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MEMORANDUM FOR Commander, Tulsa District

SUBJECT: Keystone Dam and Reservoir, Oklahoma Master Plan Revision (May, 2016)

1. Enclosed subject Master Plan is submitted for review and approval in accordance with ER 1130-2-550, Change 7 and EP 1130-2-550, Change 5.

2. Point-of-contact in Operations Division is Mr. Steve Nolen, 918.669.7660.

for EARL GROVES
Chief, Operations Division

Encl

Approved: RP Disapproved:_____

Richard A. Pratt
Colonel, U.S. Army
District Commander

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Keystone Dam and Reservoir Master Plan

Arkansas River

Creek, Osage, Pawnee, Payne, and Tulsa Counties, Oklahoma

May 2016

US Army Corps of Engineers ®
Tulsa District

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KEYSTONE DAM AND RESERVOIR MASTER PLAN
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CHAPTER 1 - INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Keystone Dam and Reservoir (hereafter Keystone Lake or project) was authorized for construction by the Flood Control Act approved May 17, 1950 (Public Law 516, 81st Congress, Chapter 188, 2nd Session) as a modification of the general comprehensive plan for flood control and other purposes approved by the Flood Control Act of June 28, 1938, and the multiple-purpose plan for the Arkansas River and tributaries, Arkansas and Oklahoma, approved by the River and Harbor Act of July 24, 1946.

Construction began by the U.S. Army Corps of Engineers (USACE) in January 1957 and the project was placed in flood control operation in September 1964. The two hydroelectric generating units became operational in May 1968.

1.2 PROJECT PURPOSE

Keystone Lake is a unit in the comprehensive plan for development of the Arkansas River Basin for flood control, hydroelectric power, and navigation. The project is operated to provide flood protection in the reach of the Arkansas River between the dam site and the mouth of the Verdigris River, and when operated with other projects in the Arkansas River Basin, provides flood protection downstream to Pine Bluff, Arkansas. Keystone Lake contributes to the navigation of the Arkansas River by control of sedimentation and by aiding in regulation of flows. Hydroelectric power is produced by two Kaplan units, a propeller-type water turbine with adjustable blades, having a capacity of 50,000 to 80,000 kilowatts (kW), depending on lake level. The project is also operated for purposes of water supply, recreation and fish and wildlife management.

1.3 PURPOSE AND SCOPE OF MASTER PLAN

The Keystone Dam and Reservoir Master Plan, originally published as Design Memorandum 12-B, hereafter referred to as Plan or Master Plan, is the strategic land use management document that guides the comprehensive, efficient and cost effective management and development of all project recreational, natural, and cultural resources throughout the life of the project. The Plan is a vital tool for responsible stewardship and sustainability of Keystone Lake 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. The Master Plan focuses on dynamic, flexible goals and objectives that are programmatic and conceptual. It does not address facility design or estimated costs. Details of design, management, administration, and implementation are addressed in the Keystone Lake Operational Management Plan (OMP). Additionally, the Keystone Dam and Reservoir Master Plan does not address the specifics of regional water quality, shoreline management, or water level management. The technical aspects of operation and maintenance of primary project operations facilities, including but not limited to the dam, spillway, and gate-controlled outlet is not included in this Plan.

The Master Plan proposes public use development and resource conservation measures necessary to realize the optimal potential of the project. The Master Plan addresses expressed public interest in the overall stewardship and management of all project lands, waters, forests, recreation facilities and other resources throughout the life of the project, and includes conceptual detail showing the most desirable and feasible locations and types of facilities needed to meet identified needs. Emphasis has been placed on a balanced approach to provide public land and water-based recreation while conserving and sustaining natural and cultural resources. Adequate facilities and land-based requirements are proposed to provide all desired recreational opportunities and to ensure compliance with applicable environmental regulations, laws and policies. The Master Plan also proposes proper utilization of natural resources and recreational facilities, assuming the continued availability of Congressionally-appropriated funds, while at the same time conserving and protecting all resources held in the public trust.

Implementation of the Master Plan must recognize and be compatible with the primary project missions of flood risk management, hydroelectric power generation, navigation, and water conservation. Recreational facility development proposed in this plan is dependent on availability of appropriated funds, but may also be partially achieved through partnerships, donations and volunteer efforts. The Master Plan does not propose the acquisition of additional land.

Additional information regarding environmental impacts to existing conditions as a result of this Master Plan can be found in the Environmental Assessment of the Keystone Dam and Reservoir Master Plan in Appendix B.

1.4 DESCRIPTION OF PROJECT AND WATERSHED

Keystone Lake was named after the community of Keystone, a small town with a post office from 1900-1962. The name stems from the circumstance that the original site, inundated by the waters of the lake, was in a key position at the Junction of the Cimarron and Arkansas Rivers. The former town sites of Mannford, Prue, Appalachia, and part of Osage also were abandoned because they were located in the area to be inundated by the lake.

Currently, the upstream watershed of Keystone Lake is 74,506 square miles. Under normal conditions within the watershed, approximately 22,351 square miles contributes runoff to the lake. Keystone Lake provides flood protection on the Arkansas River downstream from the dam to the mouth of the Verdigris River, as well as contributes to flood protection downstream to Pine Bluff, Arkansas, and to some extent on the Mississippi River.

Keystone Dam is located approximately two miles downstream from the confluence of the Arkansas and Cimarron Rivers at mile 538.8 of the Arkansas River and about 15 miles west of Tulsa, Oklahoma. Keystone Lake extends westward from the dam near the Tulsa-Creek County line to the vicinity of Blackburn, Oklahoma on the Arkansas River on the Payne-Creek County line on the Cimarron River.

The embankment is constructed of rolled earth-filled material. The total length of the dam, including a 1,600-foot-long concrete section, is 4,600 feet. The maximum height is

about 121 feet above the streambed. The concrete section consists of a spillway 856 feet wide, a non-overflow section, and a power intake structure. Highway 151 crosses the dam to connect the relocated U.S. Highway 51 on the south with the relocated U.S. Highway 64 on the north. The spillway is a gated, concrete, ogee-weir with a net width of 720 feet, surmounted by eighteen 40- by 35-foot tainter gates. Spillway capacity at the top of maximum pool (elevation 766.0) is 939,000 cubic feet per second (cfs) and at the top of the flood control pool (elevation 754.0 mean sea level (msl)) is 565,000 cfs. The spillway is also equipped with nine 5.67- by 10-foot sluices located between alternate intermediate piers. Channel capacity of the Arkansas River below Tulsa, Oklahoma, is about 90,000 cfs. The powerhouse and power intake structure are located between the spillway and the left non-overflow sections and include two penstocks, each 27 feet in diameter, controlled by two 14- by 30-foot gates. The capacity of the power and water supply pool (conservation pool) at elevation 723 msl is 431,920 acre-feet.

1.5 PRIOR PERTINENT DESIGN MEMORANDA

Eighty-one separate Design Memorandums were prepared from 1954 thru 1962 setting forth design criteria for all aspects of the project including the prime flood risk management facilities, hydroelectric power facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the Master Plan for recreation development and land management. A complete listing of the Design Memoranda is provided in Appendix B of this Master Plan.

1.6 PERTINENT PROJECT INFORMATION

The following table provides pertinent information regarding existing reservoir storage capacity at Keystone Lake. Information for Table 1.1 was taken by the 2012 Keystone Lake Water Control Manual.

Table 1.1 Water Storage Capacity

Feature	Elevation Feet	Area (acres)(1)	Lake Capacity			Spillway Capacity (cfs) 18 gates	Outlet Works Capacity (cfs)
			Accumulative (acre-feet)(1)	Runoff (inches)	Incremental (acre-feet)(1)		
Top of Dam	771.0	79, 535	2,703,355	2.27	344,225	-	-
Maximum Pool	766.5	72,370	2,359,130	1.95	798,570	854,030	36,250(2)
Top of Flood Control	754.0	53,030	1,560,560	1.31	1,128,640	557,280	35,000(3)
Top of Conservation Pool	723.0	16,740	431,920	0.36	64,380	18,180	30,800
Spillway Crest	719.0	15,420	367,540	0.31	170,380	0	29,800
Bottom of Conservation Pool	706.0	11,100	197,160	0.17	197,160	0	26,000

Feature	Elevation Feet	Area (acres)[1]	Lake Capacity			Spillway Capacity (cfs) 18 gates	Outlet Works Capacity (cfs)
			Accumulative (acre-feet)[1]	Runoff (inches)	Incremental (acre-feet)[1]		
Flood Control Storage	723.0 – 754	-	1,128,640	0.95	-	-	-
Conservation Storage	650.0	-	-	-	-	-	-

[1] Based on 2005 bathymetric survey and 2008 LiDAR survey
[2] Based on an assumption of the spillway operating. Free flow curve, gates fully open, with no spillway operating is 40,500 cfs.
[3] Based on an assumption of the spillway operating. Free flow curve, gates fully open, with no spillway operating is 37,900cfs.

The following table provides acreages for the various Land Classifications at Keystone Lake. These Land Classifications are standard throughout 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 Acreage by Land Use Classification

Classification	Acres
Project Operations	601
High Density Recreation	4,223
Environmental Sensitive Areas	166
Multiple Resource Managed Lands:	
Low Density Recreation	7,128
Wildlife Management	19,389
Vegetative Management	0
Future/Inactive Recreation Areas	0
Water Surface[1]:	
Restricted	37
Designated No-wake	681
Fish and Wildlife Sanctuary	47
Open Recreation	26,815
Total Acreage	**59,087**

[1] Water surface upstream and downstream from the Keystone Dam
Note: Acreages vary depending on changes in lake levels, sedimentation and shoreline erosion.

CHAPTER 2 - PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

2.1 DESCRIPTION OF RESERVOIR

Keystone Lake is roughly in a "V" shape with the two arms formed by the Cimarron and Arkansas Rivers spanning over Creek, Osage, Pawnee, and Tulsa Counties in Oklahoma. The shoreline is irregular with many small coves and inlets and the banks vary from gentle slopes to steep bluffs. The upstream watershed is 74,506 square miles. The top of the flood control and flood surcharge pools at Keystone Lake exist at elevations 754 and 756 feet msl, respectively.

2.2 HYDROLOGY AND GROUNDWATER

Keystone Lake has two major tributaries; the Arkansas and Cimarron Rivers. The Cimarron River, with its headwaters in northeastern New Mexico, extends 698 miles across New Mexico, Colorado, and Kansas, with the majority of its length in Oklahoma. The 1,469 mile Arkansas River, with its headwaters in the high Colorado Rocky Mountains, flows through Colorado, Kansas, and Oklahoma, finally empting into the Mississippi River in Arkansas. The Cimarron River enters the confluence from the west-southwest, while the Arkansas River enters the confluence from the northwest. Other tributaries, such as the Salt Fork, also feed the lake, affecting the lake levels, sedimentation, pollution, minerals, and nutrients in the reservoir.

At the Keystone Lake conservation pool elevation 723.0 msl, there are 431,920 acre-feet of water stored, 26,300 surface acres, and a shoreline of 330 miles. At flood control pool elevation 754.0 msl, there is 1,737,600 acre-feet of water stored, and 55,400 surface acres. The flood of record occurred on May 14, 1993 when the pool level crested at 756.49 msl. The period from September 29 to October 21, 1986 was the record of maximum release, which had a volume of 4,444,000 acre-feet, the equivalent of 3.73 inches of runoff. Peak inflow to the lake during this period was 344,000 cfs.

During normal reservoir operations, floodplains lying below the flood control surcharge pool (756.0 msl) are inundated at varying frequencies depending on elevation. The lower portions of these floodplains typically lie within fee-owned federal lands administered by USACE while the higher portions are located on private land where USACE acquired a flowage easement to allow for periodic inundation. Regardless of the estate owned by USACE on areas lying below elevation 756.0 msl, placement of habitable structures or fill material are strictly limited so as not to interfere with the operation of the project.

The Vamoosa-Ada and the Arkansas River Aquifers are located beneath Keystone Lake. The Vamoosa-Ada Aquifer spans across the Arkansas River south to the Cimarron River on the western end of the lake. The Arkansas River Aquifer is located beneath the lake on the northwestern end and beneath the Arkansas River and on the downstream side of the dam.

2.3 SEDIMENTATION AND SHORELINE EROSION

As is typical with a majority of reservoirs, Keystone Lake is affected by siltation accumulated from areas outside USACE management. The siltation on Keystone Lake acreages has increased elevation and decreased the water surface acreage from the original acquisition of project lands.

The most severe erosion at Keystone Lake has been at the shoreline. Wave action has eroded the topsoil leaving a band of rock similar to riprap along the shore in many places. Another erosion problem area is in the vicinity just below the dam and was corrected by the placement of rock dikes. Other than the measures taken below the dam, water-tolerant grasses and other ground covers have been established in public-use areas to protect shorelines and roadways from erosion. Also, vegetative management activities are being undertaken on the downstream face of the dam and along the river channel. Examples of erosion covers are Bermuda grass, weeping love grass, and big bluestem grass.

2.4 WATER QUALITY

The chemical aspect of the Keystone pool is dependent upon the loading of nutrients and minerals deposited by the Cimarron and Arkansas Rivers. The Cimarron River is highly mineralized. The Oklahoma Water Resources Board (OWRB) Beneficial Use Monitoring Program (BUMP) report for the 2002-2003 time period detailing the water quality near Oilton upstream from Keystone, states that beneficial use for Warm Water Aquatic Community-Fish and Wildlife Propagation (WWAC) is “not supported”.

Conductivity values for the lake also vary greatly depending on drainage from specific watersheds. These values fall within guidelines supporting the fish and wildlife beneficial use.

A four-quarter average of chlorophyll on the Trophic State Index (TSI), a scale used to measure the biomass in a given water body, was 61. This level classifies the lake as being hypereutrophic (very nutrient rich), although it may fall to a more eutrophic or mesotrophic state depending on environmental factors. It would be expected to be more hypereutrophic during the spring and early summer with the surge of inflows. Fertile soils and minerals from Kansas and western Oklahoma ensure Keystone Lake remains highly productive; however, the excessive productivity, heavy sedimentation and increased turbidity have negative impacts on water quality affecting spawning and overall fish health. There is some indication regarding the nitrogen to phosphorus ratio in Oklahoma Water Board’s Beneficial Use Monitory Program (BUMP) report that the lake may be co-limited. Implications on management objectives include negative impacts on growth rates resulting from turbidity, ongoing siltation of preferred spawning areas, and water quality issues in the pool. These parameters are directly correlated with the excessive primary production. The high rate of water exchange results in emigration and sudden water level drops negatively affect recruitment and ultimately adult fish abundance.

The unique thermal, chemical, and oxygen profile of the Keystone pool is a result of the two large prairie rivers converging at the pool. A study in the summers of 1986-1988 examined profiles in depth. Temperatures in the summer peak were between 82° and 86°

Fahrenheit (F), and temperatures above 80°F were common and could last for a month. Stratification begins to occur very early in summer, influenced heavily by the high salinity of the lake. Although stratified early in the summer, by mid to late August water temperatures become homogenous from top to bottom in the pool and other nearby locations. This is due in large part to the unique mixing that the two large rivers converging at the pool create. The high conductivity of the Cimarron River also seems to play a role in this phenomenon. Although the temperatures are homogenous, a chemocline is usually still present year round. At peaks between 83°F and 86°F combined with oxygen values dropping below 3.0 parts per million (ppm) at 20 to 29 feet, the pool is a harsh environment for fish. Species, such as striped bass, stop feeding under these conditions and eventually starve. This scenario is responsible for what is almost an annual striped bass kill in Keystone Lake.

The USACE conducted a water quality study for Keystone Lake between April and October 1996 and found that waters impounded by the reservoir are too highly mineralized to be suitable for municipal and industrial uses without extensive treatment. Keystone Lake presents an unusual situation in that the Cimarron River carries significantly higher dissolved salts to the lake than the Arkansas River. Higher specific conductance and chloride levels were consistently observed at depth at lacustrine stations. The water in Keystone Lake was classified as very hard, and total dissolved solids levels in the lake exceed levels acceptable for domestic uses.

Trophic classification of Keystone Lake using epilimnetic total phosphorus concentrations resulted in a classification of hyper-eutrophic. Because phosphorus has a high affinity to absorb suspended particulates this trophic state classification may be an overestimate given the short retention time (42 days) and relatively high turbidity of the reservoir. More than one-third of all turbidity observations during the study exceeded the Oklahoma Water Quality Standard of 25 Nephelometric Turbidity Unit (NTU's). Based on chlorophyll *a* concentrations, trophic classification of Keystone Lake would fall into a meso-eutrophic category. The lower index values are indicative of the effects of inorganic turbidity limiting algal productivity. Iron and manganese were also found in relatively high concentrations. During times of oxygen depletion in the hypolimnion, water users would experience staining problems. In conclusion, the water in Keystone Lake is of a reasonably good water quality when considering its primary uses of flood control, hydroelectric power, and navigation.

2.5 PROJECT ACCESS

Primary access to the lake along an east-west axis is via US Highway 64 and the Cimarron Turnpike and Sand Springs Expressway. Interstate 44 from Oklahoma City passes south of the lake area, proceeds through Tulsa, and continues on to the northeast corner of the State, and Interstate 40 bisects the State from east to west fifty miles south of Keystone Lake. Major north-south roadways servicing the lake area include Interstate 35 North from Oklahoma City, US Highway 75, bisecting the State on a line from Tulsa South, and the Muskogee Turnpike from the Tulsa area to Muskogee. Additionally, there are multiple Oklahoma Department of Transportation projects near the lake. These include Cedar Creek Bridge, Hwy 48 Cimarron River Bridge, Hwy 151a onramp/bridge, and Hwy 51 Cimarron River Bridge replacements scheduled from now through 2017.

2.6 CLIMATE

Keystone Lake lies in a region characterized by moderate winters and comparatively long summers with relatively high temperatures. The summer rains usually occur as thunderstorms of short duration and limited extent but with intense rainfall. The winter rains are generally of low intensities but cover large areas and are several days in duration. Normal annual precipitation over the watershed is about 37.1 inches. May is normally the wettest month and December the driest; however major storms may occur at any time during the year. Nearly two-thirds of the precipitation occurs during the growing season, April through September. Annual snowfall averages around 8.9 inches per year.

The mean temperature for the area is around 60°F with record extremes ranging from a minus 26°F to a plus 115°F. The Keystone Lake watershed is in an area of prevailing southerly winds with greatest wind movements occurring in the spring months. A study of available wind velocity data indicates that 45 miles per hour is the highest wind velocity that can be reasonably expected for the duration of one hour or more.

The topic of worldwide climate change, including the causes and extent, continues to be studied by the scientific community and world governments. In the United States, two Executive Orders, EO 13514 and EO 13653, as well as the President's Climate Action Plan (CAP) set forth requirements to be met by Federal agencies. These requirements range from preparing general preparedness plans to meeting specific goals to conserve energy and reduce greenhouse gas emissions. USACE has prepared an Adaptation Plan in response to the Executive Orders and CAP. The Adaptation Plan includes the following USACE policy statement:

> "It is the policy of USACE to integrate climate change preparedness and resilience planning and actions in all activities for the purpose of enhancing the resilience of our built and natural water-resource infrastructure and the effectiveness of our military support mission, and to reduce the potential vulnerabilities of that infrastructure and those missions to the effects of climate change and variability."

2.7 TOPOGRAPHY, GEOLOGY, AND SOILS

2.7.1 Topography

Land forms surrounding Keystone Lake range from strongly sloping hills around the dam and lower reaches of the lake to gently sloping grasslands at the upper reaches. The lake is located in the Eastern Sandstone Cuesta Plains subdivision of the Interior Central Lowland physiographic province. The majority of the shoreline can be described as sharply sloping toward Keystone Lake, with short rocky bluffs making up some of the shoreline.

The degree of variation does not pose a problem for recreational development as the majority of the designated public use areas possess sufficient topographic relief to provide or enhance visual appeal and the general recreation experience. Some of the public use areas located on gently sloping grasslands are easily developed but lack visual interest for the recreationist.

2.7.2 Geology

The geology of the area is dominated by materials of the Pennsylvanian system. Principal geologic formations found in the project areas are Vamoosa, Barnsdall, Tallant, Wann and Ada.

