longspite Tridens | |
| 35 | Bottomland Hardoods | Riparian/BHF | 0.44 | Greenbriar, Poison Ivy, Vitis sp. | Honey Locust | | Pecan | Elm | | Sycamore | | Bidens sp., Cocklebur, Mentha Longifolia, Sida acuta, Giant Ragweed | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | Grassland | Grassland | 0.88 | Hackberry, Plum, Poison Ivy, Persimmon, Blackberry, Vitis sp., Purple Passionflower | Honey Locust, Chinese Bush Clover | Northern Red Oak | Pecan | | | | | Bidens sp., Boneset, Tall Thistle, Scribner's Panicum, Horseweed, Ground Ivy, Crabgrass, Western Ragweed, Germander, Lemon Beebalm, Johnson Grass, Rye, Evening Primrose, Sida acuta, Acacea sp., Field Thistle, Evening Primrose | |
| 38 | Marsh | Marsh | 0.63 | Balloon Vine | | | | | | | | False Flatsedge, Aster sp., Carolina Smartweed, Johnsongrass, Creeping Water Primrose, Halberd-leaf Rosemallow, Pluchea odorata | |
| 39 | Ruderal Woodland | Upland Forest | 0.51 | Purple Passionflower | | | | | | | | Johnson Grass, Panicum Grass, Broom Sedge, Bluestem, Boneset | |
| 40 | Abandoned Cropland | Grassland | 0.62 | Persimmon, Purple Passionflower | | | | | | | Buttonbush | Boneset, Panicum Grass, Bluestem, Annual Sunflower, | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Horse Nettle, Johnson Grass, Western Ragweed, Broom Sedge, Sumpweed, Purple Gerardia, Eucalyptus, Salvia, | |
| 41 | Grassland | Grassland | 0.60 | Persimmon | | | | | | | | Sumpweed, Boneset, Johnsongrass, Horse Nettle, Panicum Grass, Annual Sunflower, Bermuda Grass, Ragweed, Pennsylvania Smartweed, Missouri Primrose, Bitter Sneezeweed, Bidens laevis | |
| 42 | Grassland | Grassland | 0.53 | Hackberry, Persimmon | Chinese Bush Clover | | | | | | | Sumpweed, Panicum Grass, Bidens sp. | |
| 43 | Ruderal Woodland | Upland Forest | 0.54 | Balloon Vine | | Black Willow | | | | | Buttonbush | Cocklebur, Switchgrass, Sida acuta | |
| 44 | Grassland | Grassland | 0.57 | Purple Passionflower | | | | | | | Buttonbush, Cottonwood | Mentha longifolia, Boneset, Giant Ragweed, Horseweed, Johnsongrass, Western Ragweed, Aster sp. | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | Post Oak and Blackjack Forest | Upland Forest | 0.55 | Hackberry, Poison Ivy, Greenbriar, Virginia Creeper, Roughleaf Dogwood, Purple Passionflower | | Chinquapin Oak | | | | | Osage Orange, Buckbrush | | |
| 46 | Marsh | Marsh | 0.68 | Greenbriar, Hackberry, Persimmon, Carolina Snailseed | Honey Locust | | Pecan | Elm | | | Buttonbush | Carolina Smartweed, Pennsylvania Smartweed, Cocklebur, Boneset, Duckweed | |
| 47 | Ruderal Woodland | Upland Forest | 0.56 | Greenbriar, Blackberry, Hackberry, Purple Passionflower | Honey Locust, Chinese Bush Clover | Black Willow | Hickory, Pecan | Elm | | | Cottonwood | Sumpweed, Western Ragweed, Bidens sp., Panicum Grass, Monkey Grass, White Gaura | |