2.7.3 Soils

Although several different soil types are present, the general predominant soil type within the project area is the Niotaze-Darnell complex. The Niotaze-Darnell complex consists of small areas of Niotaze and Darnell soils that are so intermingled that distinct separation is often not possible on a small mapping scale. The Niotaze-Darnell soil complex, which forms on the crests and side slopes of uplands, range from moderately deep (Niotaze) to thin (Darnell), somewhat poorly drained (Niotaze) to well drained (Darnell), and are very gently sloping (3%) through moderately steep (25%) in slope.

In typical Niotaze soils, the surface layer to a depth of about three inches consists of very dark grayish brown silt loam that grade at that depth to a brown silt loam to six inches. The upper part of the subsoil is reddish brown silty clay to a depth of 15 inches. The middle part is mottled in shades of red, brown, and olive silty clay to a depth of 28 inches. The lower part is olive silty clay to a depth of 36 inches. The underlying material of Niotaze soils is shale bedrock. The permeability of the Niotaze soil is slow and available water capacity is medium.

The Niotaze-Darnell soil complex supports commercial range management operations, but is also well suited for the growth of native woodlands consisting primarily of a post oak-blackjack oak complex, including Chinquipin oak, hickory, and eastern redcedar. The woodlands provide excellent wildlife habitat as well as firewood and wooden post products. The smoother, less stony areas are also suited to domestic pasture grasses.

A soil survey by the Natural Resource Conservation Service (NRCS) shows there are eight general classifications (Classes I through Class VIII) occurring in the reservoir area. The erosion hazards and limitations for use increase as the class number increases. Class I has few limitations, whereas Class VIII has many.

The soil class data for project lands is provided in Table 2.1. This data is compiled by the NRCS and is a standard component of natural resources inventories on USACE lands. This, and other inventory data, is recorded in the USACE Operations and Maintenance Business Information Link (OMBIL). A map showing the soil locations can be found in Appendix A.

Table 2.1 Soil Classes

Soil Class	**Acreage**
Class I	8%
Class II	14%
Class III	10%
Class IV	12%
Class V	8%
Class VI	11%
Class VII	26%
Class VIII	11%

A general description of the soils in the Keystone Lake and the land capability classes are described below.

- *Class I* soils have slight limitations that restrict their use.
- *Class II* soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
- *Class III* soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- *Class IV* soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
- *Class V* soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- *Class VI* soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- *Class VII* soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.
- *Class VIII* soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for aesthetic purposes.

Detailed information on all soil types surrounding Keystone Lake is available on websites maintained by the NRCS, U.S. Department of Agriculture.

2.8 RESOURCE ANALYSIS

Natural resources include vegetation, soils, wetlands, fish and wildlife resources, including threatened and endangered species present in the vicinity of Keystone Lake. The protection and enhancement of natural, cultural, and recreational resources are given priority to the extent that congressionally authorized project purposes are fulfilled. Proper resource management is imperative to the sustainability of project resources.

2.8.1 Fish and Wildlife Resources

Fisheries and Aquatic Resources

The waters of Keystone Lake provide habitat for an abundance of various species of warm-water fish. Recreational fishing is and will continue to be an important aspect of the overall recreational program enjoyed by visitors to the lake. Native species commonly sought by fisherman are channel catfish, flathead catfish, blue catfish, white crappie, white bass, largemouth bass, spotted bass, and various sunfish species. The Lake also supports an extremely active striped bass fishery that was artificially introduced in the 1965. Forage for the sport fish population is provided by gizzard shad, various minnows, and shiners.

Fish habitat consists of extensive shorelines made up of rock or sand. Rocky shorelines consist of sand stone gravel, rock boulder, and bedrock. Riprap also provides fish habitat and can be found along the dam and on the sides of state highway 51 at Salt Creek and state highway 412 at the confluence. A small area of riprap can be found upstream from Cowskin Bay. There are limited amounts of dead standing timber which are confined to a few cove areas as the impoundment ages. In general, vegetative cover is limited by the vast amount of rocky shoreline. The upper reaches of the Arkansas arm of the lake has silted in with rich soils from upstream creating an area that is suitable for water willow. Primary substrate in Keystone Lake is sandstone, loamy silt, and clay. Each year (water levels allowing) local anglers in cooperation with USACE and the Oklahoma Department of Wildlife Conservation create brush piles in different areas of the lake and add brush to previous piles.

The Oklahoma Department of Wildlife Conservation is the lead agency for fisheries management throughout the state, including Keystone Lake. In 1965 a stocking program for striped bass was started at Keystone Lake and continued until 1969 (total of 2,724,800 fish stocked, of which 11 were adults). The striped bass population is now stable and self-sustaining, but suffers annual die-offs as a result of the water quality issues mentioned in Section 2.4.

A 14 inch length limit was placed on all species of black bass in 1987 to prevent overharvest. This is the only special fishing restriction at Keystone Lake. Currently, statewide creel and length limits also apply at Keystone Lake. Fishing regulations for Keystone Lake are published annually and available to the public in the Oklahoma Fishing Guide through the ODWC.

As stated in the water quality section, Keystone Lake is hypereutrophic. Heavy nutrient and sediment loading causes an excessive amount of primary production and the

heavy silting affects spawning beds and egg survivability. Constant water fluctuations dry or flood spawning beds, cause habitat disruption, and have the potential for degrading water quality. In spite of these conditions, the overall fishery in Keystone Lake is in good condition.

Aquatic nuisance species, such as the exotic white perch, compete for resources and displace native species. Education of anglers and concessions will have to be provided to control the spread of these species to neighboring lakes. The overall health of the white bass population will have to be monitored as exotic white perch begin to grow in numbers.

Wildlife

The major wildlife habitats are upland forests, bottomland forests, and tallgrass prairie. Each of these vegetative types provides habitat for a variety of organisms. The transition zones between these areas are especially productive. Principal wildlife species include bobwhite quail, grey and fox squirrels, cottontail rabbits, white-tailed deer, songbirds, waterfowl, wild turkeys, raccoons, bobcats, and various birds of prey, including the bald eagle.

For each of the three major wildlife habitat types, the Oklahoma Comprehensive Wildlife Conservation Strategy has prepared a list of species of greatest conservation need. Conservation issues affecting these habitat types are similar, and include habitat loss and fragmentation; invasive and exotic plants and animals; and, in the case of bottomlands, altered patterns of water flow. The following is a list of species by habitat type, sorted alphabetically within groups of amphibians (Amph), birds, invertebrates (Inve), mammals (Mamm), and reptiles (Rept) for easy reference. The population abundance and trends for each species are described in general terms as follows:

Species Status Definitions:

- Low – species is rare, has a small population size, and/or occurs in only a small portion of the Region.
- Medium – species is uncommon and occurs over a large portion of the Region or species is common but occurs in only a small part of the Region.
- Abundant – species is common and widespread within the Region in appropriate habitat.
- Unknown – the status of this species is not known.

Table 2.2 Oak and Hickory Bottomland Hardwood Forest

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Crawfish Frog				X				X
Bird	American Woodcock	X							X
Bird	Bell's Vireo		X			X			
Bird	Harris's Sparrow		X						X
Bird	Hooded Warbler	X							X
Bird	Kentucky Warbler		X						X
Bird	Lesser Scaup		X			X			
Bird	Little Blue Heron		X						X
Bird	Louisiana Waterthrush		X						X
Bird	Northern Pintail		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Warbler		X						X
Bird	Prothonotary Warbler		X						X
Bird	Red-headed Woodpecker		X			X			
Bird	Rusty Blackbird	X							X
Bird	Solitary Sandpiper	X							X
Bird	Wood Thrush	X							X
Mamm	Brazilian (Mexican) Free-tailed Bat				X				X
Mamm	Eastern Harvest Mouse				X				X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Marsh Rice Rat				X				X
Mamm	River Otter		X					X	
Mamm	Seminole Bat				X				X
Mamm	Swamp Rabbit				X				X
Rept	Alligator Snapping Turtle				X				X
Rept	Eastern River Cooter				X				X
Rept	Midland Smooth Softshell				X				X
Rept	Mississippi Map Turtle				X				X
Rept	Northern Scarletsnake				X				X
Rept	Ouachita Map Turtle				X				X
Rept	Razor-backed Musk Turtle				X				X
Rept	Spiny Softshell Turtle				X				X
Rept	Western Chicken Turtle				X				X

Table 2.3 Post Oak/Blackjack Oak/Hickory Woodland and Forest

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Bird	American Woodcock	X							X
Bird	Bachman's Sparrow	X							X
Bird	Bell's Vireo		X			X			
Bird	Black-capped Vireo	X				X			
Bird	Harris's Sparrow		X						X
Bird	Kentucky Warbler		X						X
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Warbler		X						X
Bird	Red-headed Woodpecker		X			X			
Inve	American Burying Beetle		X						X
Inve	Byssus Skipper	X							X
Inve	Prairie Mole Cricket	X				X			
Mamm	Brazilian (Mexican) Free-tailed Bat				X				X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Long-tailed Weasel				X				X
Mamm	Ringtail				X				X
Rept	Northern Scarletsnake				X				X
Rept	Texas Horned Lizard				X				X
Rept	Western Diamond-backed Rattlesnake				X				X

Table 2.4 Tallgrass Prairie

Species of Greatest Conservation Need		Status				Trend			
Group	Common Name	Low	Medium	Abundant	Unknown	Declining	Stable	Increasing	Unknown
Amph	Crawfish Frog				X				X
Bird	American Golden Plover		X						X
Bird	American Woodcock	X							X
Bird	Bald Eagle	X						X	
Bird	Barn Owl	X							X
Bird	Bell's Vireo		X			X			
Bird	Buff-breasted Sandpiper	X				X			
Bird	Burrowing Owl	X							X
Bird	Greater Prairie Chicken	X				X			
Bird	Harris's Sparrow		X						X
Bird	Henslow's Sparrow	X							X
Bird	LeConte's Sparrow		X						X
Bird	Loggerhead Shrike		X			X			
Bird	Northern Bobwhite		X			X			
Bird	Painted Bunting		X						X
Bird	Prairie Falcon	X							X
Bird	Red-headed Woodpecker		X			X			
Bird	Sandhill Crane		X				X		
Bird	Short-eared Owl				X				X
Bird	Smith's Longspur	X							X
Bird	Sprague's Pipit				X				X
Bird	Swainson's Hawk		X						X
Bird	Upland Sandpiper				X		X		
Inve	American Burying Beetle		X						X
Inve	Byssus Skipper	X							X
Inve	Dotted Skipper	X				X			
Inve	Iowa Skipper	X				X			
Inve	Prairie Mole Cricket	X				X			
Inve	Regal Fritillary				X				X
Mamm	Eastern Spotted Skunk				X				X
Mamm	Long-tailed Weasel				X				X
Rept	Texas Horned Lizard				X				X

2.8.2 Vegetative Resources

Three basic vegetation zones can be found in the project area: the upland forest, the bottomland hardwood, and the tall prairie grass. The upland forest Post Oak-Blackjack types in the Central Great Plains and the Cross Timbers regions represents a mixture of forest and grassland ecosystems characteristic of most of the lake shoreline and recreation areas. The overstory is composed largely of blackjack oak (*Quercus merilandica*), post oak (*Quercus stellata*), eastern red cedar (*Juniperus virginiana*), and black hickory (*Carya texana*). Various species of sumac, berries, and grasses make up the understory growth.

The Bottomland Hardwood type has, for the most part, been inundated by the lake, but some stands of the forest type remain in the extreme reaches of the lake. The principal tree species found on the river bottoms are northern red oak (*Quercus rubra*), black oak (*Quercus velatina*), chinquapin oak (*Quercus muehlenbergi*), overcup oak (*Quercus lyrata*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), black walnut (*Juglans nigra*), pecan (*Carya illinoensis*), river birch (*Betula nigra*), winged elm (*Ulmus alata*), slippery elm (*Ulmus ruba*), hackberry (*Celtis laevigata*), sassafras (*Sassafras albidum*), hawthorn (*Crataegus sp.*), redbud (*Cercis canadensis*), honey locust (*Gleditsia triacanthus*), red maple (*Acer rubrum*), box elder (*Acer negundo*), dogwood (*Cornus florida*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvania*), swamp privit (*Forestiera acuminata*), and buttonbush (*Cephalanthus occidentalis*). The shallow upland soils support the growth and vitality of the native Blackjack forest vegetation. The overall visual character of the forested area is good, however, due to protection and management resulting from USACE ownership.

The tall prairie grass vegetation type is a very desirable native grass ecosystem. Better soils in the rolling plains area of the lake support such desirable grasses as big bluestem (*Andropogon gerardi*), Indian grass (*Sorghastrum nutans*), purple top (*Tridens flavus*), and little bluestem (*Andropogon scoparius*). Unfortunately, at the time of Federal acquisition, virtually no virgin vegetation remained in the area and the quality of existing vegetation was degraded by erosion, fires, and historic overgrazing. However, with fifty years of Federal ownership has resulted in beneficial tall prairie grass vegetative succession.

The vegetative data of the Keystone Lake were classified using information derived from FY2014 Project Site Vegetation Classification Records reported in OMBIL this data and the results are displayed in Table 2.2.

Table 2.5 Vegetation Classification Records

Order	Class	Sub-Class	Acreage
Non-Vegetated(1)	Non-Vegetated	Non-Vegetated	40%
Herb Dominated	Herbaceous Vegetation	Perennial forb vegetation	9%
Shrub Dominated	Shrubland (Scrub)	Mixed evergreen-deciduous shrubland (scrub)	17%
Tree Dominated	Closed Tree Canopy	Deciduous closed tree canopy	34%

(1)Includes lakebed

2.8.3 Threatened and Endangered Species

Considerations for federally-listed threatened and endangered species at Keystone Lake are in accordance with Tulsa District's current Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (USFWS). Past and potential future actions include such measures as construction and management of nesting habitat for the endangered Interior Least Tern (ILT) (*Sterna antillarum*) and American Burying Beetle (ABB) (*Nicrophorus americanus*). Should federally-listed species change in the future (e.g., delisting of the ILT or other species or listing of new species) associated requirements will be reflected in a revised BO from the USFWS. Natural resources needs and management for listed species at Keystone Lake will change accordingly.

Section 7(a)(2) of the Endangered Species Act 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.

The ILT is a federally-listed endangered bird that nests on sand bars along the Arkansas River in Oklahoma and Arkansas. Preferred nesting habitat for the ILT is bare sand substrate located a considerable distance from trees or other potential roosting spots for avian predators. In accordance with a BO issued by the USFWS, the Tulsa District is required to construct and maintain a given quantity of suitable nesting habitat for the ILT at varying civil works projects. ILT nesting success is monitored by Tulsa District biologists.

The ABB can be found at Keystone Lake. It was proposed for federal listing in October 1988 (53 FR 39617) and designated as an endangered species on July 13, 1989 (54 FR 29652) and retains this status. The ABB is an annual species and typically reproduces once in its lifetime. It competes with other invertebrate species as well as vertebrate species, for carrion. Although ABBs are considered feeding habitat generalists, they are believed to be more selective regarding breeding habitat. Direct adverse impacts to ABBs during their

inactive and active periods may occur as a result of impacts from clearing vegetation; soil compaction due to heavy equipment operation; fuel and chemical contamination of the soil; grading; soil excavation and filling; and re-vegetation and reseeding of disturbed areas. If construction occurs during the active season, ABB broods could be displaced during soil excavation, adults could be separated from larvae/eggs, and/or both could be crushed by equipment. For future actions where incidental take may occur, USACE will comply with the BO to conduct presence/absence surveys.

Other threatened and endangered species having potential habitat at Keystone Lake fee lands, as identified by USFWS Information for Planning and Conservation report, can be found in Table 2.3.

Table 2.3 Threatened and Endangered Species

	Status	**Federal and State List**	**Has Critical Habitat**	**Biological Opinion Issued**
Birds				
Piping Plover *Charadrius melodus*	Threatened	FED	No	Yes
Least Tern *Sternula antillarum*	Endangered	FED	No	Yes
Red Knot (1) *Calidris canutus*	Threatened	FED	No	No
Whooping Crane *Crus americana*	Endangered	FED	No	No
Clams				
Neosho Mucket *Lampsilis rafinesqueana*	Endangered	FED	Yes (1)	No
Insects				
American Burying Beetle *Nicrophorus americanus*	Endangered	FED	No	Yes
Rattlesnake-master Borer Moth *Papaipema eryngii*	Candidate	FED	No	No
Mammals				
Northern Long-eared Bat *Myotis septentrionalis*	Threatened	FED	No	No

Note: There are no Final Recovery Requirements or Recovery Actions Designated for any of the species listed above.
(1) Only applies for wind energy projects
(2) There is no critical habitat within the Keystone Lake area

2.8.4 Invasive Species

The Arkansas River basin has been identified as a major pathway for the introduction of aquatic nuisance species. The following vegetative species are considered of special concern in Oklahoma: alligator weed (*Alternanthera philoxeroides*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), purple loosestrife (*Lythrum salicaria*), salvinia (*Salvinia molesta*), and water hyacinth (*Eichhornia crassipes*). Due to its proximity to the McClellan Kerr Arkansas River Navigation System, Keystone Lake is particularly vulnerable to the transport by boaters of these invasive plants as well as some invasive animal species. Salvinia and water hyacinth have been documented to occur in Keystone Lake, but are not yet at population levels that allow them to have widespread impacts in the lake. Salvinia refers to a genus of perennial, aquatic ferns from South America that is common in water gardens and aquarium industries. In Oklahoma giant salvinia has established in ponds, lakes and slow moving streams. It prefers nutrient rich waters and forms extensive mats that can completely cover water surfaces resulting in the degradation of natural habitats by shading natural plants, reducing available dissolved oxygen and creating large amounts of decaying plant material. Giant salvinia can clog water intakes which interferes with irrigation, water supply, and electrical generation. Human transport aids in the spread of this species, with plants adhering to anything entering infested waters including boats, trailers, vehicular wheels, intakes, and gear. Water hyacinth is common in Gulf Coast states and its presence has caused massive problems with navigation, water based recreation, canal systems, pumping stations, and water intakes. While the risk of establishment in Oklahoma is low due to cold winter air temperatures, its continued popularity in water gardens poses a threat that it could adapt to colder temperatures or become established in thermal refugia. In addition to aquatic invasive plants, Oklahoma has a total of 22 invasive plant species on the Oklahoma Invasive Plant Council problem list. Invasive terrestrial plants known to occur on Keystone Lake lands include Japanese honeysuckle (*Lonicera japanica*), Chinese lespedeza (*Lespedeza cuneata*), Japanese climbing fern (*Lygodium japonicum*), kudzu (*Puearia lobata*), and autumn olive (*Elaeagnus umbellata*).

The zebra mussel (*Dreissena polymorpha*) is an invasive, fresh water invertebrate that has a high filtration rate, high reproductive rate, strong byssal threads for substrate attachment, and limited number of natural predators. Due to these characteristics, zebra mussels are able to populate an aquatic ecosystem relatively quickly and out-compete native mussel populations. Economic impacts caused by the invasive species include fouling water intake pipes, cooling systems, filtration systems, and fouling boat engine cooling systems. Zebra mussels fouling filtration systems associated with fire suppression at facilities using raw water can impede effectiveness of the system, increasing the potential of damage to the facility and danger human welfare. When a zebra mussel “die-off” occurs, thousands of shells can wash up on the shoreline and/or beach area; the sharp edges of the mussels’ shells could potentially cause human harm and subsequent public beach closure for public safety.

Zebra mussels were introduced to North America via trans-Atlantic barges to the commercial waterways of the United States from Europe in the 1980’s. Once established, the spread of zebra mussels to inland waters has occurred via navigation system traffic, overland transportation of private boats from an infested water body to an uninfected water body, and natural downstream flows that carry the free floating larva form of the species. Within the

Tulsa District, zebra mussels were first confirmed in Oklahoma in the McClellan-Kerr Arkansas River Navigation System (MKARNS) in January 1993 inside Locks 14 (W.D. Mayo), 15 (Robert S. Kerr), and 16 (Webbers Falls). The invasive species were subsequently found in the Verdigris River of the MKARNS at lock 17 (Chouteau) in June 1993 and at lock 18 (Newt Graham) January 1994. In conjunction with zebra mussel infestation at the locks along the MKARNS, the species were also observed to be in the powerhouses associated with Keystone Lake. Upon confirmation of zebra mussel establishment, monitoring efforts at locks and dams along the MKARNS were conducted by USACE biologists and Northeastern State University research faculty at boat ramps that provide access to the reservoirs along the MKARNS. Signs were posted to educate the public concerning the presence of invasive species assisting in the prevention of spreading the species to other water bodies. Zebra mussels continue to populate the navigation system and populations are monitored via routine maintenance activities associated with the facilities along the MKARNS. In 2012, USACE facilities at Keystone Lake noted an increase in manual maintenance to the powerhouse cooling systems during the summer months, when zebra mussel activity is greatest.

White perch *(Morone americana)* were stocked by accident into Cheney and Wilson reservoirs in Kansas. This stocking was a result of a striped bass *(Morone saxatilis)* stocking contaminated with white perch. Since white perch were found in Kaw reservoir in 2000, the Oklahoma Department of Wildlife Conservation (ODWC) has continued monitoring competition with native species such as white bass (*Morone chrysops*). In 2004 white perch were found in Keystone during fall gillnetting samples.

Table 2.4 lists the invasive species that occur on Keystone Lake fee lands. Data were retrieved from the FY2014 Project Site Invasive Species Records reported in OMBIL.

Table 2.4 Invasive Species

Species Group	**Common Name**	**Type of Occurrence**	**Acreage Impacted**	**Percent Acreage Impacted**	**Acreage Treated**
Aquatic and Wetlands Animals	Zebra mussel	Significant/Major	23,610	40.24%	0
Terrestrial Plants	Kudzu	Moderate	100	0.17%	0
Terrestrial Plants	Red cedar	Significant/Major	15,000	25.57%	0
Terrestrial Plants	Russian olive	Minor	200	0.34%	0
Terrestrial Plants	Sericea lespedeza	Significant/Major	8,000	13.64%	0

2.8.5 Ecological Setting

According to ODWC, Keystone Lake is located in the Central Great Plains and the Cross Timbers regions. This compares to a collaborative ecoregion mapping project by the Environmental Protection Agency (EPA) which describes the ecoregion surrounding Keystone Lake as the Northern Crosstimbers. The Crosstimbers stretch across Oklahoma from north to south with portions extending into Kansas to the north and Texas to the south and are sometimes described as containing some of the most extensive tracts of ancient forests in the eastern United States. Included in this ecoregion for Keystone Lake is the Keystone Ancient Forest, with its 300 year old post oaks and 500 year old cedars. This forest type exists because of its limited commercial value for timber production, and is protect through its designation of an Environmentally Sensitive Area (ESA) by the USACE.

Figure 2.1 Keystone Ancient Forest

Source: www.biosurvey.ou.edu

The Central Great Plains is slightly lower, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland. The eastern boundary of the region marks the eastern limits of the major winter wheat growing area of the United States. The Cross Timbers region is a transition area between the once-prairie, now winter wheat growing regions to the west, and the forested low mountains of eastern Oklahoma. The region does not possess the arability and suitability for crops such as corn and soybeans that are common in the Central Irregular Plains to the northeast. Transitional "cross-timbers" (little bluestem grassland with scattered blackjack oak and post oak trees) is the native vegetation, and presently rangeland and pastureland comprise the predominant land cover.

2.8.6 Wetlands

In accordance with standard USACE natural resources inventory requirements, wetlands are inventoried using the US Fish and Wildlife Service *Classification of Wetlands and Deepwater Habitats of the United States.* Table 2.5 lists the acreages of various types of

wetlands present at Keystone Lake. Data were retrieved from the FY2014 Project Wetland Classes Records is reported in OMBIL.

Table 2.5 Wetland Classes

System	Sub-System	Class	Class Acres
Lacustrine	Limnetic	Unconsolidated Bottom	23,610
Palustrine	No Sub-System	Emergent Wetland	994
Palustrine	No Sub-System	Forested Wetland	2,880
Riverine	Lower Perennial	Unconsolidated Bottom	13,021

2.9 BORROW AREAS

There are two borrow areas located around Keystone Lake. These areas consist of soil, gravel, and sand, and are used to maintain various sites around the lake. The borrow areas are located near the New Mannford Boat Ramp (approximately 19 acres) and south of Brush Creek near the radio antenna tower (approximately 14 acres). These areas do not have a significant effect on recreational development.

2.10 CULTURAL RESOURCES

Cultural resources preservation and management is an equal and integral part of all resource management at Civil Works operating projects. The term “cultural resources” is a broad term meant to include anything that is of cultural significance to humans and that has some historical value, and generally includes, but is not limited to, the following categories of resources: archaeological sites (historic and prehistoric), historic standing structures, traditional cultural properties, and sacred sites. There are approximately 400 known archaeological sites located on project lands associated with Keystone Lake. Twenty-five of these sites are documented as completely inundated. Some archaeological sites have high sensitivity because of past recoveries of human remains and associated funerary objects.

Numerous cultural resources laws 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. Stewardship of cultural resources on USACE Civil Works water resources projects is an important part of the overall Federal responsibility.

2.10.1 Archaeology

In 1952, the University of Oklahoma (OU), the Smithsonian Institution, and the National Park Service sponsored an archaeological survey of the Keystone Lake area prior to construction and impoundment. Harold Brighton, under direction of Dr. Robert Bell of OU, located 84 archaeological sites in April and May of 1952. Limited testing was conducted at some of the sites, and funding was unavailable for salvage excavations. In 1978, Jack Hofman surveyed the project area on behalf of the Oklahoma Archaeological Survey (OAS), for the Oklahoma Department of Parks and Tourism (ODPT). He identified eight sites in an area slated for facilities construction.

In 1979, the Tulsa District contracted Archaeological Research Associates (ARA) to conduct additional survey of the Keystone Lake lands to locate, describe, and evaluate

cultural resources located between the approximate top of the power pool and the project boundary. Fieldwork was conducted from October through December of 1979. The results of the survey and testing were reported in Moore (1980). ARA documented 270 sites in the Keystone Lake project area and reassessed the conditions of previously recorded sites. ARA also interviewed local artifact collectors and documented their collections, making every effort to tie the collections to the site locations. Test excavations were also conducted at a number of sites.

Additional limited investigations have been carried out at Keystone Lake for compliance with Section 106 of the National Historic Preservation Act (NHPA). In the larger regional area there are hundreds of archaeological sites and historic standing structures on record with the Oklahoma State Historic Preservation Office (SHPO) and OAS.

2.10.2 Cultural History Sequence

Six broad cultural divisions are applicable to a discussion of the culture history of the Keystone Lake region: Paleo-Indian, Archaic, Woodland, 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: 12,000 to 8000 BP
- Archaic: 8000 to 2000 BP
- Woodland: AD 1 to 800
- Plains Village: AD 800 to 1500
- Protohistoric: (Contact Period) AD 1500 to 1825
- Historic: AD 1825 to present

Paleo-Indian

While it is becoming increasingly evident that humans may have arrived in the Southern Plains as early as 30,000 years ago, the Paleoindian Period is the earliest well substantiated archaeological period in the project region. Signature stone tools are unnotched lanceolate projectile points, fluted (Clovis and Folsom) and unfluted (Plainview, Dalton, and others), often found in contexts where mammoth or bison remains also occur. During this period, small bands of hunters and gatherers relied largely on the hunting of megafauna such as mammoth and bison; however, several sites to the east have exhibited evidence of reliance on a wide variety of plant and animal species.

Paleoindian points are found in the project area, but usually on eroded surfaces lacking context or in river beds. Clovis, Folsom, Scottsbluff, Eden, Meserve, Plainview, and Scottsbluff points, and a Cody knife have been documented from a local private collection. The well documented Clovis sites in Oklahoma are the Domebo site in Caddo County where people killed an Imperial Mammoth 11,800 years ago, and Jake Bluff in Harper County, which is a bison kill site which has yielded both Clovis and later Folsom points. Two additional Folsom sites are the Cooper (a bison kill site) and Waugh (a possible camp). Dalton points have been found more often on sites in Eastern Oklahoma, and are associated with more diverse artifact assemblages.

Archaic Period

A larger variety of floral and faunal resources were utilized during the Archaic Period. An increase in seasonal variability of resources and increasing populations resulted in changing settlement and subsistence patterns. 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. Increasing diversity of stone tools through time reflects the increasing variability of resources and diversity of activities taking place at habitation sites. Projectile points from the Archaic are stylistically quite different (typically notched and stemmed) from those of the Paleoindian Period. Archaic assemblages in the project area include a variety of contracting and expanding stemmed large dart points, scrapers, and grinding implements. The Archaic period is traditionally divided into Early, Middle, and Late periods, the overall extent of which was approximately 8,500 BP to 2,000 BP.

Woodland

The Woodland Period in Eastern Oklahoma was a time of continuity marked by incorporation of new technologies and intensification of resources. The appearance in the archaeological record of small corner notched projectile points indicates that the bow and arrow was in use. Cultivation of plants began during this period and is often referred to as "insipient agriculture." The presence of ceramic sherds indicates that ceramic use in the form of pottery for storage and cooking had become widespread. Archaeological assemblages from this period indicate people were living in semi-permanent villages and dispersed communities, using settlement strategies such as seasonal mobility, targeted long distance resource procurement by portions of the community or household, and intensification of wild and domestic plants to meet their needs. Small game and aquatic resources remained essential in subsistence. Projectile points from this period include, in addition to the small corner notched points, large contracting stem points and large 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.

Rather than an abrupt change in lifeways from the Archaic to the Woodland, the archaeological record indicates continuity even as populations in the area adopted new technologies and intensified resource use, which in turn drove increasing residential stability, community identity, and possibly territoriality. In northeastern Oklahoma, the principle Woodland manifestation is known as the Cooper Focus, which shares many material culture traits and settlement patterns with the Fourche Maline to the south, and symbols and styles with groups to the north in Southeast Kansas which mirror those characteristic of earlier Hopewellian sites in Northeast Kansas and to the east in Ohio and Illinois.

Plains Village

During the Plains Village period, people lived in small to moderate sized villages and in dispersed communities. Villages were often situated in lowland terraces of waterways where floodplain horticulture was viable. House structures were pole framed with waddle and daub, and subsistence was more focused on domesticated plants, supplemented by hunting and gathering. Groups traded and traveled to obtain needed resources, resulting in

additional site types for this time period: temporary hunting camps, bison kill and processing sites, limited activity areas, and quarry/workshop localities.

Agricultural tools of stone and bone are present in artifact assemblages, along with small triangular unnotched and side and corner notched arrowpoints for hunting and warfare. Pottery types are plain and cordmarked, and are greatly increased in variability in form and function. Personal items provide evidence for complex cultural traditions, rank, and widespread trade and interaction.

The Protohistoric (Contact) Period

The period from A.D. 1500-1825 is referred to as the Protohistoric (or Contact) Period. Villagers aggregated into large fortified villages situated along major rivers during this time period. Also 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 change. Protohistoric sites in Oklahoma appear to be directly related to an earlier manifestation of similar village sites located further north in Kansas, including the Great Bend Aspect with sites in central, south-central, and southeast Kansas. Great Bend sites represent the villages encountered by Francisco Coronado in 1541. People 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. This way of life continued into the eighteenth century.

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 Oklahoma and had developed trading relationships with Wichita groups in the Arkansas Valley and the Osage to the east. Diseases swept through the region during this time period, dramatically reducing local populations. This, combined with increased intergroup violence, resulted in the coalescence of communities into large villages, often with defensive fortifications. Competition between rivals intensified through time as the fur trade brought significant and lasting changes to the economic systems of Villages. These economic systems in turn brought changes in social structure, including gender roles. During this time the Caddo were in the process of emigrating toward the Red River, largely due to the constant raiding by the Osage from the north.

The Wichita and Affiliated Tribes were historically known as the Wichitas, Wacos, Taovayas, Tawakonis, and Kichais. Protohistoric Wichita sites from the early 1700’s have been identified in Kay County, north-central Oklahoma, including the Bryson Paddock (34KA5) and Deer Creek Sites (34KA3), and in south-central Oklahoma at the Longest site (34JF1). These Protohistoric Wichita sites, dating from the early 1700s, provide evidence of the extent of French influence on the central and southern Plains, as artifact assemblages from these sites contain metal musket parts from French firearms, glass trade beads, copper kettle pieces, and European gunflints. Villagers did not dramatically change the function of material culture in spite of this influx of European goods. Rather, they incorporated French goods into existing material culture frameworks. Guns were used until no longer viable, and then were hammered into hoes similar in shape to bison scapula hoes (which had seen long

use on the Plains). Copper kettles were hammered flat and used to create tinklers- copper cones sewn to clothing- and other items of personal adornment. The Osage had villages to the east of the protohistoric Wichita Villages, and they often fought the Wichita over access to trade goods.

The Caddo, Wichita, Osage, and Quapaw, hunted in the Arkansas Valley. By 1760 the Wichita moved south to the Red River and the hunting grounds of the area became contested by the Osage, Kiowa, Kiowa Apache, Comanche, and Wichita. Territorial claims shifted between France and Spain during the rest of the eighteenth century; however, France controlled the land until it was acquired by the United States in the 1803 Louisiana Purchase. After the Louisiana Purchase, military and political expeditions in the region included those by James B. Wilkinson (1806), George C. Sibley (1811), Stephen H. Long (1821), Thomas James (1821), and Jacob Fowler (1821).

The Historic Period

Congress created Arkansas Territory on March 2, 1819, and this territory included present-day Oklahoma. Between 1820 and 1907, Oklahoma was designated as Indian Territory on maps of the United States, and, during this time period, it was an Indian resettlement zone for tribes from various parts of the country.

In May 1830, Congress passed the Indian Removal Act, which resulted in lasting consequences for all native groups in the United States. By 1838, most of Indian Territory was assigned to five Indian nations from the eastern United States. These included the Cherokee, Choctaw, Chickasaw, Creek, and Seminole nations.

Land south of the Arkansas and Canadian Rivers in Oklahoma was ceded by the United States to the Choctaws residing in Arkansas Territory in 1825. In 1816, Osage hunting territory north of the Arkansas River was transferred to their rivals, the Cherokee residing in Arkansas during the late 1700s and early 1800s. In 1828, the Cherokee ceded all their Arkansas land for a tract of land that later became the Cherokee Nation and the Cherokee Outlet. This treaty required that all Cherokees (including those residing in the Southeast) move to the land in Indian Territory. The Arkansas River was established as the territorial boundary between the Cherokee and the Choctaw.

Historic site types in the area include historic Indian villages, camps, towns and agencies, European trading posts, Euroamerican homesteads and ranches, Indian plantations, homes, and farmsteads, and freed slave homesteads and farms. Related types of resources are wells, cisterns, privies, rock walls, railroad lines, cattle trails, roads, schools, cemeteries, and water diversion features.

2.11 DEMOGRAPHICS

The region of interest for the socio-economic analysis consists of Creek, Osage, Payne, Pawnee, and Tulsa Counties in Oklahoma. These counties are part of the Tulsa Metropolitan Statistical Area (MSA) and include 17% of the state's Native American population.

2.11.1 Population

Population estimates for the region are 837,572 for 2013 as shown in Table 2.6. Between 2000 and 2013, the population of the region increased at an annual rate of 0.8%. From 2013 to 2060, regional population is expected to increase to 1,157,259, a growth rate of approximately 0.7% per year. The population of Oklahoma is projected to increase 0.6% per year. The distribution of the gender in the population of interest is approximately 49% male and 51% female in most geographical regions, with the male/female ratio reversed only in Osage and Payne Counties as shown in Table 2.7.

Table 2.6 2013 Population Estimates and 2060 Projections

Geographical Region	2000 Population Estimate	2013 Population Estimate	2060 Projection
Oklahoma	3,450,654	3,853,118	5,140,129
Creek County	67,367	70,698	100,498
Osage County	44,437	47,924	66,415
Pawnee County	16,612	16,527	22,980
Payne County	68,190	79,457	110,069
Tulsa County	563,299	622,966	857,297
Region of Interest Totals	**759,905**	**837,572**	**1,157,259**

Source: "Oklahoma State and County Population Projections through 2075" Oklahoma Department of Commerce, U.S. Bureau of the Census, American Fact Finder (2013 Estimate)

Table 2.7 2013 Percent of Population Estimate by Gender

Geographical Region	Male%	Female%
Creek	49.4%	50.6%
Osage	50.3%	49.7%
Pawnee	48.8%	51.2%
Payne	51.1%	48.9%
Tulsa	48.7%	51.3%
Region of Interest Totals	**49.1%**	**50.9%**

Source: U.S. Bureau of the Census, American Fact Finder (2013 Estimate)

Population by race or Hispanic origin is displayed in Table 2.8. For the region of interest, approximately 68% of the population is White alone. American Indian or Native Alaskan account for 7% of the inhabitants of the region. Two or more races make up 5% of the total, Hispanic and Black each make up 10% of the region's population, and 2% of the region are Asian. The race classification account for less than 2% of the total regional

population. By comparison, for the state of Oklahoma, 69% of the population is White alone, 9% Hispanic, 8% American Indian/Native Alaskan, 7% Black, 5% two or more races, and 2% Asian. The region of interest contains 17% of the state's Native American residents.

Table 2.8 2010 Population Estimate by Race or Hispanic Origin

Region	White Alone	Black Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Two or more races	Hispanic or Latino
Oklahoma	2,575,381	272,071	308,733	64,154	3,977	192,074	332,007
Creek County	54,821	1,528	6,834	230	43	4,321	2,152
Osage County	30,709	5,355	6,704	118	11	3,195	1,366
Pawnee County	13,216	116	1,908	42	6	943	336
Payne County	61,655	2,757	3,494	2,679	34	3,670	2,990
Tulsa County	393,401	63,737	34,615	13,892	383	30,165	66,582
Region of Interest Totals	553,802	73,493	53,555	16,961	477	42,294	73,426

Source: U.S. Bureau of the Census, American Fact Finder (2010 Estimate)

2.11.2 Education and Employment

For of the population 25 years of age and older in the region of interest, 12% have attended some amount of secondary school but have never received a diploma, and 29% have attained a high school diploma or equivalent. In this group, 24% have some college but no degree, 8% have an associate's degree, 19% have a bachelor's degree, and 9% have a graduate or professional degree. For Oklahoma, 86% of the population aged 25 and over have at least a high school diploma, 24% have some college but no degree; 7% have an associate's degree, 16% have a bachelor's degree, 8% have a graduate or professional degree.

2.11.3 Households and Income

There are 1.4 million households in the state of Oklahoma with an average household size of 2.55. In the region of interest, there are approximately 323,000 total households with an average household size of 2.59. As shown in Table 2.9, household income in the Creek, Osage, Pawnee, and Payne Counties are lower than the state average of $45,000 per year. Only Tulsa County has a higher median household income than the state average. Median household income in Creek County is approximately $43,000; in both Osage, and Pawnee Counties it is approximately $44,000 per year. Payne County has the lowest median household income at approximately $37,000 per year. Tulsa County has median household income of approximately $48,000 per year. County per capita income follows the same pattern as median household income.

Table 2.9 Households and Income

Region	Total Number of Households	Average household size	Median Household Income	Per Capita Income
Oklahoma	1,444,081	2.55	45,339	24,208
Creek County	26,296	2.64	43,026	22,327
Osage County	18,512	2.50	44,195	22,353
Pawnee County	6,341	2.59	44,375	21,220
Payne County	30,010	2.33	36,812	20,868
Tulsa County	241,915	2.48	48,181	27,676
Region of Interest Totals	**293,064**	**2.59**	**NA**	**NA**

Source: U.S. Bureau of the Census, American Fact Finder (2013)

The number of persons whose income fell below the poverty level was slightly lower in the region of interest (16.6%) compared to the state of Oklahoma (16.9%). All counties in the region of interest showed poverty levels between 14.1% and 15.9%, with the exception of Payne County. At 25.7%, Payne County has the highest percentage of persons with incomes below the poverty level of the counties in the region of interest.

2.12 RECREATION FACILITIES, ACTIVITIES, AND NEEDS

The recreational opportunities and potential of Keystone Lake is considered to be of great importance within the project's zone of influence. The project offers many recreational activities such as swimming, boating, water skiing, fishing, hunting, picnicking, and camping, as well as multiple trails for hiking and biking.