| 48 | Abandoned Cropland | Grassland | 0.68 | Persimmon | Honey Locust, Chinese Bush Clover | | | | | | | Boneset, Switchgrass, Johnson Grass, Bidens sp., Mentha longifolia, Sumpweed, Pennsylvania Smartweed, Panicum Grass, Goldenrod, White Gaura, Western Ragweed, Horseweed, Sida acuta, | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Cocklebur, Giant Ragweed | |
| 49 | Ruderal Woodland | Upland Forest | 0.61 | Hackberry, Greenbriar, Blackberry, Poision Ivy | | | Pecan | Elm, Box Elder, Green Ash | | | | Pokeweed, Panicum Grass, Monkey Grass, Yellow Foxtail, Boneset, Bermuda Grass, Marsh Fleabane, Fish on a fishing pole | |
| 50 | Tallgrass Prairie | Grassland | 0.76 | Blackberry, Persimmon, Sumac | Chinese Bush Clover | | | | | | | Goldenrod, Tall Boneset, Ironweed, Big Bluestem, Indian Grass, Leadplant, Dawny Milkpea, Blue Sage, Field Thistle, Rye, Side-Oats Gramma | |
| 51 | Ruderal Shrubland/Woodland | Upland Forest | 0.48 | Persimmon, Blackberry, Plum, Hackberry | Chinese Bush Clover | | Pecan | | | | Buckbrush | Broadleaf Unolia, Boneset, Field Thistle | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | Planted Evergreen Forest | Upland Forest | 0.54 | Hackberry, Blackberry, Virginia Creeper | Chinese Bush Clover | | | | Pine | | | Pokeweed, Boneset, Crabgrass, Scribner's Panicum | Pine trees are planted |
| 53 | Post Oak and Blackjack Forest | Upland Forest | 0.47 | Hackberry, Blackberry, Fragrant Sumac, Carolina Snailseed, Greenrbriar | Chinese Bush Clover | Post Oak, Blackjack Oak, Chinquapin Oak | Hickory | | | | Buckbrush | Boneset, Field Thistle, Broadleaf Unolia | |
| 54 | Hackberry Forest | Upland Forest | 0.60 | Virginia Creeper, Hackberry, Carolina Snailseed, Poison Ivy, Greenbriar | | | | Eastern Red Cedar, Elm | | | Osage Orange | Boneset, Carolina Smartweed, Scribner's Panicum, Tall Thistle, Bermuda Grass | |
| 56 | Ruderal Woodland | Upland Forest | 0.55 | Hackberry, Persimmon, Virginia Creeper, Greenbriar | Redbud | | | Elm | | | Buckbrush | Rye | |
| 57 | Bottomland Forest | Riparian/BHF | 0.58 | Persimmon, Hackberry, Greenbriar, Poison Ivy, Carolina Snailseed | Honey Locust, Chinese Bush Clover | | Pecan | | | | | Carolina Smartweed, False Flatsedge, Duckweed, Wolfia Sp., Windmill Grass, Boneset, Scribner's Panicum | Man-made impoundment; technically a wetland but more diverse as a woodland |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | Tallgrass Prairie | Grassland | 0.60 | Hackberry, Purple Passionflower | Chinese Bush Clover | | | American Elm | | | Arkansas Yucca, Prickly Pear | Compass Plant, Northern Sea Oats, Wild Carrot, One-seed Croton, Rye Grass, Eryngo, Spreading Hedge Parsley, Wood Sorrel, American Basket Flower, Lemon Bee-balm, Rose Vervain, Lead Plant, Prairie Broom-weed | |
| 59 | Ruderal Woodland | Upland Forest | 0.56 | Hackbery, Sugarberry, Poison Ivy, Greenbriar | Redbud, Chinese Bush Clover | Chinquapin Oak | Bitternut Hickory | American Elm | | | | Canadian Rye, Woodland Sedge, Shepherds Purse, White Aster, Lead Plant | |