2.12.1 Zones of Influence

The visitation market area is the area from which the majority of the visitors to the reservoir originate. For Keystone Lake, this is estimated to be the region within 100 miles from the project.

2.12.2 Recreation Facilities

Table 2.10 Management of High Density Recreation Lands

Area	Number of Acres	Managing Agency	Recreation Type
Appalachia Bay (1)	540	USACE	Maintained Facility
Brush Creek	85	USACE	Maintained Facility
Cowskin Bay South (2)	187	City of Cleveland	Maintained Facility
Dawson Ridge(3)	64	USACE	Access Point
Feyodi Creek Park	99	City of Cleveland	Maintained Facility

Area	Number of Acres	Managing Agency	Recreation Type
Friendship Community Church Camp	211	Friendship Community Church Camp	Access Point
Keystone Ramp	23	USACE	Access Point
Keystone State Park (4)	623	State of Oklahoma	Maintained Facility
New Mannford Park (5)	139	City of Mannford	Maintained Facility
River City Park	48	City of Sand Springs	Maintained Facility
Sandy Park	27	USACE	Access Point
Salt Creek Cove South (6)	173	USACE	Access Point
Mannford Point	16	USACE	Access Point
Walnut Creek Park	1,484	USACE	Maintained Facility
Washington Irving South	31	USACE	Maintained Facility
White Water Park (1)	156	USACE	Access Point
Yogi Bear's Jellystone Park	275	City of Mannford	Maintained Facility
Windycrest Sailing Club	3	Windycrest Sailing Club	Access Point
Total Acres	**4,184**		

(1) ORV user is permitted in these areas only
(2) Westport Marina is located in the Cowskin Bay South recreation area
(3) Cruiser Cove Yacht Club is located in the Dawson Ridge recreation area
(4) Pier 51 Marina is located in the Keystone State Park recreation area
(5) The Harbor Cross Timbers Marina is located in the New Mannford Park recreation area
(6) Keyport Marina is located in Salt Creek Cove South recreation area

2.12.3 Off-Road Vehicle Areas

ORV trails exist within areas at White Water Park and Appalachia Bay. Where severe alteration of the natural features are occurring, trail alteration and barrier construction may become necessary. Parking areas at ORV areas are the same surfacing as the access roads into the areas, with dirt roads and trails extending from exits provided at the parking lots. These areas are monitored for resource destruction and may require temporary closing for rejuvenation. Fees are charged for each ORV entering the area. All vehicles are to be equipped with spark arrestors and muffled so that at 50 feet the noise produced by the engine does not exceed 90 decibels.

Although no public comment was received concerning the management or public use of these two ORV areas, USACE is aware of periodic conflicts between users at the Appalachia Bay area. Boaters and ORV users sometimes use the same segment of shoreline with resulting conflict. As time and funding allows, USACE will conduct public workshops and interviews with user groups to solicit recommendations for future management of these areas. Key issues to address include visitor safety, user conflict, and resource protection.

2.12.4 Visitation Profile

Keystone Lake visitors are a diverse group ranging from campers who utilize the campgrounds around the lake, full time and part time residents of the immediate area, hunters who utilize the Wildlife Management Areas (WMA) around the lake, fishermen launching from boat ramps or setting up on the shoreline, trail users who enjoy the scenic terrain, day users who picnic and many other user groups. The peak visitation months are April through September. July is typically the highest visitation month. A majority of visits to recreation areas occur in USACE managed recreation areas.

2.12.5 Recreation Analysis

Fish and wildlife resources at Keystone Lake provide a wide variety of outdoor recreation opportunities. White bass, black bass, crappie and catfish are also in abundance.

There are approximately 17,000 acres open for public hunting. White-tailed deer, bobwhite quail, mourning dove, ducks, geese, cottontail rabbit, and squirrel are among the principal game species. Public hunting area maps are available from the Keystone Project Office or online.

Numerous parks have been developed by USACE, and the State of Oklahoma maintains two parks. The cities of Cleveland and Mannford also maintain parks on Keystone. There are nine developed swimming beaches. The parks have campsites, picnic areas, drinking water, restrooms, playgrounds, boat ramps, and courtesy docks.

Boating on the lake is in accordance with Oklahoma boating laws and USACE regulations. Rules and regulations governing operational requirements of boats may be obtained from the Keystone Project Office near the dam.

Washington Irving Scenic Nature Trail begins on the northern end of Washington Irving South Public Use Area and winds nearly a mile along sandstone bluffs dotted with gnarled cedars. The trail meanders in and out of wooded areas and passes through rock formations. Two Rivers Scenic Nature Trail begins on the northwest end of the Keystone Dam and meanders over a mile near the shoreline. The trail offers panoramic views of Keystone Lake and is often used by fishermen. Similar to Washington Irving Trail this trail passes through heavily wooded areas. While hiking numerous bird species may be observed.

2.12.6 Recreation Carrying Capacity

The plan formulated herein proposes to provide a variety of activities and to encourage optimal recreational use of project resources. Each type of use, whether it is

fishing, camping, boating, hunting, ORV use, and others can reach a level that exceeds optimal use. In other words, the use can exceed the capacity of the resource to sustain the use, reach a level that is unsafe, or reach a level that reduces the quality of the user's recreational experience. Excessive use has a high potential to occur at Keystone Lake given its location within the greater Tulsa metropolitan area with a population of approximately 766,000. Although no recreation or natural resources carrying capacity studies have been conducted at Keystone Lake, USACE will use visitation data, public safety statistics, and best professional judgment to address recreational uses where the level of use is approaching an excessive level. USACE will work to identify possible causes and effects of excessive use apply appropriate best management practices including site management, regulating visitor behavior, modifying visitor behavior, or conducting recreational carrying capacity studies.

Table 2.11 shows the annual visitation for Keystone Lake. Information provided by OMBIL.

Table 2.11 Annual Project Visitation

Year	Visitation
2002	905,836
2003	1,001,470
2004	1,225,523
2005	1,131,437
2006	1,294,471
2007	970,877
2008	843,226
2009	1,056,370
2010	1,096,265
2011	839,241
2012*	945,890
Annual Average	**1,028,236**

Note: Projections stopped at 2012 pending data collection process improvement

2.13 REAL ESTATE

Land and flowage easements for the project were acquired under the comparatively conservative land acquisition policy in effect from 1953 to 1962. This policy generally resulted in the acquisition of fee simple title only for those lands required for the construction of the dam and for operation and maintenance purposes in the area designated as the damsite, and in general, all lands in the lake area up to a blocked perimeter that encompasses the 5-year frequency pool elevation of 754.0 msl. The project includes an area of approximately 58,671 acres of land and water surface. Criteria used as a basis for this land acquisition are contained in design memorandums on real estate. Approximately 26,705 acres of perpetual flowage easements were acquired for the land between the fee area and elevation of maximum flood capacity (754.0 msl).

Government property is monitored by Keystone Lake 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 USACE approval. Unauthorized trespasses may result in a Title 36 citation 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 Real Estate, with recommendations from Operations Division, Office of Counsel, and lake personnel. The USACE 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.

Compliance inspections of major outgrants, concessions, public parks, wildlife areas, are accomplished annually by USACE personnel of the Tulsa District Real Estate Division. Other outgrants, such as utility line easements, are accomplished by the USACE staff at Keystone Lake in accordance with all applicable regulations and guidelines.

2.14 PERTINENT PUBLIC LAWS

The following Public Laws are applicable to Keystone Lake. Additional information on Federal Statutes applicable to Keystone Lake can be found in the Environmental Assessment for Keystone Dam and Reservoir Master Plan in Appendix C of this Plan.

- Public Law 59-209, Antiquities Act of 1906. - 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.
- Public Law 74-292, Historic Sites Act of 1935. - 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".
- Public Law 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. This act also

authorized the creation of the Southwestern Power Administration, then within the Department of the Interior and currently within the Department of Energy, as the agency responsible for marketing and delivering the power generated at Federal reservoir projects.

- 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.
- Public Law 78-534, Flood Control Act of 1944. - Section 4 of the act as last amended in 1962 by Section 207 of Public Law 87-874 authorizes 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.
- Public Law 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.
- Public Law 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.
- Public Law 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.
- Public Law 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.
- Public Law 86-717, Forest Conservation. - This act provides for the protection of forest cover for reservoir areas under this jurisdiction of the Secretary of the Army and the Chief of Engineers.

- Public Law 87-88, Federal Water Pollution Control Act Amendments of 1961, as amended. Section 2(b)(1) of this Act gives 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.
- Public Law 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.
- Public Law 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.
- Public Law 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. An Office of Compliance and Enforcement/Office of Management and Budget (OCE/OMB) implementation policy made these provisions applicable to projects completed prior to 1965.
- Public Law 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.
- Public Law 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.
- Public Law 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.
- Public Law 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.

- Public Law 91-190, National Environmental Policy Act of 1969. - 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.
- Public Law 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.
- Public Law 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 USACE from collecting entrance fees to projects.
- Public Law 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."
- Public Law 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.
- Public Law 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.
- Public Law 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.

- Public Law 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.
- Public Law 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 nonreimbursable project costs.
- Public Law 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.
- Public Law 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.
- Public Law 94-422, Amendment of the Land and Water Conservation Fund Act of 1965. - 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.
- Public Law 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.
- Public Law 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.
- Public Law 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.

- Public Law 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.
- Public Law 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 USACE, except policymaking or law or regulatory enforcement.
- Public Law 99-662, The Water resources Development Act 1986. - Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.
- Public Law 110-114, Water Resources Development Act of 2007, Section 3134. - This act requires lakes within the State of Oklahoma under USACE jurisdiction research methods for demonstration projects to benefit and enhance recreation. However, no funding has been appropriated and Section 3134 expires in 2017.

CHAPTER 3 - RESOURCE OBJECTIVES

This chapter sets forth goals and objectives necessary to achieve the USACE vision for the future of Keystone Lake. The terms “goal” and “objective” are often defined as synonymous, but in the context of the Master Plan, goals express the overall desired end state of the cumulative land and recreation management programs at Keystone Lake. Resource objectives specify task-oriented actions necessary to achieve the master plan goals. The goals and objectives in the Master Plan support the broader USACE Environmental Operating Principles (EOP).

3.1 PROJECT-WIDE RESOURCE GOALS

The following goals are the priorities for consideration when determining management objectives and development activities:

- Manage existing natural resources and recreation facilities in compliance with all pertinent laws, regulations and policies.
- Protect and preserve existing native wildlife species and improve wildlife habitat for now and in the future.
- Protect and preserve existing Government boundary line from encroachment, trespass, and private exclusive use through boundary line surveillance and communication with adjacent landowners.
- Protect and preserve existing Government property from erosion and overuse through natural resource management.
- Inform the public through programs and personal contacts about the project and resource management purposes and objectives.
- Integrate fish and wildlife management practices with other natural resource management practices while working closely with state and local natural resource agencies.
- Identify safety hazards or unsafe conditions; correct infractions and implement safety standards in accordance with EM 385-1-1.
- Develop and manage the project lands and water for maximum enjoyment of the recreating public.
- Increase value of all project lands and waters for recreation, fisheries, and wildlife.
- Encourage non-consumptive use of project lands.

Implementation of these goals is based upon time, manpower, and budget. The goals provided in this chapter are established to provide high levels of stewardship of USACE managed lands and resources while still providing a high level of public service and recreational opportunity. These goals will be pursued through the use of a variety of mechanisms including, but not limited to volunteer efforts, hired labor, contract labor, permit conditions, remediation, mitigation, and special lease conditions. USACE is committed to provide a sustainable approach to the management of all resources.

3.2 FISH AND WILDLIFE MANAGEMENT OBJECTIVES

Fish and wildlife are managed cooperatively between the ODWC and USACE. USACE is not primarily involved with management within the ODWC areas of responsibility. However, USACE has determined that both agencies objectives complement our goals for fish and wildlife management and should remain as the primary objectives for these locations. In addition to these objectives, USACE will continue providing support when resources are available, such as assistance in the placement of fish structures, archeological reviews for proposals involving soil disturbance, GIS mapping, and other natural resource related assistance on a case-by-case basis. The management objectives for fish and wildlife include the following:

- Give priority to the preservation and improvement of wild land values in public use planning, design, development, and management activities.
- Manage habitat for threatened and endangered species and to support a diversity of fish and wildlife as well as recreation use.
- Prevent the introduction of invasive species and aquatic nuisance species (ANS), detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, monitor invasive species and ANS populations accurately and reliably, and provide for restoration of native species and habitat conditions in ecosystems that have been invaded.
- Manage identified recreations lands in ways that enhance benefits to wildlife.

A portion of the 21,592 acre Keystone Wildlife Management Area is licensed to the State of Oklahoma and established by the ODWC exist on USACE property for the purpose of wildlife management. The objectives for these lands are to preserve the existing native wildlife species and improve their habitat. The management plans written within this objective center on both game and non-game species and can be found in the Operation Management Plan (OMP).

3.3 RECREATION OBJECTIVES

Recreation falls within two categories and can be identified as either land or water based recreation. Management objectives for each type vary depending on the location and the intensity of use. General objectives are provided in this Plan as to the work necessary to meet the public’s needs for land and/or water based recreation.

Land-based recreation includes opportunities, activities, areas and facilities that typically occur on, or adjacent to, USACE land and water, such as camping, hiking, hunting, picnicking, wildlife/bird viewing, sightseeing, etc. Land-based recreation areas include campgrounds, day-use areas, overlooks, bathrooms, roads, boat ramps, courtesy docks, and wildlife management areas. Facility types typically found within these recreation areas include campsites, picnic sites, hunting areas, and trails. These recreation areas are managed by several entities including USACE, State of Oklahoma, local municipalities, and private/commercial concessionaires. Land-based recreation objectives focus on providing service and rehabilitating existing parks to a level that is economically justified based on historical and projected use.

Water-based outdoor recreation includes opportunities, activities, areas and facilities that occur on water surface managed by USACE. These activities include; fishing, boating, swimming, scuba diving, operating seaplanes, kayaking, etc. Unlike land-based recreation the majority of water-based recreation is managed by USACE with some assistance from the Oklahoma Highway Patrol, Marine Enforcement Division. The objective of this program is to insure public safety while providing recreational opportunities on the water. Water-based recreation must be continually evaluated taking into consideration recreation carrying capacity and recreational trends vs. current use patterns, zoning requirements for no-wake or restricted areas, user conflicts, and general public safety. USACE will keep in close coordination with the Oklahoma Lake Patrol in determining use patterns within the water portions of the project and promote water safety. A water-related recreation carrying capacity study may be required prior to allowing additional wet slips or boat ramp parking spaces at Keystone Lake.

Keystone Lake plays an important public recreation role since it adjoins the Tulsa Metropolitan Area. Because of this role, it is important that recreational management objectives consider a diversity of opportunity, public safety, environmental preservation and facility development. Implementation of the following management objectives is intended to serve the regional public outdoor recreation needs for the planning horizon of 2016 to 2041:

- Renovate existing facilities to provide a quality recreation experience for visitors while protecting natural resources for use by others.
- Continue separating different types of users.
- Improve campgrounds by providing high impact campsites and functional facilities.
- Provide a sufficient number of campsites in more popular areas.
- Provide modern facilities in day use areas.
- Provide playground equipment in areas used by families with small children.
- Provide fish cleaning stations near boat ramp locations used by the fishing public.
- Provide a universally accessible fishing dock for day use.
- Improve universal access to other park facilities.
- Work with partners to expand existing trails and develop new ones.
- Increase opportunities for picnicking.

The 2012 Oklahoma State Comprehensive Recreation Plan (SCORP) includes 14 recommendations addressing outdoor recreation concerns and issues. The SCORP indicates (1) there is an increased awareness regarding water quality and water quantity issues throughout the state, (2) the public is primarily concerned with maintaining access to public lands while providing a wide variety of recreation opportunities, (3) Oklahomans under-value public recreation, and (4) Oklahoma lacks trails or a plan for trails to link communities or populations to outdoor recreation resources.

One of the unique challenges identified in the SCORP is the change in demographics that all outdoor recreation providers are experiencing. Ethnic and racial minorities, especially Hispanic groups are growing in population and are increasingly becoming significant user groups in public recreation areas. These groups have differences in preferences for space, facilities, and amenities. This SCORP also demonstrated that low-income and rural constituents often face unique challenges in accessing outdoor recreation resources and that Oklahomans do not fully comprehend the costs associated with recreation services and facilities provided by the public sector. Further depletion of the available outdoor recreation resource base would increase the negative impacts on these population groups. Maintaining what is currently held in the public sector and purposefully managing some of these spaces for undeveloped outdoor recreation use would address the needs of these minority user groups.

3.4 GENERAL RESOURCE OBJECTIVES

The project-wide resource management objectives involve the long-term development and management goals of project resources to guide proposed future actions for the public benefit, consistent with resource capabilities within the framework of the USACE Environmental Operation Principles.

The project-wide resource objectives for Keystone Lake, not in priority order, are listed below:

- Preserve and protect important paleontological, archeological, ecological, and aesthetic resources.
- Manage and develop project lands to accommodate periodic fluctuations in lake elevations with minimal impacts.
- Develop and manage project resources to support types and levels of recreation activities indicated by visitor demand and consistent with carrying capacities and aesthetic, cultural, and ecological values.
- Provide access by Tribal members 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.
- Expand public outreach and education about the history of the area, project resources, and the USACE's role in developing and managing these resources.
- Foster stewardship by minimizing encroachments and other non-allowed uses.
- Develop and manage lands in cooperation and coordination with other management agencies and appropriate entities in the private sector.
- Maintain and manage project lands and waters to support regional management programs.
- 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 13653, Executive Order 13693 and related USACE policy.

Execution of resource objectives at a multi-purpose project such as Keystone Lake can be challenging. Project and task execution is a delicate balance between items that often compete for funds, time, and other resources. Priority will be given to those items required by law with an attempt to provide continued public use of Government land. Public access will still be a priority to service all ethnic groups and income levels. Access to hunting, fishing, camping, bird watching, boating, and other various lake related recreational opportunity will be given priority to the extent that funding, personnel, and resource protection will allow.

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

4.1 LAND ALLOCATION

Land allocation is defined by USACE regulations as the congressionally authorized purpose for which project lands were purchased. There are four categories of allocation identified as Operations, Recreation, Fish and Wildlife, and Mitigation. The federal estate at Keystone Lake encompasses 58,671 acres of fee-owned land and 26,705 acres of flowage easement. Approximately 23,610 acres of fee-owned land is inundated at the conservation pool elevation of 723.0 msl. All Government-owned fee lands above the conservation pool are required for project operations, public use, and wildlife management. Each allocation is described in the following paragraphs.

4.1.1 Operations

All lands acquired at Keystone Lake fall within this allocations. These lands were acquired specifically to meet the requirements of the congressionally authorized purpose of constructing and operating the project for the primary missions of flood control, hydroelectric power generation, navigation, and water conservation.

4.1.2 Recreation

Lands purchased for the sole purpose of providing outdoor recreation opportunities fall within the allocation. USACE regulation defines these lands as “separable” land that are not needed for project operations. No lands at Keystone Lake are allocated to Recreation.

4.1.3 Fish and Wildlife

Lands acquired for the sole purpose of fish and wildlife management are included in this allocation. There were no lands purchased at Keystone Lake specifically for the purpose of Fish and Wildlife.

4.1.4 Mitigation

This category includes lands purchased specifically to offset losses associated with the creation of the project. There were no lands congressionally authorized for the purpose of mitigation.

4.2 LAND CLASSIFICATION

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.

Previous versions of the Keystone Lake Master Plan included land classification criteria that were similar to the current criteria. These prior land classifications were based more on projected need than on 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 over 40 years since the previous Master Plan was published, wildlife habitat values, surrounding land use, and regional recreation trends have changed significantly 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.

Land Classification indicates the primary use for which project lands are managed. There are six categories of classification identified as: Project Operations, High Density Recreation, Mitigation, Environmentally Sensitive Areas, Multiple Resource Management Lands, and Water Surface. Over time, land classification acreages will vary and change from the previous Master Plan reported acreages due to changes in lake levels, sedimentation, shoreline erosion, and measurement technology. This Master Plan revision utilizes GIS technology to accurately map and measure acreages that was not available during the previous Master Plan acreage calculations. Maps showing the various land classifications can be found in Appendix A. Each land classification is described in the following paragraphs.

4.2.1 Project Operations

This category includes the lands managed for the dam, project office, bulkhead access area, borrow pits, emergency material storage, radio antenna area, maintenance yards hydroelectric facilities and roads to access these areas which must be maintained to carry out the authorized purpose of flood control and hydroelectric power. There are 601 acres of Project Operations lands specifically managed for these features.

4.2.2 High Density Recreation

These are lands developed for intensive recreational activities for the visiting public including day use areas, campgrounds, ORV areas and concession areas. Recreation development by lessees operating on USACE lands must follow policy guidance contained in USACE regulations at ER 1130-2-550, Chapter 16. That policy includes the following statement:

"*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 stand-alone 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…."

At Keystone Lake, prior land classifications included an excessive number of areas under the high density recreation classification. Several of these 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. There are 4,223 acres of land classified for high density recreation.

4.2.3 Mitigation

This classification is only used for the lands allocated for mitigation for the purpose of offsetting losses associated with the development of the project. There are no lands classified as mitigation since this land allocation was not included in congressional authorization language for Keystone Lake.

4.2.4 Environmentally Sensitive Areas

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. This designation limits and can prohibit any further development within the area. There are 166 acres currently classified for environmentally sensitive areas to manage and protect, but more areas may be maturing and will be added as time and funding permit.

4.2.5 Multiple Resource Management Lands

This classification is divided into four sub-classifications. The chosen sub-classification identifies the predominant use of an area with the understanding that uses associated with other sub-classifications may also occur on the area. The four sub-classifications are Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. There are 26,517 acres of lands that are under this classification. The following identifies the amount contained in each sub-classification:

- Low Density Recreation. These are lands that may support passive public recreational use (e.g., fishing, hunting, wildlife viewing, natural surface trails, hiking, etc). Low Density Recreation lands are typically narrow strips of land lying between the shoreline at the conservation pool elevation and the USACE property boundary line, and are often located adjacent to private residential areas. The narrow configuration and location next to residential areas make these areas unsuitable for other uses such as High Density Recreation or Wildlife Management. These areas are often used by adjacent landowners for the passive recreation activities listed above. There are 7,128 acres under this classification at Keystone Lake.

- Wildlife Management. This land classification applies to those 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 19,389 acres of land under this classification at Keystone Lake.
- Vegetative Management. These are lands designated for stewardship of forest, prairie, and other native vegetative cover. There are no acreages under this classification at Keystone Lake.
- Future or Inactive Recreation. These are lands with site characteristics compatible with potential future recreation development or recreation areas that are closed or open but no longer maintained. These areas will be managed as multiple resource land until an opportunity to develop or reopen these areas. There are no acres under this classification at Keystone Lake.

4.2.6 Water Surface

The project does have a surface water management program for project operations security, public safety and natural resource protection. The water surface includes areas upstream and downstream from Keystone Dam. Acreages vary depending on lake levels. Buoys are managed by USACE with close coordination with ODWC. Water surface classifications are divided into four sub-classifications identified as: Restricted, Designated No-Wake, Fish and Wildlife Sanctuary, and Open Recreation. There are 27,580 total acres of Water Surface under this classification. The following identifies the acres contained in each sub-classification.

- Restricted. These are water areas restricted for project operations, safety, and security purposes. The area around the dam, which has been identified for no boat entry, covers an area of approximately 37 acres.
- Designated No-Wake. There are 681 acres of designated no-wake zones, though caution should be used as there are underwater hazards throughout the entire lake. In many areas buoys identify no-wake areas, such as boat ramps and coves containing marinas. These no-wake areas will be enforced by USACE and local law enforcement.
- Fish and Wildlife Sanctuary. These areas are managed with annual or seasonal restrictions to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning. Keystone Lake has designated the northern-most cove along the ESA of the Ancient Cross Timbers Forest totaling 47 acres of surface water as a Fish and Wildlife Sanctuary.
- Open Recreation. The remainder, approximately 26,815 acres, of the lake is open to recreational use. There is no specific zoning for these areas, but there is a buoy system in place to help aid in public safety. These buoys mark hazards, no wake areas, and boat restrictions.

Table 4.1 provides a summary of land classifications at Keystone Lake. A map representing these areas can be found in Appendix A.

Table 4.1 Acreage by Land Use Classification

Classification	**Acres**
Project Operations	601
High Density Recreation	4,223
Environmental Sensitive Areas	166
Multiple Resource Managed Lands:	
Low Density Recreation	7,128
Wildlife Management	19,389
Vegetative Management	0
Future/Inactive Recreation Areas	0
Water Surface[(1)]:	
Restricted	37
Designated No-wake	681
Fish and Wildlife Sanctuary	47
Open Recreation	26,815
Total Acreage	**59,087**

[(1)] Water surface upstream and downstream from the Keystone Dam
Note: Acreages vary depending on changes in lake levels, sedimentation and shoreline erosion.

4.3 PROJECT EASEMENT LANDS

These are 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. There are 26,705 acres of easement lands at Keystone Lake.

4.3.1 Operations Easement

These are easements USACE purchased for the purpose of project operations. There are no acres of operation easements at Keystone Lake.

4.3.2 Flowage Easement

These are easements purchased by USACE that grant to the government the right to temporarily flood private land during flood risk management operations. There are 26,705 acres of flowage easement lands located at Keystone Lake.

4.3.3 Conservation Easement

These are easements purchased by USACE for the purpose of protecting wildlife, fisheries, recreation, vegetation, archeological, threatened and endangered species, or other environmental benefits. There are no conservation easements at Keystone Lake.

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CHAPTER 5 - RESOURCE PLAN

5.1 CLASSIFICATION AND JUSTIFICATION

This chapter describes the management plans for each land classification within the Master Plan. The management plans identified are in broad terms of how these project lands will be managed. The land classifications at Keystone Lake include the following:

- Project Operations
- High Density Recreation
- Environmentally Sensitive Areas
- Multiple Resource Management Lands for
  - Low Density Recreation
  - Wildlife Management
- Water Surface
  - Restricted
  - Fish and Wildlife Sanctuary
  - Open Recreation

A more descriptive, task and budget oriented plan for managing these lands can be found in the Keystone Lake OMP. The OMP supports the broadly stated plans in this chapter.

5.2 PROJECT OPERATIONS

This land is classified for security and public safety reasons pertaining to project operations. This is land associated with the dam and associated structures, lake office, maintenance facilities, borrow pits, and other areas solely for the operation of the project. There are 601 acres of lands under this classification which are managed by USACE. The management plan for this area is to continue providing physical security necessary to ensure continued operations of the dam and related facilities. This means that public access must be restricted in hazardous locations near the dam. The goal for these classified lands is to continue operating as done historically in order to ensure project operations.

5.3 HIGH DENSITY RECREATION

Lands classified for High Density Recreation (HDR) are currently developed for intensive recreational activities. Keystone Lake has (include the total number of all HDR areas including concessions) distinct parcels included in this classification with each area having a unique name. These areas are generally referred to as “Parks” unless they only include a marina concession. Depending on available space, funding, and public demand, these lands may support additional outdoor recreation development in the future. These areas include access points, day use areas, and campgrounds. Commercial concession areas such as marinas and comprehensive resorts also fall into this category. These areas have been developed to support concentrated visitation to the extent that an atmosphere of open space compatible with the natural resources of Keystone Lake is maintained.

There are a number of areas partially or fully leased to non-federal partners referred to as grantees; the USACE operates and manages all park areas that are not leased to others.

Each grantee is responsible for the operation and maintenance of their leased area; USACE does not provide direct maintenance within any of the leased locations, but may occasionally lend support where appropriate. The USACE reviews requests and ensures compliance with applicable laws and regulations for proposed activities in all leased and USACE-operated high density recreation areas. 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 high density recreation area, including existing and proposed facilities, is provided below. Included in high density recreation lands are six commercial concessions, which include Keyport Marina, Westport Marina, Cruiser Cove Yacht Club, The Harbor Cross Timbers Marina, Windycrest Sailing Club, and Pier 51 Marina.

Commercial Concessions

- Cruiser Cove Yacht Club – Located off Coyote Trail north of State Highway 51 within the northern cove east of Dawson Ridge. Facility includes 20 slips on one floating dock.
- Harbor Cross Timbers Marina – Located within New Mannford Park Ramp Recreation Area. Facilities included boat storage slips, gated security, restrooms with showers, trailer storage, and onsite boat service station.
- Keyport Marina – Located within Salt Creek Cove South. The marina is equipped with 154 boat storage slips, a gas dock, snack bar, fishing dock, and rental craft.
- Pier 51 Marina – Located within Keystone State Park. The marina is equipped with 220 boat storage slips, a gas dock, restaurant, fishing dock, and rental craft. A boat sales and repair facility exists on site.
- Windycrest Sailing Club – Located near Baker Creek. There are 104 slips on four docks, three boat wide launching ramp, two level Pavilion, modern shower house, primitive camping area, boat trailer storage area, and a travel trailer/recreational vehicle parking area.
- Westport Marina – Also known as Cowskin Bay South is located eight miles southeast of Cleveland, Oklahoma on Highway 64 to Westport exit. The marina is equipped with 120 boat storage slips, a gas dock, restaurant, and rental craft. A boat sales and repair facility exists on site. Campground includes 30 primitive sites, restrooms and showers, outdoor grills, and picnic areas.

High Density Recreation Areas

- Appalachia Bay – This park is managed by USACE and heavily used, partly due to being easily accessible from US Highway 64. Topography in the park is gently sloping except in the upper reaches of the peninsula where steep hills and bluffs predominate. Sandy soils in the area are subject to shore erosion during periods of high water, but they have formed sandy beaches which attract users from the land and by boat. Facilities include 18 Campsites, four picnic sites, concrete tables, utility tables, refuse containers, grills, water hydrants, vault toilets, paved roads and parking lots, swimming beach, courtesy dock, boat ramp, and gate complex. Off Road Vehicle (ORV) use is permitted on the south peninsula.

- Brush Creek Park – This park is managed by USACE and located on the northern bank of the Arkansas River downstream of the Keystone Dam, three miles west of Mannford on Highway 51, north on Highway 151. Facilities include 20 electric hookups, restrooms and showers, and outdoor grills.
- Dawson Ridge – Dawson Ridge (also known as Cruiser Cove) displays rugged topography and heavy forestation, which extends along the east bank of the peninsula where the Keystone Ramp is located. Large rock outcroppings create a commanding overlook at the point of the peninsula. Although residential development is increasing on the adjacent land, the area has retained a rustic and primitive character due in part to the steep slopes. The government property line runs parallel to and only several hundred feet from the lake shore forming a relatively narrow band of land for recreational use. Access to Dawson Ridge is along the same road leading to Keystone Ramp and parking is available at the ramp site.
- Feyodi Creek Park – Campground is leased to the City of Cleveland. Facilities include full RV hookups, tent camping, restrooms and showers, hiking trails, driving range, disc golf, volleyball, playground, picnic shelters, boat ramp, and amphitheater.
- Keystone State Park – The ODPT leases this park from USACE to furnish day and overnight use facilities. Boat ramps within the park provide easy access to the lake. Pier 51 Marina is located in Keystone State Park, offering boat and equipment rentals as well as fuel, groceries and other boating necessities. Keystone State Park also has a full-service, floating restaurant at the marina when in season.

  Keystone State Park offers 82 tent sites, 22 cabins and 72 RV sites with full hookups including 30 or 50 amp electric. There are picnic areas with outdoor grills and pavilions throughout the park for meals and congregating. Comfort stations with showers are available near the campsites. Pets are allowed in the park, and there is dump station access for visitors.
- New Mannford Ramp Recreation Area – This recreation area has three boat ramps of which one is a two lane ramp, 47 designated campsites for the RV and Tent camper, several picnic tables throughout the park, a covered group picnic shelter, and one restroom with showers and three sets of pit toilets.
- River City Park – A community park leased to the City of Sand Springs is located downstream of the Keystone Dam on the Arkansas River. River City Park's features include a trail, custom concrete skateboard park, disc golf, horseshoe facilities, picnic areas, grills, and a restroom. This is Sand Springs' busiest park with little league baseball, soccer, rodeo, and Bike Moto Cross (BMX) clubs operating here during most of the year. Special events for the public are held throughout the year including Fourth of July fireworks displays, Easter egg hunts, Mayor's Cup, and more. River City Trail meanders through the park, connecting to the vast metro Tulsa trails system.

- Salt Creek Cove South – The area features interesting topography and heavy tree cover of the upland forest type and is the location of Keyport Marina. The area south of Salt Creek Cove North is predominantly subject to inundation during periods of flooding. No development of the area, other than the Keyport Marina, has been conducted.

- Walnut Creek Park – Once leased by the State of Oklahoma, the park is now managed by USACE. Walnut Creek Park offers fishing, boating, water skiing, wildlife viewing, and more. The park is nestled between sandstone bluffs and sandy beaches. Principal wildlife includes squirrel, rabbit, quail, dove and waterfowl. The park includes access to swim beaches, lighted and unlighted boat ramps, a softball field, a group picnic shelter and playground areas. The park has 73 full and semi-modern RV hookups, tent sites, and comfort stations with showers and picnic areas.

  The Sand Plum Trail is a 15-mile multi-purpose trail for hiking, horseback riding, and bicycling. Visitors must bring their own horses, as horses are not available to rent at the park. Walnut Creek State Park also offers an equestrian campground with electrical hookups, water, picnic areas, grills, picket posts and a comfort station.

- Washington Irving South – This campground is managed by USACE and separated into three loops with a total of 41 reservable campsites, many with water and electric hookups. Flush and pit toilets, showers, drinking water and a dump station are provided. Washington Irving South Campground is located on the Arkansas arm of Keystone Lake, 30 minutes from Tulsa, Oklahoma. Local history has Washington Irving crossing the Arkansas River in this area during his expeditions west.

- White Water Park – The area lies in the south bank of the spillway and was formed during the project construction on the original riverbed of the Arkansas River. Access is from a park road connecting to US Highway 151 crossing the dam. Cottonwoods and willows dot the area and help stabilize the sandy soil of the rolling terrain. Fishing occurs off this bank. Area use is predominately ORV use with trails. This area is day use only to keep the ORV noise within reasonable hours.

- Yogi Bear’s Jellystone Park (formerly Salt Creek Cove North) – Park is leased to the City of Mannford and subleased to Yogi Bear’s Jellystone Park Camp-Resorts. The park is located 1 mile west on Highway 51 from the stoplight in Mannford. Facilities include electric hookups sites, primitive sites, restrooms and showers, sanitary dump station, outdoor grills, picnic areas, boat ramps, and docks.

5.4 ENVIRONMENTALLY SENSITIVE AREAS

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. Designation of these lands is not limited to lands that are otherwise protected by laws, such as the Endangered Species Act, the NHPA, or applicable State statues. These areas must be considered by management to ensure they are not adversely impacted. Typically, limited or no development of public use is allowed on these lands. No agricultural or grazing uses are permitted on these lands unless necessary for a specific resource management benefit, such as prairie restoration.

Keystone Lake's Ancient Cross Timbers Forest totaling 166 acres is classified as an Environmentally Sensitive Areas (ESA), due to the area being considered sensitive and needs to be protected as such. Until recently there was only one 40-acre preserve (at the Fort Worth, Texas Nature Center) and a small research center (Wise County, Texas) preserving this forest type which contains 300 to 500 year old stands of cedars and post oaks. Its craggy terrain and impassible thickets may have spared it from the ravages of pioneer farming and industry, but is being eaten away by modern development. This Preserve is part of a plan by the Nature Conservancy to establish "The Ancient Timbers Consortium for Research, Education, and Conservation." The Keystone Ancient Forest is adjacent to a 1,200 acre tract purchased by the State of Oklahoma and the city of Sand Springs. The Keystone Ancient Forest Preserve is operated by the City of Sand Springs and only open on selected days.

5.5 MULTIPLE RESOURCE MANAGEMENT LANDS

Multiple Resource Management Lands (MRML), as the name implies, are lands that serve multiple purposes, but that are sub-classified and manage for a predominant use. The following paragraphs describe the various sub-classifications of MRML at Keystone Lake, the number of acres in each sub-classification, and the management plan for these lands.

Low Density Recreation. These lands have minimal development or infrastructure, but when not storing flood water serve an important role in providing a place for passive public use. Typically, these lands are comparatively narrow strips of land lying between the conservation pool elevation and the USACE property boundary line. Most Low Density Recreation lands are open to the public, including adjacent landowners, for pedestrian traffic and are frequently used by adjacent landowners for access to the shoreline near their homes. These lands are also used hiking, fishing and bird watching. Select areas are also open to public hunting. These lands are generally not of sufficient size or lack the higher elevations needed for major wildlife management or high density recreation purposes. There are 7,128 acres classified for Low Density Recreation.

Keystone Lake offers hiking and mountain biking trails located on Low Density Recreation lands. Washington Irving Scenic Nature Trail begins on the northern end of Washington Irving South Public Use Area and winds nearly a mile along sandstone bluffs dotted with gnarled cedars. Never far from the shoreline, the trail meanders in and out of wooded areas and passes through rock formations. Along

the route may be seen the evidence that beavers have been at work cutting saplings for food and shelter.

Two Rivers Scenic Nature Trail begins on the northwest end of the Keystone Dam and meanders over a mile near the shoreline. The trail offers panoramic views of Keystone Lake and is often used by fishermen. Similar to Washington Irving Trail this trail passes through heavily wooded areas. While hiking numerous bird species may be observed.

Future management of Low Density Recreation lands includes continued availability of these lands for the development of new natural surface trails and expansion of existing trails. Maintenance of the USACE boundary line, to include fencing, placement of signs, and clearing a line of sight, will be conducted to prevent trespass, encroachments, and unauthorized use such as trash dumping. Wildlife management activities will be conducted on these lands in select areas to create nesting and foraging habitat for neotropical birds. Vegetation management activities will be conducted to promote and protect ecologically-adapted native vegetation.

Wildlife Management. These are lands designated for the management of wildlife resources. The goal for Wildlife Management areas is for USACE to continue working with ODWC and USFWS partners to ensure wildlife management is being conducted in a manner that benefits both game and non-game species. The lands managed directly by USACE will continue being managed in a fashion that enhances the existing environment and benefits both game and non-game wildlife. USACE has licensed 12,280 acres of land to ODWC for wildlife management. These lands are part of the 21,592 acre Keystone Wildlife Management Area (WMA) operated by ODWC in portions of Creek, Osage, and Pawnee Counties in north central Oklahoma. Located near the towns of Cleveland, Mannford, and Oilton, Keystone WMA is comprised of the Arkansas and Cimarron rivers and adjacent flood plains and bottom lands. The remaining wildlife management lands not managed by ODWC are managed by USACE. Management efforts focus on producing native wildlife foods as well as nesting and foraging habitat. Prescribed burns are conducted when conditions permit. Supplemental forage is provided through management of farming leases where needed to support the needs of species of greatest conservation need. Wetland development units are managed to provide additional waterfowl habitat and hunting opportunity. Hunting and fishing activities are regulated by federal and state laws. A priority will be given to accomplishing the objectives identified in Chapter 3.

There are several federally-listed endangered species that could utilize habitat within the Keystone Lake area. Therefore, any work conducted on this project will be in accordance to the Endangered Species Act, associated BO, and will be appropriately coordinated with the USFWS. The species of focus within this area of consideration are animals listed as a threatened or endangered species under the Endangered Species Act. These species (Table 2.3) will continue to receive attention to ensure they are managed in accordance to their habitat needs. Priority is also given

to those species listed as Species of Greatest Conservation Need by ODWC in the most recent version of the Oklahoma Comprehensive Wildlife Conservation Strategy (OCWCS) for the Crosstimbers Region. The OCWCS also lists several Very High or High Priority Conservation Landscapes that exist on USACE lands at Keystone Lake, the most important being the Post Oak/Blackjack Oak/Hickory Woodland and Forest. USACE will give priority to this high value habitats in all management decisions.

Non-game wildlife is also managed by USACE. Other non-game programs, such as song bird nest box construction, creation of suitable foraging habitat for neotropical and nearctic migratory birds, and installation of bat boxes, are often performed on an intermittent basis. The plan is to continue these initiatives in order to provide some form of management for non-game species.