| 60 | Ruderal Woodland | Upland Forest | 0.49 | Persimmon, Hackberry, Purple Passionflower, Blackberry, Greenbriar, Virginia Creeper | Honey Locust, Chinese Bush Clover | | | | | | | Rosette Grass, Sedge, Basleet Flower, Virginia Rye, Germander, Mugwort, Mulberry Weed, Croton, Ribseed Sandmat, Annual Fleabane, Lead Plant | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | Oak/Hickory Forest | Upland Forest | 0.78 | Besswood, Coralberry, Virginia Creeper, Smilax, Hackberry, Trumpet Creeper, Black Cherry, Cinnamon Vine, Grapevine, Posion Ivy, Privet | Honey Locust, Trailing Lespedeza | Red Oak, Chinquapin Oak | Hickory | Elm | | | | Wood Sedge, Inland Sea Oats, Liquorice Bedstraw | |
| 62 | Ruderal Woodland | Upland Forest | 0.47 | Greenbriar, Virgnia Creeper, Hackberry, Milk Vine, Persimmon | Honey Locust, Chinese Bush Clover | | Bitternut Hickory | | | | | Canadian Rye, White Avens, Drop-seed Grass, Shepherds Purse, Croton, Basket Flower, Wild Poinsetta, Flat Snakeroot | S |
| 63 | Marsh | Marsh | 0.53 | Balloon Vine | | | | | | | Buttonbush, Willow | Sumpweed, Frogweed, Boneset, Beggars Tick, Annual Ragweed, Aster sp., Cocklebur, Sedge, Smartweed, Switchgrass | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | Ruderal Woodland | Upland Forest | 0.60 | Blackberry, Purple Passionflower, Greenbriar, Hackberry, Gum Bumilia | Chinese Bush Clover | | Bitternut Hickory | | | | | Boneset, Sedge, Germander, Rossette Grass, Wood Sorrel, Indian Grass, Wild Carrot | |
| 65 | Ruderal Woodland | Upland Forest | 0.93 | Greenbriar, Grapevine, Hackberry, Balloon Vine, Snailseed | | | Pecan | American Elm | | | Cottonwood, Willow | Three-seed Mercury, Smartweed | |
| 67 | Bottomland Forest | Riparian/BHF | 0.54 | Virginia Creeper, Poison Ivy, Greenbriar, Grapevine, Coralberry | | Chinquapin Oak, Northern Red Oak | Pecan | | | | American Basswood | | |
| 68 | Ruderal Woodland | Upland Forest | 0.67 | Hackberry, Poison Ivy, Snailseed, Virginia Creeper, Dogwood, Greenbriar | Redbud | Red Oak | Pecan, Hickory | American Elm, Ash | Eastern Red Cedar | | Osage Orange, American Basswood | Beggars Tick, Buttercup, Inland Sea Oats, Sumpweed, Three-seed Mercury, Smartweed, Wood Sedge, Aster sp., White Avens | |
| 69 | Ruderal Woodland | Upland Forest | 0.64 | Grapevine, Persimmon, Snailseed, Hackberry, Mulberry, Privet | | | Pecan | Elm | | Sycamore | Trumpet Vine | Panicum, Buttercup, Boneset, Snakeroot, Goldenrod | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | Marsh | Marsh | 0.68 | Persimmon, Purple Passionflower, Balloon Vine | | | | | | | Buttonbush | Carolina Smartweed, Beggars Tick, White Gaura, Sedge, Croton, Marsh Pinegrass, Yellow Nut Sedge, Bidens sp., Submergent Vegetation | |