A map showing managing agencies and their locations can be found in the maps section (NK15MP-OM-01). Table 5.2 lists each non-USACE agency and their respective management areas.

Table 5.1 Managing Agencies Areas Other than USACE

Park	Number of Acres	Land Classification	Managing Agency	Outgrant Document
Keystone Wildlife Management Area	12,280[(1)]	Wildlife Management	Oklahoma Department of Wildlife Conservation	License

[(1)] Land and water surface acres total approximately 21,592 acres

Vegetative Management. These are lands designated for the stewardship of forest, prairie, and other native vegetative cover. There are no lands at Keystone Lake designated as vegetative management.

Future or Inactive Recreation Areas. These are areas with site characteristics compatible with potential future development or recreation areas that are closed. Until there is an opportunity to develop or reopen these areas they will be managed for multiple resources. There are no lands at Keystone Lake designated as future or inactive recreation areas.

5.6 WATER SURFACE

USACE is the primary agency responsible for managing the recreational use of the water surface at Keystone Lake. Enforcement of water surface rules and regulations is a shared responsibility between USACE and ODWC. Zoning of the water surface is intended to ensure the security of key project operations infrastructure, and to promote public safety, and habitat protection. There are four types of water surface zoning utilized at Keystone Lake totaling 27,580 acres.

Restricted. This water surface zone at Keystone Lake includes areas where public boat traffic is prohibited. These areas are located around the dam and bulkhead and is delineated with buoy lines on the lakeside and riverside of Keystone Dam. Other

restricted areas include designated swim beaches. There are 37 acres of Restricted Water Surface at Keystone Lake.

Fish and Wildlife Sanctuary. A single area is included in this zone and includes a cove adjacent to the Ancient Cross Timbers Forest ESA. This zone is needed to compliment the management objectives of the ESA. There are 47 acres of Fish and Wildlife Sanctuary Water Surface at Keystone Lake.

Designated No-Wake. The designation of no-wake zones is necessary to protect shorelines from erosion and allow safe boating and swimming in designated areas. There are 681 acres of Designated No-Wake Water Surface at Keystone Lake.

Open Recreation. This zone includes the vast majority of the water surface at Keystone Lake. Water surface included in this zone is available for year round or seasonal water-based recreational use. There are 26,815 acres of Open Recreation Water Surface at Keystone Lake.

Future management of the water surface includes the maintenance of warning, information, and regulatory buoys as well as routine water safety patrols during peak use periods. In future years, if USACE determines that a water-oriented recreation use study is needed at Keystone Lake to determine the level and type of boating traffic occurring on the lake, the outcome of such a study may include changes in water surface zoning.

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 the map section of this Plan. 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 RESOURCES

Keystone Lake is a large multi-purpose project with numerous authorized purposes. The authorized purposes include municipal and industrial users that have developed over time and are reliant on their provided benefits. These benefits are critical to the local and regional economies and are of great interest to the public. As a result, competing interests for the utilization of federal lands impacts and the way natural resources are managed can be influenced. It is a challenge to balance these interests so the public and stakeholders can benefit while ensuring the adverse impacts are minimized per USACE's environmental stewardship mission. The intention of this document is to outline a plan, which when executed, provides public and stakeholders service and appropriate natural resource management.

6.2 CULTURAL RESOURCES

As mentioned in section 2.10, there is an abundance of cultural resources located around and within Keystone Lake. Special consideration should be given to any activity that may have a negative impact on cultural resources. Therefore, a thorough review of all actions that have soil disturbance must be conducted and reviewed by the District Archeologist. Any action found to have a negative impact must be coordinated with the appropriate state or tribal entity before authorization of work is granted.

6.3 MINERAL EXPLORATIAON AND PRODUCTION ACTIVITES

Effective management of mineral exploration and production activities including geophysical (seismic) survey activities, particularly when USACE does not own the mineral estate requires close coordination among several USACE elements including Operations, Real Estate, Engineering-Construction and Office of Counsel personnel. Mineral extraction activities can include exploration operations, mining operations, drilling operations, production operations, reworking operations (including hydraulic fracturing), and high pressure pipeline operations.

6.4 POWERHOUSE AND HYDROPOWER

The primary missions for Keystone Lake include flood control, navigation support, and the generation of hydropower. Not every USACE project includes a hydropower generation mission. Keystone Lake is one of eight lakes in Tulsa District that generates hydropower.

Construction began on the Keystone Dam in January 1957 and the project was placed in flood control operation in September 1964. The number two generating unit became operational on May 2, 1968, and the number 1 generating unit became operational on May 21, 1968. The capacity of the power and water supply pool (conservation pool) elevation 706 msl to 723 msl is 351,000 acre-feet.

6.5 SHORELINE MANAGEMENT PLAN

This section briefly explains the scope and history of the Keystone Lake Shoreline Management Plan (SMP). This plan is focused on the management of certain private uses of USACE lands and water surface including private floating facilities and vegetation modification activities. The SMP includes shoreline allocations for land and water surface with specific requirements and restrictions related to private shoreline uses. In accordance with USACE regulation ER 1130-2-406, shoreline allocations must not contradict the land. The shoreline allocations must compliment, and certainly not contradict the land classifications in the Master Plan. The SMP for Keystone Lake is available for review at the USACE Keystone Lake Project Office.

Purpose

Shoreline Management Plans help to ensure that the private use of water area, shoreline and adjacent public land of USACE projects are managed to protect the environment and scenic beauty for future generations.

History

Keystone Lake was authorized by Congress under the Flood Control Act approved May 17, 1950. Construction of the dam began in January 1957 and was placed in operation for full flood regulation in September 1964. Soon thereafter, the public was informed through various news media that applications for private floating facilities were being accepted at the resident office. Applicants were required to submit plans and specifications of the facility proposed including structural design, anchorage method, construction materials, and proposed location for the facility. If the structural criteria and the site location were acceptable and the applicant had a residence within the immediate vicinity of the lake, a permit for the floating structure was granted. In addition to private floating facilities, permits were also issued for landscaping and other vegetation modification.

During the late 1960's, these private uses expanded, and at many USACE lakes across the nation private use of public land became controversial. In response to the controversy, USACE initiated efforts to stop issuing new permits and to remove existing private use as permits expired. This action was also controversial among existing permittees and eventually resulted in USACE pursuing a formal rulemaking process by amending Title 36, Part 327, of the Code of Federal Regulations to include a section addressing management of private use under the umbrella heading of Lakeshore Management, later changed to Shoreline Management. The formal rulemaking was published in the Federal Register on December 13, 1974. This regulation prohibits new private uses at all new lakes and at all existing lakes where no private uses had been granted. In general, the regulation granted grandfather privileges to existing permittees and required USACE to prepare Shoreline Management Plans at all lakes where private shoreline uses had been permitted. Preparation of the SMPs required full public involvement. One of the most important parts of an SMP is the allocation of the shoreline into four possible allocations as follows:

- Public Recreation Areas (in general, no private uses allowed)

- Limited Development Areas (private floating facilities and vegetation modification generally allowed by written permit up to specified limits)
- Protected Shoreline Areas (in general, no private uses allowed with possible exception of vegetation modification for wildfire prevention)
- Prohibited Access Areas (no private uses permitted)

The original SMP for Keystone Lake was approved by the Southwestern Division (SWD) Engineer in 1976. In 1981, the plans was reviewed and opened for comment in keeping with SWD guidance to review every 5 years. The review was accomplished by holding workshops at various locations around the lake in order to obtain input from local citizens. In 1986, the Keystone Shoreline Management Plan was again reviewed. This review resulted in an additional .5 miles of shoreline being designated as limited development area.

In 1991, the Lakeshore Management Plan, now referred to as the *Shoreline Management Plan***,** was again reviewed by a 30-day public comment period. Public Notices were issued in three area newspapers and included in the weekly USACE article. Representatives of the Keystone Lake Association met at the resident office on April 8, 1991 to review revisions to the plan. A total of four written comments were received from individuals concerning changes to the Shoreline Management Plan.

In 1996, the Shoreline Management Plan was reviewed during a 30-day public comment period. Public notifications were distributed in three area newspapers and included in the weekly USACE newspaper article. Representatives of the Keystone Lake Association, Mannford and Cleveland Chambers of Commerce, Keystone marina operators and the ODWC reviewed proposed administrative changes and the public requests for changes to the Plan. The two areas requested by the public to be rezoned for private floating facilities were rejected by the review group and not approved in the updated plan.

In summary, the Keystone Lake SMP will continue to be periodically reviewed and changes made as needed. Currently, there are permits for both private floating facilities and for vegetation modification. Future changes to the SMP will require public involvement and compliance with NEPA through preparation of an Environmental Assessment.

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CHAPTER 7 - PUBLIC AND AGENCY COORDINATION

7.1 PUBLIC AND AGENCY COORDINATION

The USACE began planning to revise the Keystone Lake Master Plan Revision in the fall of 2014. Major tasks to be accomplished in the revision included:

- Revision of existing Land Classifications
- Preparation of new Resource Management Objectives
- Preparation of a conceptual Resource Plan describing how each land classification will be managed

The revised Master Plan will 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 first action was a scheduled public scoping meeting providing an avenue for public and agency stakeholders to ask questions and provide comments. The public scoping meeting was held on March 10, 2015 at the Senior Citizen's Center in Mannford, Oklahoma. The Tulsa District placed advertisements on the USACE webpage and social media two weeks prior to the public scoping meeting.

USACE employees hosted the workshop, which was conducted in an open format. Participants were asked to sign-in at a table where staff provided the participants with information regarding the structure of the scoping meeting, comment forms, and postage paid envelopes to return 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
- How to Submit 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 returned in a pre-stamped envelope
- Submitting a comment using electronic mail
- Submitting a comment and mailing it in on letterhead or choice of paper

In total, twenty-two (22) individuals, not including USACE personnel, attended the March 10, 2015 public scoping meeting for interest groups, partner agencies, other government agencies, and businesses. One (1) comment was received following this public scoping meeting requesting USACE to coordinate with the local floodplain administrator.

7.2 PUBLIC AND AGENCY REVIEW OF DRAFT MP, EA, AND FONSI

On March 01, 2016 the USACE Tulsa District and Regional Planning and Environmental Center (RPEC) released the revised Keystone Lake Master Plan draft for public and agency review. This review was open for comment until April 01, 2016, providing an opportunity for the public and agencies to comment on the draft Master Plan, EA, and Finding of No Significant Impact statement (FONSI). Three responses were received during the review period and are summarized below.

The Oklahoma Department of Environmental Quality responded on March 01, 2016 with a list of environmental recommendations to consider for projects. The Department of Wildlife Conservation sent a response on March 14, 2016 requesting minor additions to the fish and wildlife section in Chapter 2. Finally, the Department of Energy, Southwestern Power Administration responded on April 01, 2016 requesting that the hydropower information be updated to include the 2008 survey. Recommendations were implemented into the Master Plan and EA as appropriate.

Once public, agency, and Project Delivery Team (PDT) comments to the draft are addressed, the Master Plan and all appendices are prepared for final approval. The District Engineer has the approval authority to sign the FONSI and at that time the revised Keystone Lake Master Plan is implemented and supersedes the previous Master Plan. A copy of the correspondence from agencies that provided comments and planning assistance for preparation of the EA are found in the EA (Appendix C).

CHAPTER 8 - SUMMARY OF RECOMMENDATIONS

8.1 SUMMARY OVERVIEW

The preparation of this Master Plan for Keystone Lake followed the USACE Master Planning guidance in ER 1130-2-550 and EP 1130-2-550, both dated 13 January 2013. Three major requirements set forth in the guidance include the preparation of contemporary resource objectives, classification of project lands using the most recent 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 and the consideration of regional recreation and natural resource management priorities identified by other federal, state, and municipal authorities. 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 staff levels at the Keystone Lake Project. Factors considered in the Plan development were identified through public involvement and review of statewide planning documents including ODPTs 2012 SCORP. This Master Plan will ensure the long term sustainability of the recreation program and natural resources associated with Keystone Lake.

8.2 LAND RECLASSIFICATION PROPOSAL

A key component in the preparation of this Master Plan was the examination of prior land classifications and the need to transition to the new land classification standards. The public involvement process explained that prior land classifications were similar to the new classification standards but in addition to simply changing the nomenclature of the classifications, USACE also wanted to know if there should be a shift of land from one classification to another (for example, should lands with a recreation classification be reclassified to a wildlife classification or vice versa). Public input was sought using several approaches as described in Chapter 7. The public involvement process did not result in a specific request or proposal to demonstrably change prior land classifications. In the absence of public or other agency suggestions/proposals to reclassify project lands, the land classifications presented in this Plan were formulated by USACE personnel assigned to the Master Plan Project Delivery Team (PDT). Key decision points in the reclassification of project lands are presented in Table 8.1.

Table 8.1 Reclassification Proposals

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 1	Classify all 44 acres of River City Park to High Density Recreation.	YES – Not clearly marked in previous Master Plan.
Reclassification Proposal 2	Reclassify 197 acres south of Brush Creek from High Density Recreation to Project Operations.	YES – Area is the site for the lake's radio tower, emergency material storage, and borrow pits. These are areas in need of project security.
Reclassification Proposal 3	Reclassify eight acres of riprap along dam from High Density Recreation to Project Operations.	YES – Project Operations is the correct classification as riprap's primary purpose is erosion protection to the dam.
Reclassification Proposal 4	Reclassify 11 acres of land north of the bulkhead in the water to Project Operations.	YES – Area needs to be maintained for staff access to bulkhead for inspections, maintenance and emergency operations.
Reclassification Proposal 5	Classify 25 acres of water surface upstream and 12 acres downstream of the Dam totaling 37 acres to Water Surface: Restricted.	YES – Areas are restricted for project security and public safety.
Reclassification Proposal 6	Classify 47 acres of water surface within Eagle Cove to Water Surface: Fish and Wildlife Sanctuary.	YES – Cove has seasonal restrictions necessary to protect ecological resources.
Reclassification Proposal 7	Reclassify all 166 acres of the Ancient Cross Timbers Forest from Natural Area to Environmental Sensitive Area.	YES –The reclassification more accurately defines management objectives for this area and provides habitat protection. Area is considered sensitive and needs to be protected as such.
Reclassification Proposal 8	Reclassify five acres of Whispering Hills Boat Ramp	YES – a boat ramp is the single asset in this area. No intensive future development is planned.

PROPOSAL	DESCRIPTION	RESPONSE
	from High Density Recreation to Low Density Recreation	
Reclassification Proposal 9	Reclassify all 154 acres of Osage Point and Osage Ramp from High Density Recreation to Low Density Recreation.	YES – This area has never been developed for High Density Recreation and future management objectives do not support High Density Recreation.
Reclassification Proposal 10	Reclassify all 63 acres of Cedar Creek Bay from High Density Recreation to Low Density Recreation.	YES – This area has never been developed for High Density Recreation and future management objectives do not support High Density Recreation.
Reclassification Proposal 11	Reclassify 12 acres High Density Recreation south of State Highway 99 bridge to Wildlife Management.	YES – This area has never been developed for High Density Recreation and future management objectives do not support High Density Recreation.
Reclassification Proposal 12	Reclassify 34 acres of Lakeland area from High Density Recreation to Wildlife Management.	YES – No facilities were developed in this area and no future development is planned. Area is suitable for wildlife management.
Reclassification Proposal 13	Reclassify all eight acres of East Levee from High Density Recreation to Project Operations.	YES – Levees are more appropriately classified as Project Operations for safety and security purposes. No facilities were developed, and no future development is planned.
Reclassification Proposal 14	Reclassify all 291 acres of Cowskin North from High Density Recreation to 141 acres of Low Density Recreation and 150 acres of Wildlife Management.	YES – This area is an access point with no additional facilities. No future development is planned under current management objectives.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 15	Reclassify one acre of Hill'n Dale Boat Ramp from High Density Recreation to Low Density Recreation.	YES – This area is an access point with a boat ramp with no additional facilities. No future development is planned under current management objectives.
Reclassification Proposal 16	Reclassify 212 acres of Washington Irving Cove North from High Density Recreation to Wildlife Management.	YES – The access point and boat ramp are closed. No future development is planned. Area is better used as wildlife management under current management objectives.
Reclassification Proposal 17	Reclassify 365 acres of the southern peninsula of Appalachia Bay from Low Density Recreation to High Density Recreation.	YES – Activities permitted in this area are identified as intensive recreational activities.
Reclassification Proposal 18	Reclassify 100 acres west of Pump Jack Island and north of New Mannford Ramp and Cross Timbers Marina from Wildlife Management to Low Density Recreation.	YES – The reclassification more accurately defines management objectives for this area. Passive recreation activities have been proposed for this area.
Reclassification Proposal 19	Reclassify all 175 acres of Sandy Park from Low and High Density Recreation to Wildlife Management.	YES – Facilities were never developed in this area and current management plans show no future development. Wildlife Management best fits lands use in this area.
Reclassification Proposal 20	Reclassify New Mannford Ramp's borrow pit totaling 19 acres from High Density Recreation to Project Operations.	YES – This area is an active borrow pit needed by USACE to maintain facilities.
Reclassification Proposal 21	Reclassify the 26-acre Old Mannford Ramp and the area from there to Pawnee Cove consisting of 228 acres of Low Density Recreation and 75 acres of High Density Recreation to	YES – Recreation facilities were never developed and future management plans do not support intensive recreation activities.

PROPOSAL	DESCRIPTION	RESPONSE
	329 acres of Wildlife Management.	
Reclassification Proposal 22	Reclassify the 43 acres of Low Density Recreation east of Friendship Community Church Camp to Wildlife Management.	YES – Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 23	Classify all 35 acres of the Mannford Reservoir as Low Density Recreation.	YES – Lands were not previously classified. Under current management plans lands are best classified as Low Density Recreation.
Reclassification Proposal 24	Reclassify all 43 acres of Cimarron Park from High Density Recreation to Low Density Recreation.	YES – Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 25	Reclassify area storing emergency material within Pawnee North totaling 55 acres from High Density Recreation to Project Operations.	YES – This area is an active borrow pit needed by USACE to maintain facilities.
Reclassification Proposal 26	Reclassify all 332 acres of Pawnee North, excluding the area storing emergency material, from High Density Recreation to Low Density Recreation.	YES – Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 27	Reclassify 16 acres of Low Density Recreation to High Density Recreation located west of the Highway 51 bridge in Mannford.	YES – Area is suitable for the future development of High Density Recreation facilities which meets potential public interest and supports resource objectives.

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CHAPTER 9 - BIBLIOGRAPHY

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APPENDIX A - LAND CLASSIFICATION, MANAGING AGENCIES, RECREATION, AND SEAPLANE RESTRICTION MAPS

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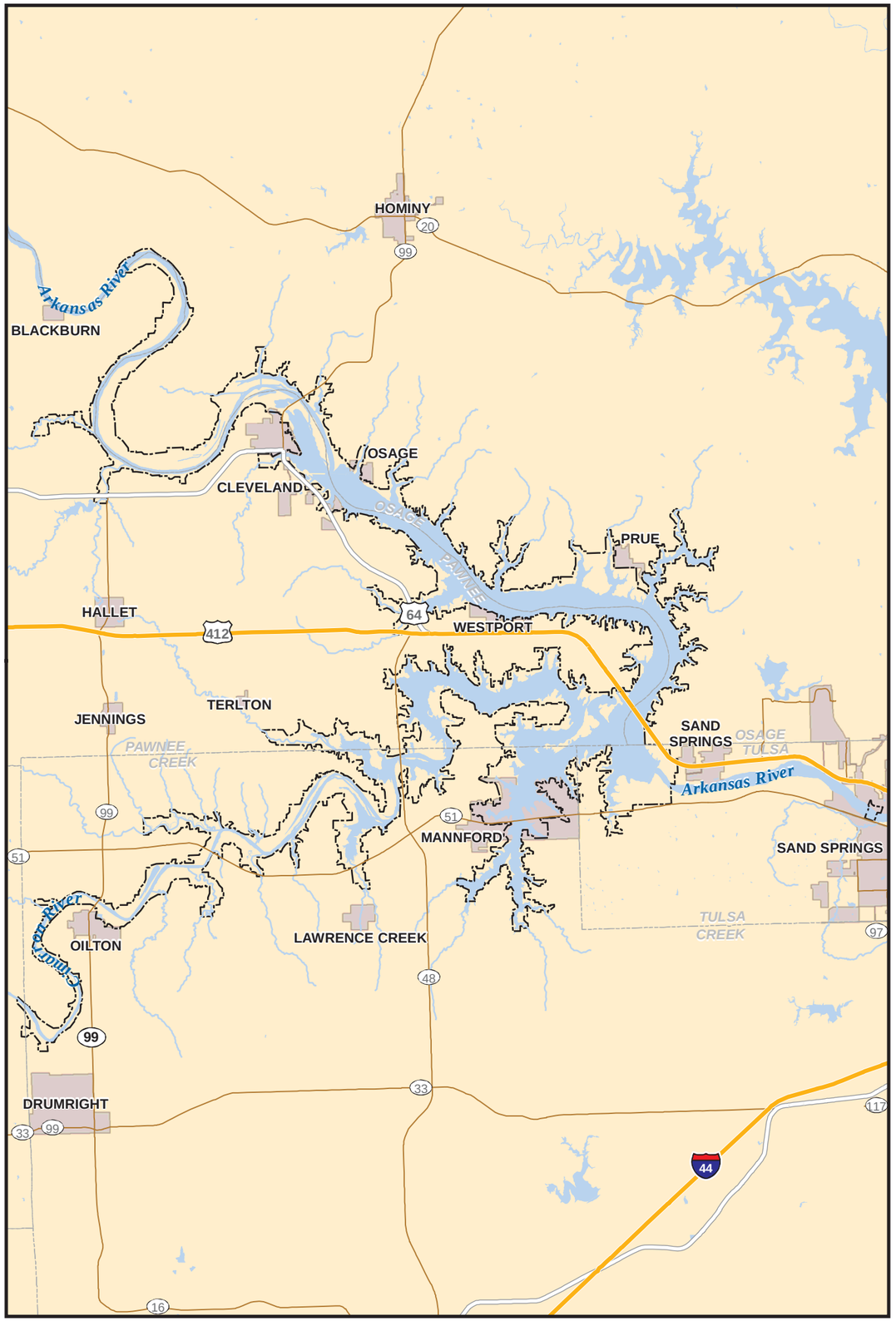

INDEX TO MASTER PLAN MAPS

GENERAL

MAP NO.	TITLE
NK15MP-OI-00	PROJECT LOCATION & INDEX TO MAPS
NK15MP-OM-01	AGENCY LAND MANAGEMENT
NK15MP-OP-01	SEA PLANE GUIDE
NK15MP-OW-01	WATER SURFACE CLASSIFICATIONS

LAND CLASSIFICATION

MAP NO.	TITLE
NK15MP-OC-00	LAND CLASSIFICATION SHEET (00)
NK15MP-OC-01	LAND CLASSIFICATION SHEET (01)
NK15MP-OC-02	LAND CLASSIFICATION SHEET (02)
NK15MP-OC-03	LAND CLASSIFICATION SHEET (03)
NK15MP-OC-04	LAND CLASSIFICATION SHEET (04)
NK15MP-OC-05	LAND CLASSIFICATION SHEET (05)
NK15MP-OC-06	LAND CLASSIFICATION SHEET (06)
NK15MP-OC-07	LAND CLASSIFICATION SHEET (07)
NK15MP-OC-08	LAND CLASSIFICATION SHEET (08)
NK15MP-OC-09	LAND CLASSIFICATION SHEET (09)
NK15MP-OC-10	LAND CLASSIFICATION SHEET (10)
NK15MP-OC-11	LAND CLASSIFICATION SHEET (11)
NK15MP-OC-12	LAND CLASSIFICATION SHEET (12)
NK15MP-OC-13	LAND CLASSIFICATION SHEET (13)
NK15MP-OC-14	LAND CLASSIFICATION SHEET (14)
NK15MP-OC-15	LAND CLASSIFICATION SHEET (15)

RECREATIONAL AREAS

MAP NO.	TITLE
NK15MP-OR-00	RECREATIONAL AREAS
NK15MP-OR-01	BRUSH CREEK PARK
NK15MP-OR-02	WASHINGTON IRVING (SOUTH)
NK15MP-OR-03	WALNUT CREEK PARK
NK15MP-OR-04	APPALACHIA BAY
NK15MP-OR-05	SALT CREEK (NORTH) - JELLYSTONE
NK15MP-OR-06	NEW MANNFORD PARK

FEE BOUNDARY

WATER SURFACE

THIS PRODUCT IS REPRODUCED FROM GEOSPATIAL INFORMATION PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS. GIS DATA AND PRODUCT ACCURACY MAY VARY. THEY MAY BE DEVELOPED FROM SOURCES OF DIFFERING ACCURACY. ACCURATE ONLY FOR CERTAIN SCALES, BASED ON MODELING OR INTERPRETATION, INCOMPLETE WHILE BEING CREATED OR REVISED. USING GIS PRODUCTS FOR PURPOSES OTHER THAN THOSE FOR WHICH THEY WERE CREATED MAY YIELD INACCURATE OR MISLEADING RESULTS.

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

PROJECT LOCATION AND INDEX

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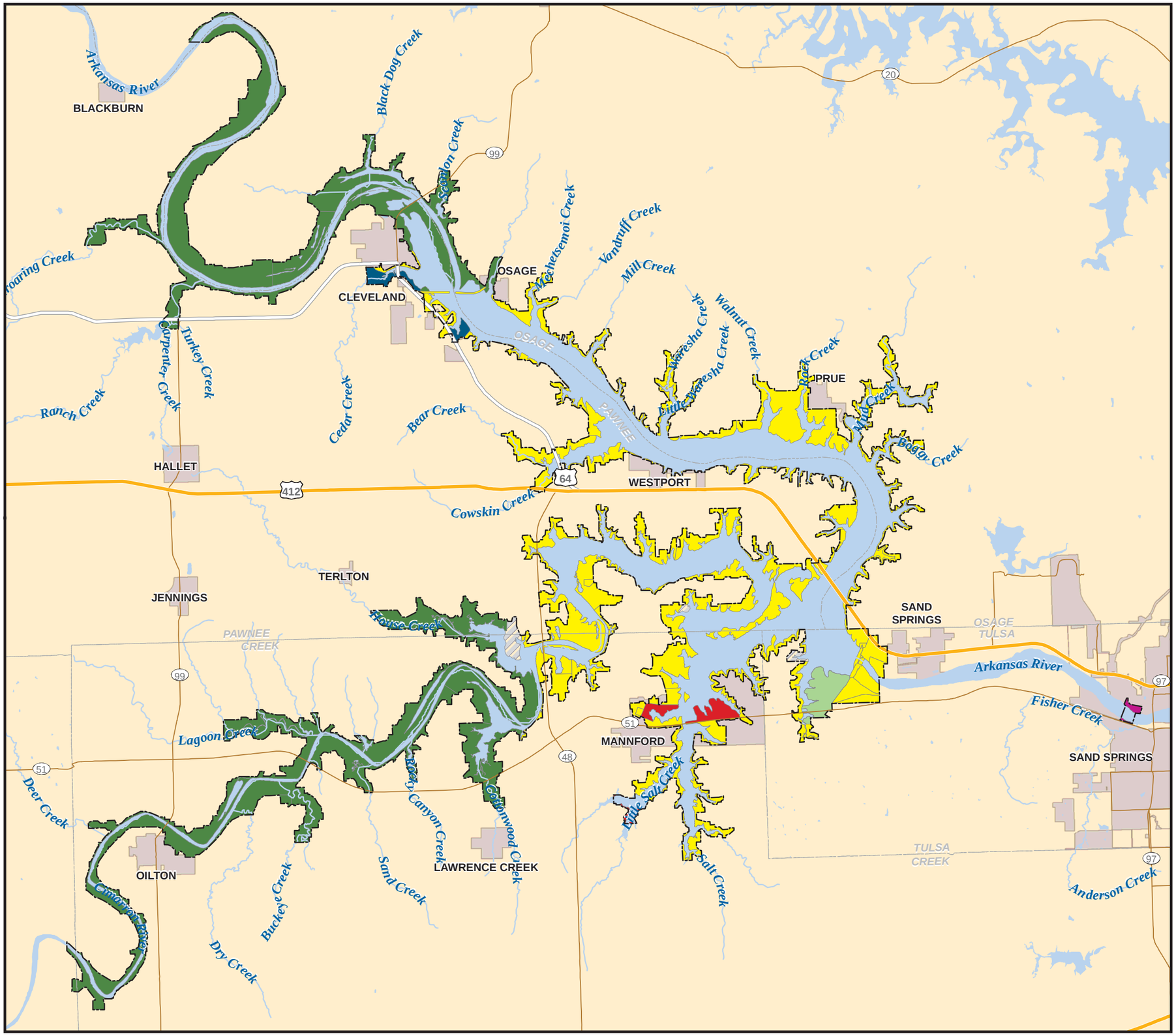
DATE:	MAP NO.
MAY 2016	NK15MP-OI-00



- FEE BOUNDARY
- U.S. ARMY CORPS OF ENGINEERS
- OKLAHOMA DEPT. OF WILDLIFE CONSERVATION
- OKLAHOMA DEPT. OF TOURISM AND RECREATION
- CITY OF CLEVELAND
- CITY OF MANNFORD
- CITY OF SAND SPRINGS
- OTHER

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

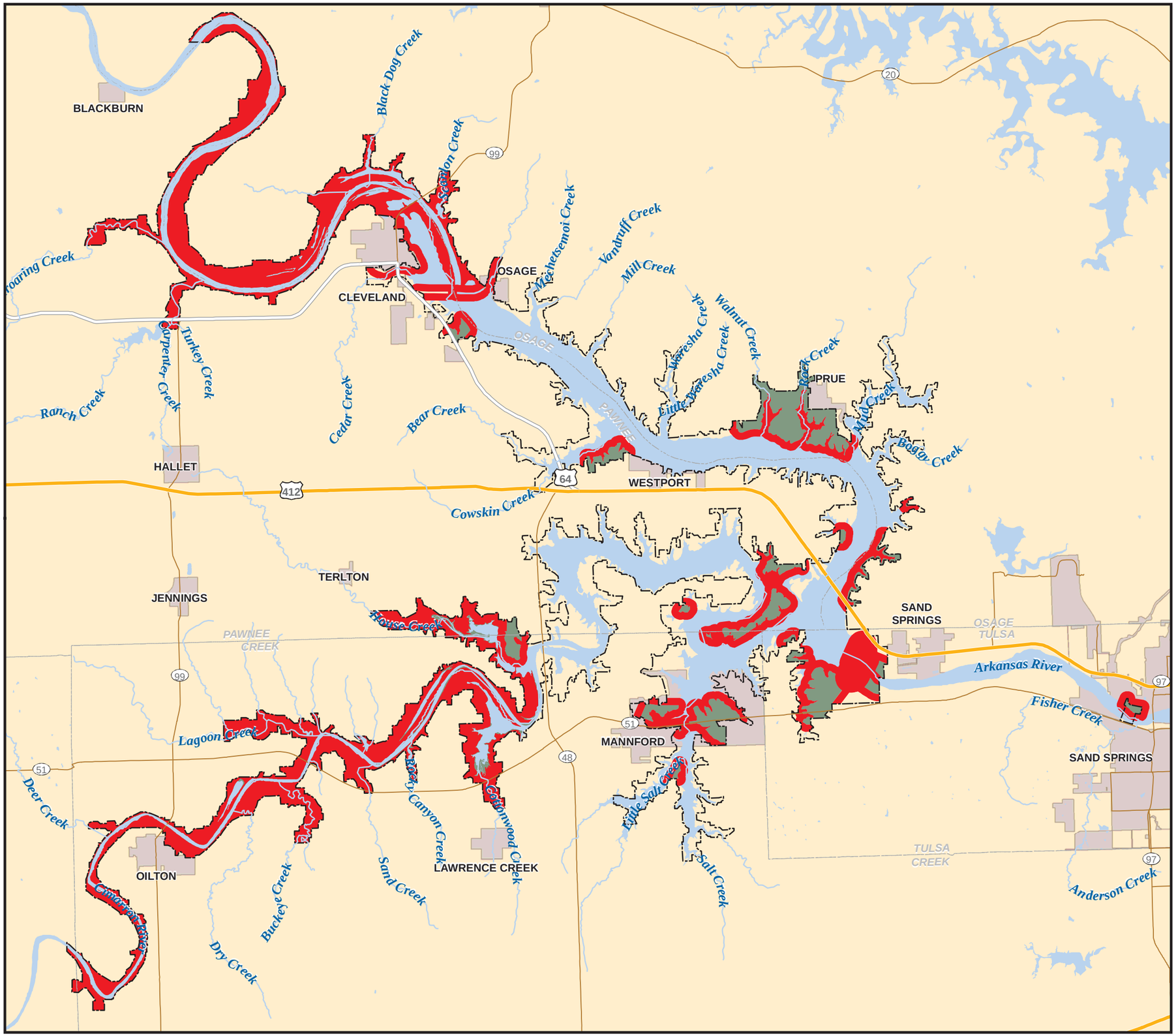
KEYSTONE LAKE MASTER PLAN

AGENCY LAND MANAGEMENT

N

0 1 2 3 4 5 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OM-01



FEE BOUNDARY

RESTRICTED AREAS

RECREATION AREAS

WATER SURFACE

TAKE OFF AND LANDING PROHIBITED WITHIN 2000 FEET OF DAM STRUCTURE AND WITHIN 1000 FEET OF BRIDGES AND RECREATION AREAS.

OPERATION OF SEA PLANE AT CORPS PROJECTS IS A THE RISK OF THE PLANE'S OWNER, OPERATOR, AND / OR PASSENGER(S).

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

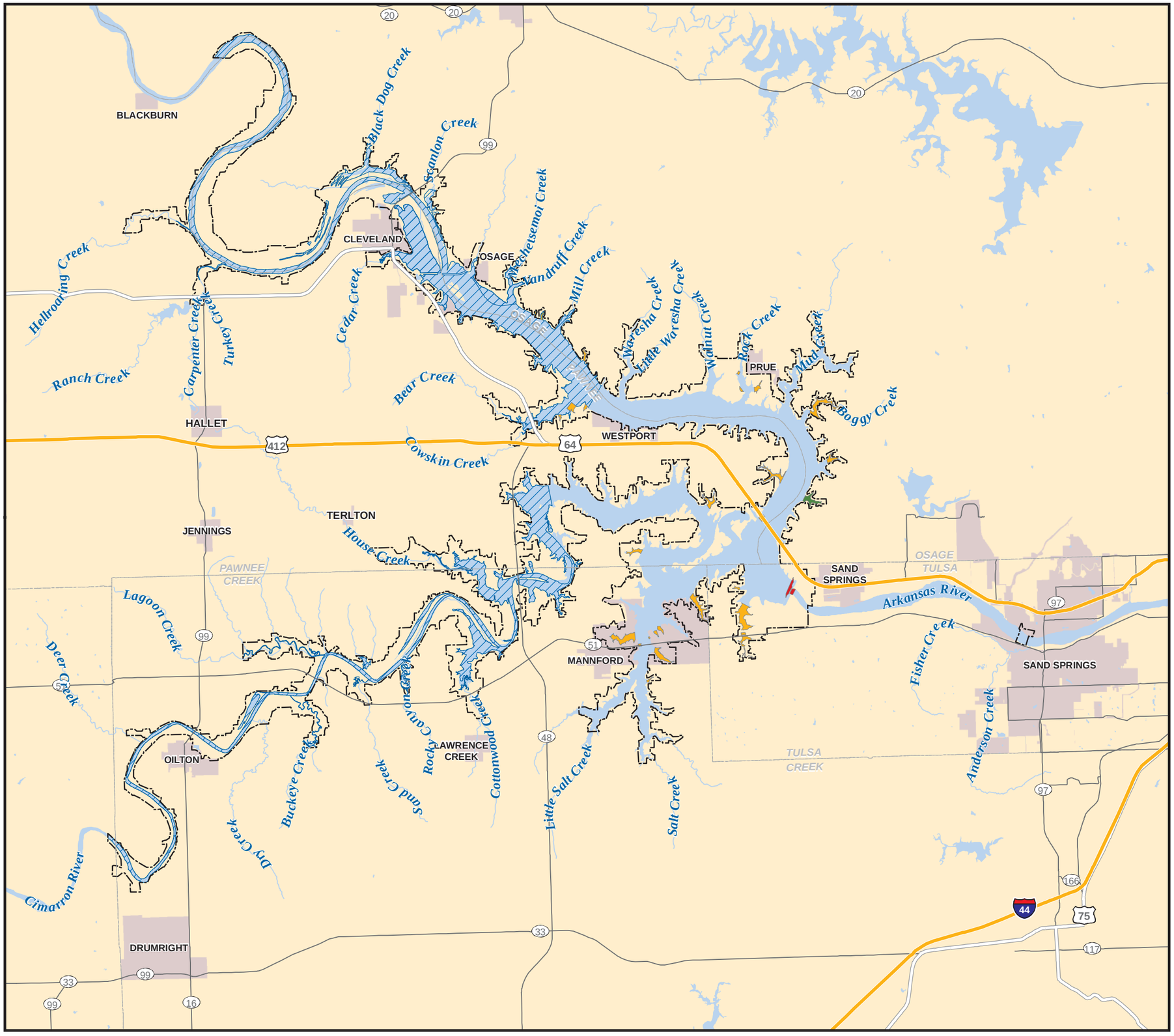
KEYSTONE LAKE MASTER PLAN

SEAPLANE GUIDE

N

0 1 2 3 4 5 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OP-01



FEE BOUNDARY

RESTRICTED

DESIGNATED NO WAKE AREAS

FISH AND WILDLIFE SANCTUARY

SHALLOW WATER

OPEN RECREATION

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

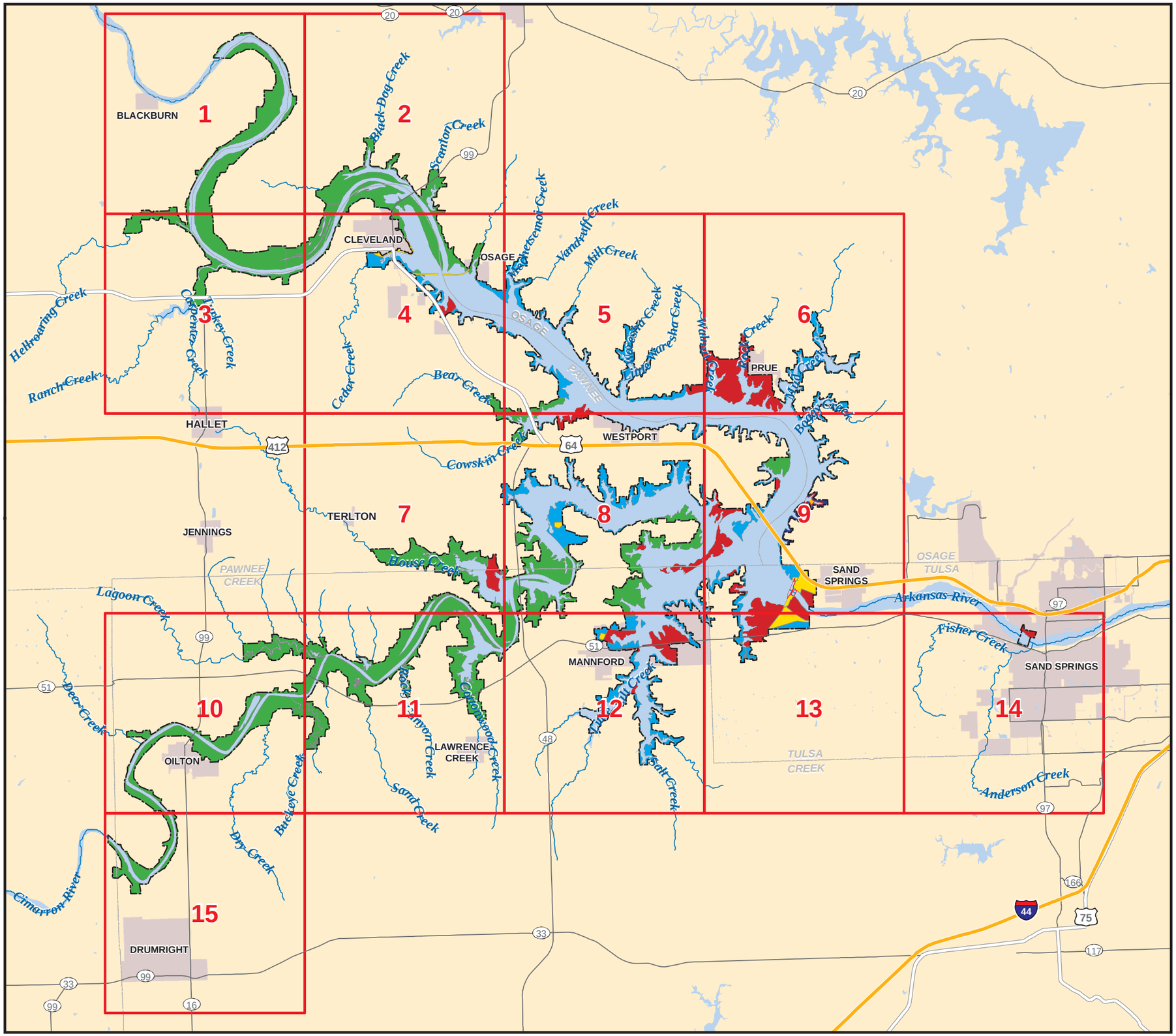
KEYSTONE LAKE MASTER PLAN

WATER SURFACE CLASSIFICATIONS

N

0 1.25 2.5 5 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OW-01



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U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