| 71 | Ruderal Woodland | Upland Forest | 0.55 | Privet, Hackberry, Poison Ivy | Honey Locust, Chinese Bush Clover | | | Elm | Juniper | | Buckbrush | Hairy Hawkweed, Sedge, Horse Nettle, Aster sp., Switchgrass, Western Ragweed, Broomsedge, Goldenrod, Thistle, Honeysuckle, White Avens, White Gaura, Canadian Wild Rye, Beggars Tick, Boneset, Horse Nettle, Panicum Grass, Rosette Grass, Wooly Croton, Brewers Monkey Flower | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | Oak Forest | Upland Forest | 0.86 | Poison Ivy, Coralberry, Greenbriar, Virginia Creeper | Eastern Redbud, Chinese Bush Clover, Shrub Lespedeza | Chinquapin Oak, Shumard Oak | Bitternut Hickory | White Ash | | | | Tickclover, Canadian Rye, Nothern Sea Oats, White Grass | |
| 73 | Ruderal Woodland | Upland Forest | 0.70 | Poison Ivy, Coralberry, Sugarberry, Greenbriar, Virginia Creeper | Redbud | Post Oak, Red Oak | Bitternut Hickory | Texas Ash | Cedar Elm | | | Pennywort, Cordgrass, Sedge | |
| 74 | Ruderal Woodland | Upland Forest | 0.66 | Blackgum, Persimmon, Purple Passionflower, Greenbriar, Balloon Vine | Honey Locust, Chinese Bush Clover | | Bitternut Hickory | | | | | Prickley Sida, Boneset, Ravens-foot Sedge, Morning Glory, Ragweed, Prostrate Sandmat, Bristlegrass, Saltmarsh Morning Glory, Rosette Grass, Clustered Mille Grains, Swamp Smartweed, Sumpweed | |
| 75 | Post Oak and Blackjack Forest | Upland Forest | 0.41 | Dogwood, Greenbriar, Hackberry | Redbud, Trailing Lespediza | Post Oak, Red Oak, Chinquapin Oak | Pecan, Hickory | | | | | Poke Milkweed, Monkey Grass | |
| 76 | Ruderal Woodland | Upland Forest | 0.60 | Hackberry, Greenbriar | Honey Locust, Chinese Bush Clover | Post Oak, Chinquapin Oak | Pecan, Hickory | Elm | Eastern Redcedar | | Prickly Pear, Buckbrush | Little Bluestem, Wild Rye, Ragweed, Broomweed, Croton | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | Ruderal Woodland | Upland Forest | 0.53 | Persimmon, Ballon Vine, Mulberry, Rubus sp., Hackberry, , Purple Passionflower | Honey Locust | | Pecan | Ash | | | | Wavy Leaf Thistle, Wooley Croton, Boneset, False Poinsetta, Annual Ragweed, White Gaura, Horse Nettle, American Germander, Rosette Grass, Vervain, Heliotropium sp. | |
| 78 | Disturbed Woodland | Upland Forest | 0.735632184 | Persimmon, Blackberry, Box Elder, Hackberry, Virginia Creeper | Redbud, Honey Locust, Chinese Bush Clover | | Hickory | | | Sycamore | | Croton, Camphorweed, Switchgrass, Johnson Grass, Boneset, Ragweed, Beggars Tick, Smartweed, Foxtail, Inland Sea Oats, Goldenrod | |
| 79 | Riparian Hardwood | Riparian/BHF | 0.41 | Persimmon, Greenbriar, Virginia Creeper | | Red Oak, Chinquapin Oak | | Elm, Green Ash | Eastern Redcedar | | Buckbrush | Broadleaf Unolia, Brome Grass | |
| 80 | Marsh | Marsh | 0.85 | Trumpet Vine, Anglepod | Honey Locust | | Pecan | | | | Buttonbush, Willow | Beaked Panic Grass, Arrowhead, Pennsylvania Smartweed, Beggars Tick, Yellow Sedge, Barnyard Grass, Catgrass, Scarlet Toothycup, | |

| Point | Habitat | Habitat Group | Adjusted Total Score | Berry Drupe | Legume Pod | Acorn | Nut Nutlike | Samara | Cone | Achene | All Others | Herbaceous Species | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | False Daisy, Nutweed | |
| 1A | Canebrake | Riparian/BHF | 0.59 | Hackberry, Poison Ivy | | Bur Oak | Black Walnut | | | | | River Cane, Rye, Pennsylvania Smartweed, Lemon Beebalm, Monkey Grass, Carolina Smartweed, Giant Ragweed, False Nettle | |
| 1B | Canebrake | Riparian/BHF | 0.59 | Hackberry, Mulberry, Vitis sp. | | | Pecan, Black Walnut | Elm | | | | River Cane, Monkey Grass, Lemon Bee Balm, Cardinal Flower, False Nettle | |

Attachment B: Oologah WHAP Site Photos

(Not all points have photos)

# Point 1A (111) NESW

# Point 1B (11B) NESW

# Point 1 NESW

# Point 3 NESW

# Point 4 NESW

# Point 7 NESW

# Point 8 NESW

# Point 9 NESW

# Point 10 NESW

# Point 14 NESW

# Point 16 NESW

# Point 18 NESW

# Point 19 NESW

# Point 25 NESW

# Point 26 NES (missing W)

# Point 28 NESW

# Point 30 NESW

# Point 31 NESW

# Point 32 NESW

# Point 33 NESW

# Point 34 NESW

# Point 35 NESW

# Point 36 NESW

# Point 38 NESW

# Point 39 NESW

# Point 40 NESW

# Point 41 NESW

# Point 42 NESW

# Point 43 NESW

# Point 44 NESW

# Point 45 NESW

# Point 46 NESW

# Point 47 NESW

# Point 48 NESW

# Point 49 NESW

# Point 50 NESW

# Point 51 NESW

# Point 52 NESW

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# Point 54 NESW

# Point 55 NESW

3

# Point 56 NESW

# Point 57 NESW

# Point 63 NESW

# Point 64 NESW

# Point 65 NESW

# Point 67 NESW

# Point 68 NESW

# Point 69 NESW

# Point 71 NESW

# Point 72 NESW

# Point 73 NESW

# Point 75 NESW

# Point 76 NESW

# Point 77 NESW

# Point 78 NESW

# Point 79 NESW

# Point 80 NESW

# APPENDIX D – SUMMARY OF PUBLIC COMMENTS

**Table D.1 Public Comments from DATE Public Scoping Meeting**

| Comment | USACE Response |
|---|---|
| I would like to see Goose Island area opened to ATV-ORV Park. I'm sure some organizations would help to keep it cleaned and or maintained. There is potential for revenue for the Oologah Lake area, and would also keep residents of the area from traveling to other parks. | Goose Island is leased to the Oklahoma Department of Wildlife Conservation (ODWC) and managed for wildlife management purposes. Conversion of the area to off-road vehicle use would be incompatible with current use. In accordance with USACE regulations (ER 1130-2-550, Chapter 10) all USACE lands are closed to off-road vehicle use unless an area is specifically designated for such use through a public process and in accordance with strict criteria that protects important resources and existing uses. In general, areas at USACE lakes that are designated for off-road vehicle use are restricted to relatively small, highly disturbed areas such as areas where borrow material has been obtained. No such areas exist at Oologah Lake. Furthermore, access to the island is very limited. The land bridge that connects from the main land to the island sets at a very low elevation. Once the lake's elevation increases only about 2' above normal, mainland access to this island is cut-off, and would restrict access much of the year. There are also significant historic and cultural sites on the island which would be negatively affected by disturbances related to ATV/ORV usage. |

| Comment | USACE Response |
| --- | --- |
| Extend the recreational area on “goat island” to the north. This could allow RBM to utilize the island more & attract more customers. This would generate more business for the marina. It would be nice if another beach could be included somewhere or play equipment at the one at Hawthorn. Another fishing dock in one of the recreational areas would be great. | Currently, there is a strip of land on Goat Island that is classified for recreational development and is included within the existing recreation lease to the Redbud Bay Marina. The remainder of Goat Island is currently classified for wildlife management purposes. The physical characteristics of the wildlife management portion of Goat Island would make recreational development impractical. The USACE would look to the marina for any future recreational development of Goat Island within the area included in their lease. High water level and flooding would restrict access to the island much of the year. There are also significant historic and cultural sites on the island which would be negatively affected by intense recreational usage.<br><br>Hawthorn's shoreline simply does not provide for adding an additional beach. Nowhere else along the shoreline at Hawthorn would the gradient or adjacent terrain meet USACE requirements of EM 1110-1-400. The campground already has 2 playgrounds and seems to satisfy current visitation. A new courtesy boat dock was just added at Spencer creek boat ramp in 2019. Hawthorn currently has 2 fishing docks and a boat dock. There are no plans at this time to add additional fishing docks within the USACE managed campgrounds. |

# APPENDIX E – ACRONYMS

| | |
|---|---|
| °F | Degrees Fahrenheit |
| ac-ft | Acre Feet |
| AQI | Air Quality Index |
| B.P. | Before Present |
| BMP | Best Management Practices |
| CAP | Climate Action Plan |
| CRMP | Cultural Resources Management Plan |
| CWA | Clean Water Act |
| DC | District Commander |
| DF | Deciduous Forest |
| DM | Design Memorandum |
| DQC | District Quality Control |
| DQCB | District Quality Control Board |
| EA | Environmental Assessment, NEPA Document |
| EMS | Ecological Mapping System |
| EOP | Environmental Operating Principles |
| EP | Engineering Pamphlet |
| EPA | United States Environmental Protection Agency |
| ER | Engineering Regulation |
| ESA | Environmentally Sensitive Area |
| FONSI | Finding of No Significant Impact |
| FWCA | Fish and Wildlife Coordination act Act of 1958 |
| GIS | Geographical Information Systems |
| HDR | High Density Recreation |
| HQ | USACE Headquarters (also HQUSACE) |
| IH | Interstate Highway |
| IPaC | Information for Planning and Consultation |
| LDR | Low Density Recreation |

| | |
|---|---|
| LEED | Leadership in Energy and Environmental Design |
| MP | Master Plan or Master Planning |
| MRML | Multiple Resource Management Lands |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act, 1970 |
| NGVD29/NGVD | National Geodetic Vertical Datum (1929) |
| NHPA | National Historic Prevention Act |
| NOA | Notice of Availability |
| NRCS | Natural Resource Conservation Service |
| NRHP | National Registry of Historic Places |
| NVCS | National Vegetation Classification System |
| NWI | National Wetland Inventory |
| O&M | Operations and Maintenance |
| ODWC | Oklahoma Department of Wildlife Conservation |
| OK | Oklahoma |
| OMB | Office of Management and Budget |
| OMBIL | Operations and Maintenance Business Information |
| OMP | Operations Management Plan for a specific lake project |
| OPM | Operations Project Manager |
| PDT | Project Development Team |
| PL | Public Law |
| PM | Project Management or Project Manager |
| PMP | Project Management Plan |
| PO | Project Operations |
| RBLH | Riparian Bottomland Hardwoods |
| RBS | Recreational Boating Survey |
| RIFA | Red Imported Fire Ant |
| RPEC | Regional Planning and Environmental Center |
| SCORP | Statewide Comprehensive Outdoor Recreation Plan (synonymous |

| | |
|---|---|
| SGCN | Species of Greatest Conservation Need |
| SH | State Highway |
| SHPO | State Historical Preservation Office |
| SIP | State Implementation Plan |
| SMPS | Shoreline Management Policy Statement |
| SWA | State Wildlife Area |
| US | United States (U.S.) |
| USACE | United States Army Corps of Engineers |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| USGS | United States Geological Survey |
| VM | Vegetative Management Area |
| WDA | Workforce Development Area |
| WHAP | Wildlife Habitat Appraisal Procedure |
| WM | Wildlife Management Area |