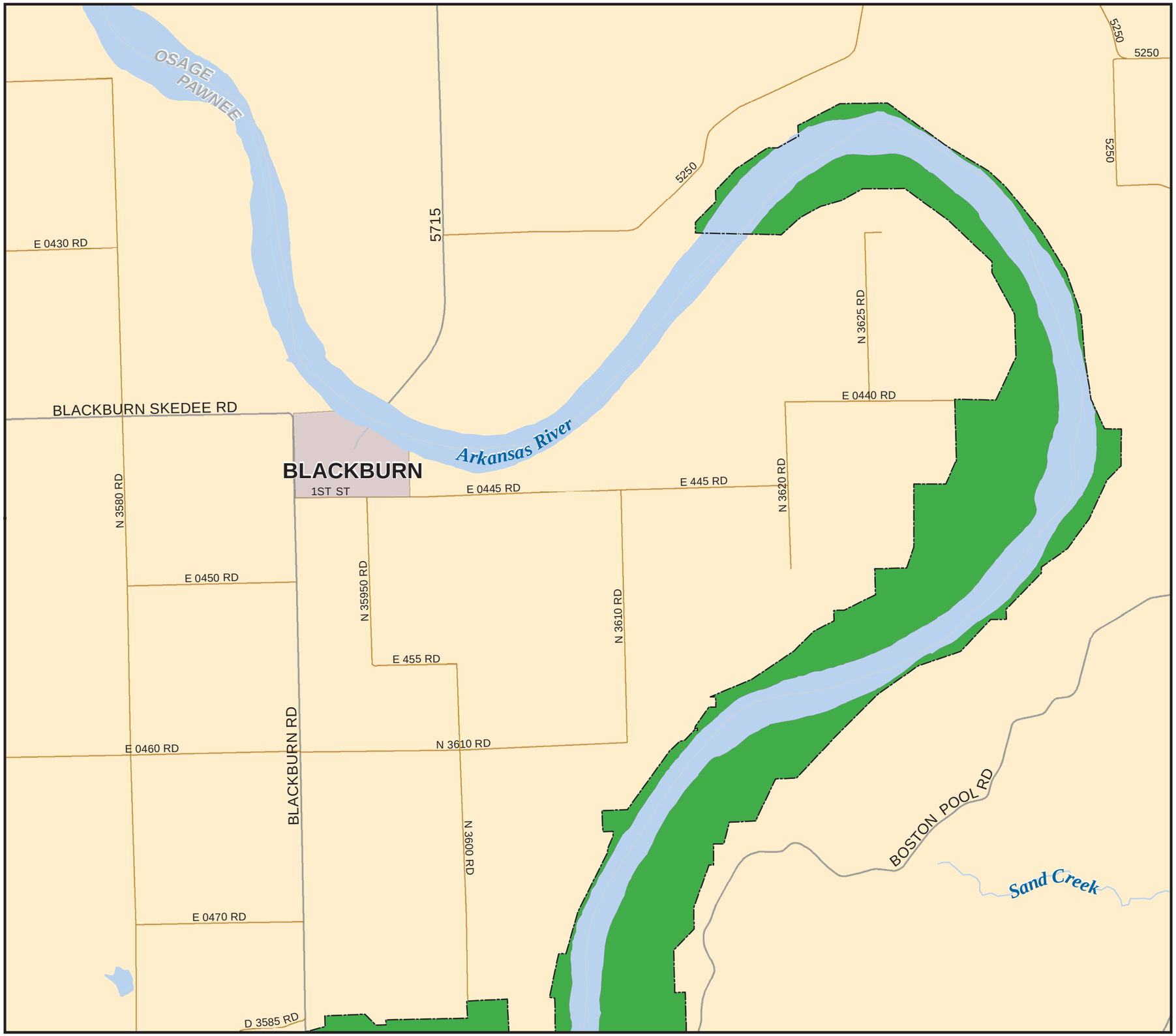
KEYSTONE LAKE MASTER PLAN

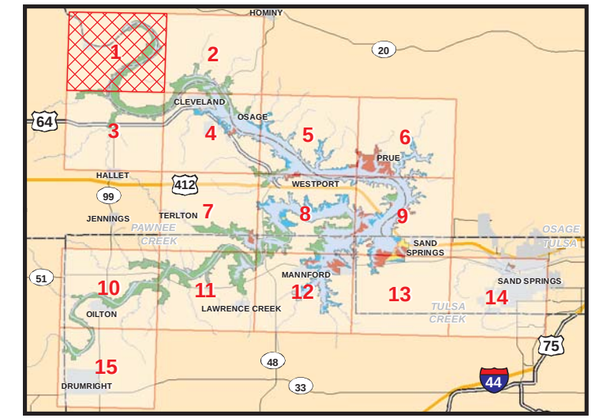
LAND CLASSIFICATION (INDEX SHEET 00)

N

0 1.25 2.5 5 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-00





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U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

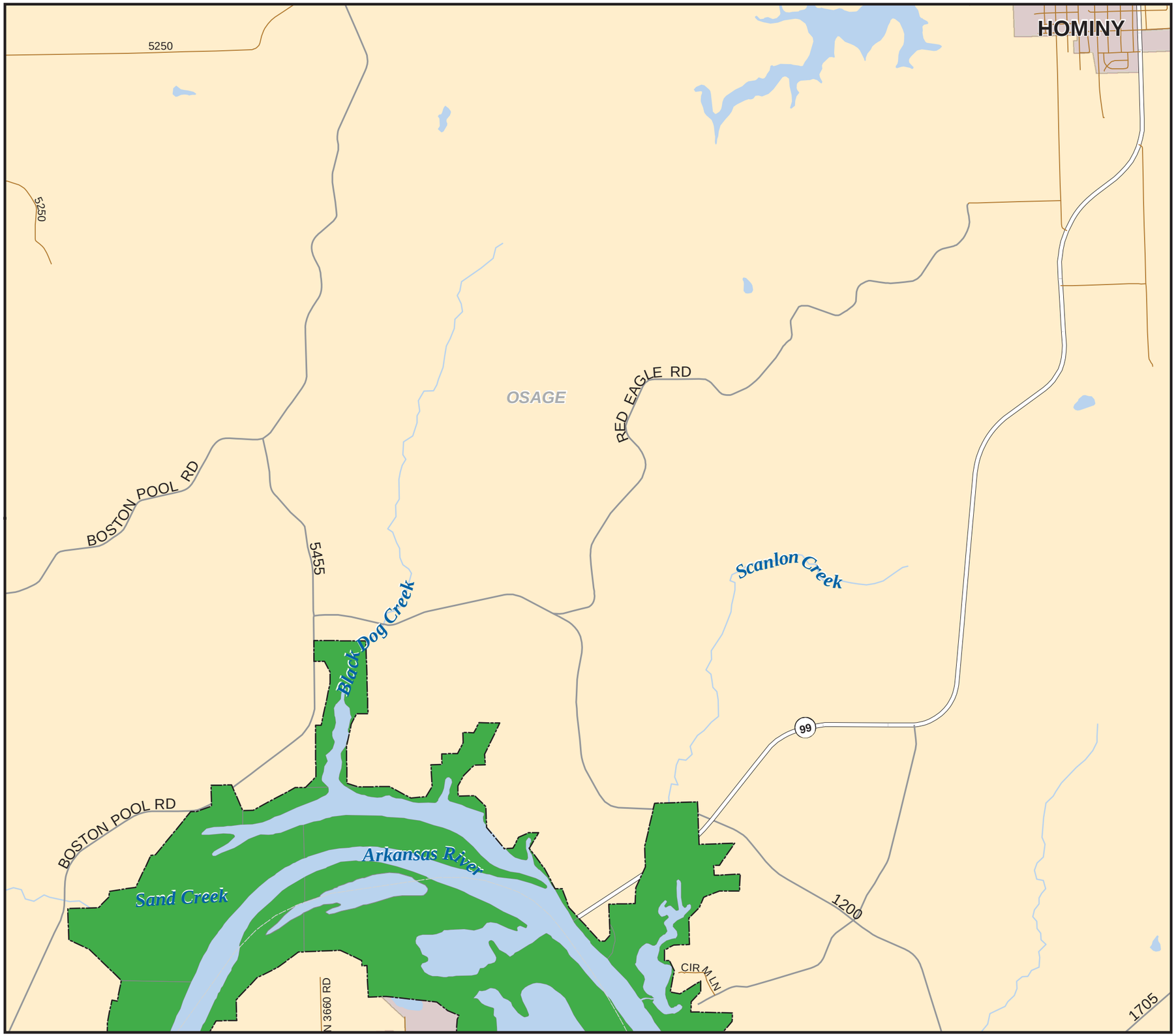
KEYSTONE LAKE MASTER PLAN

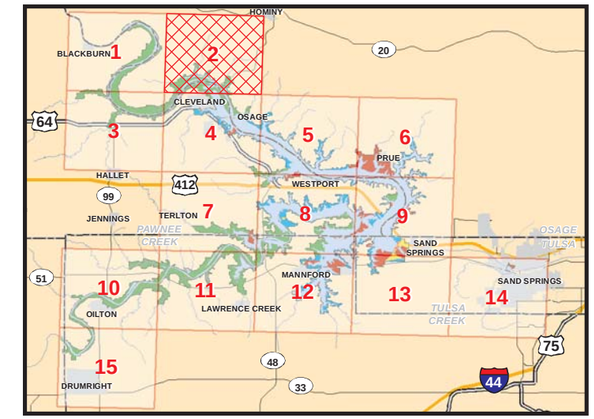
LAND CLASSIFICATION (SHEET 01)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-01





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

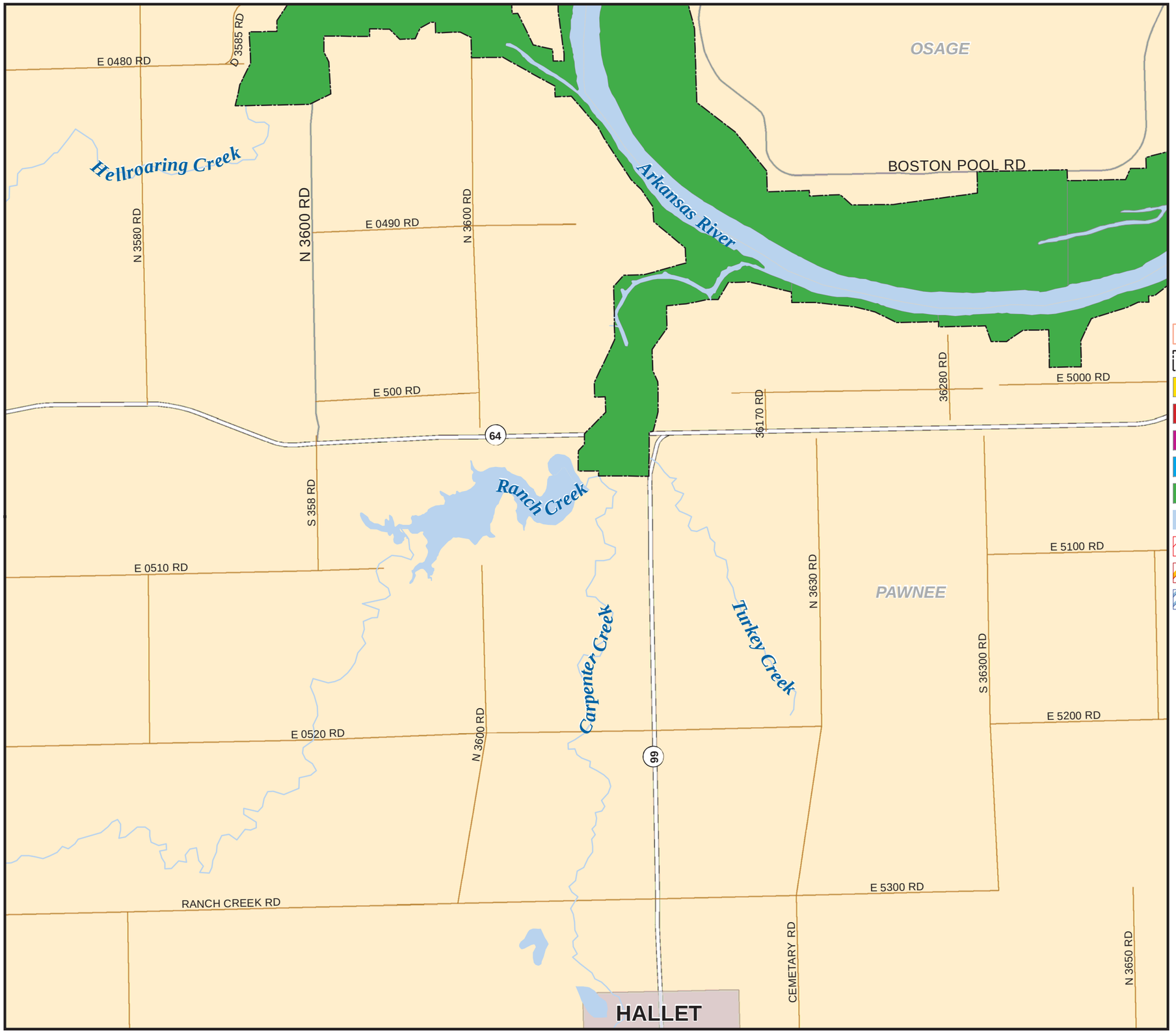
KEYSTONE LAKE MASTER PLAN

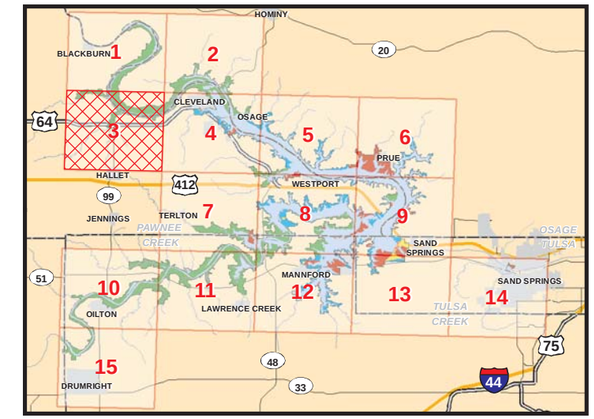
LAND CLASSIFICATION (SHEET 02)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-02





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U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

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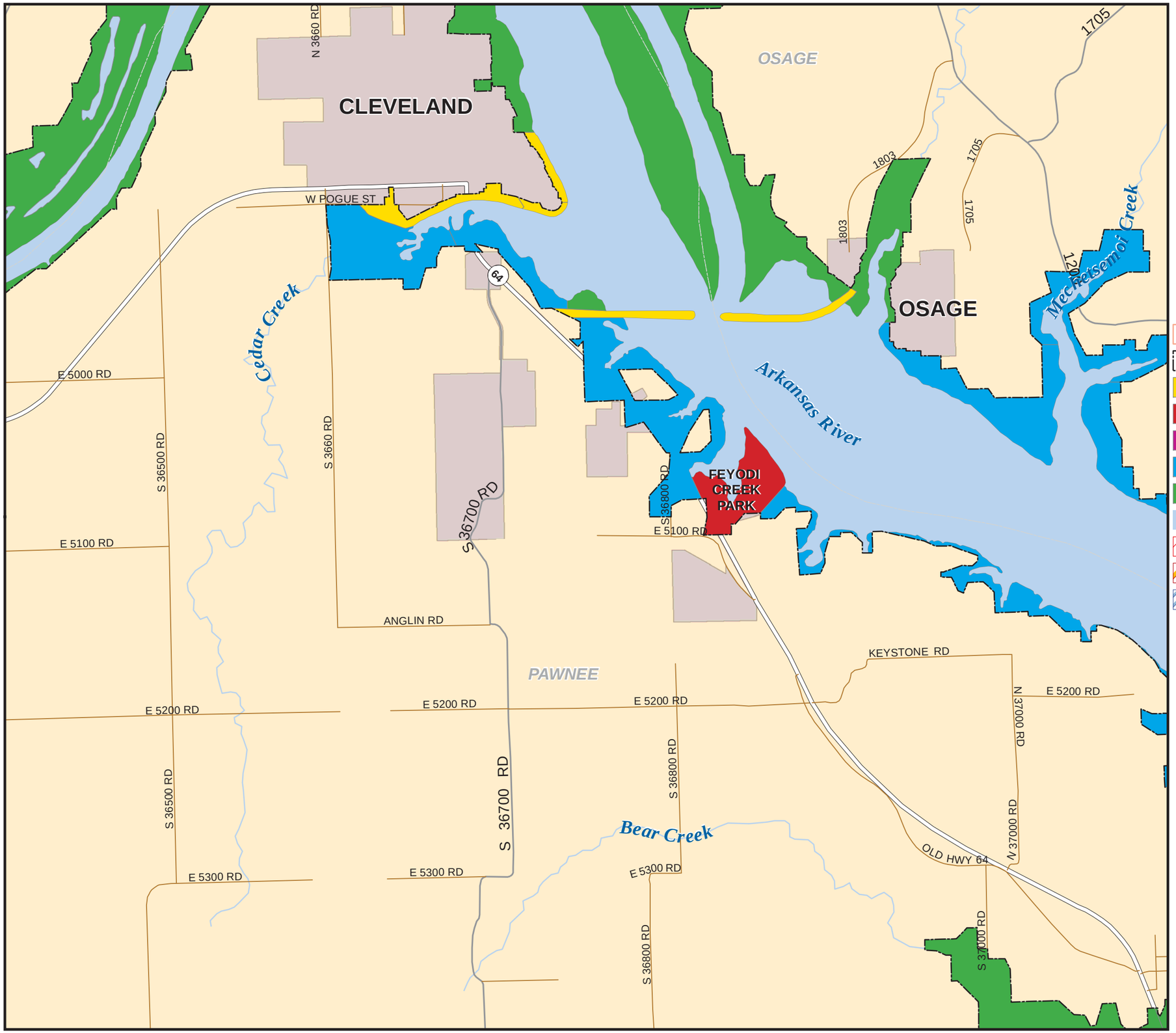
KEYSTONE LAKE MASTER PLAN

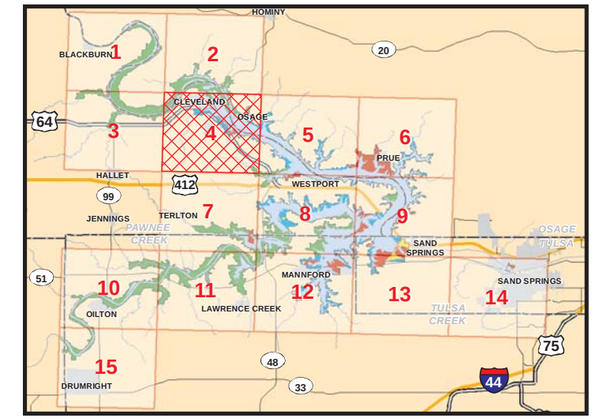
LAND CLASSIFICATION (SHEET 03)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-03





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

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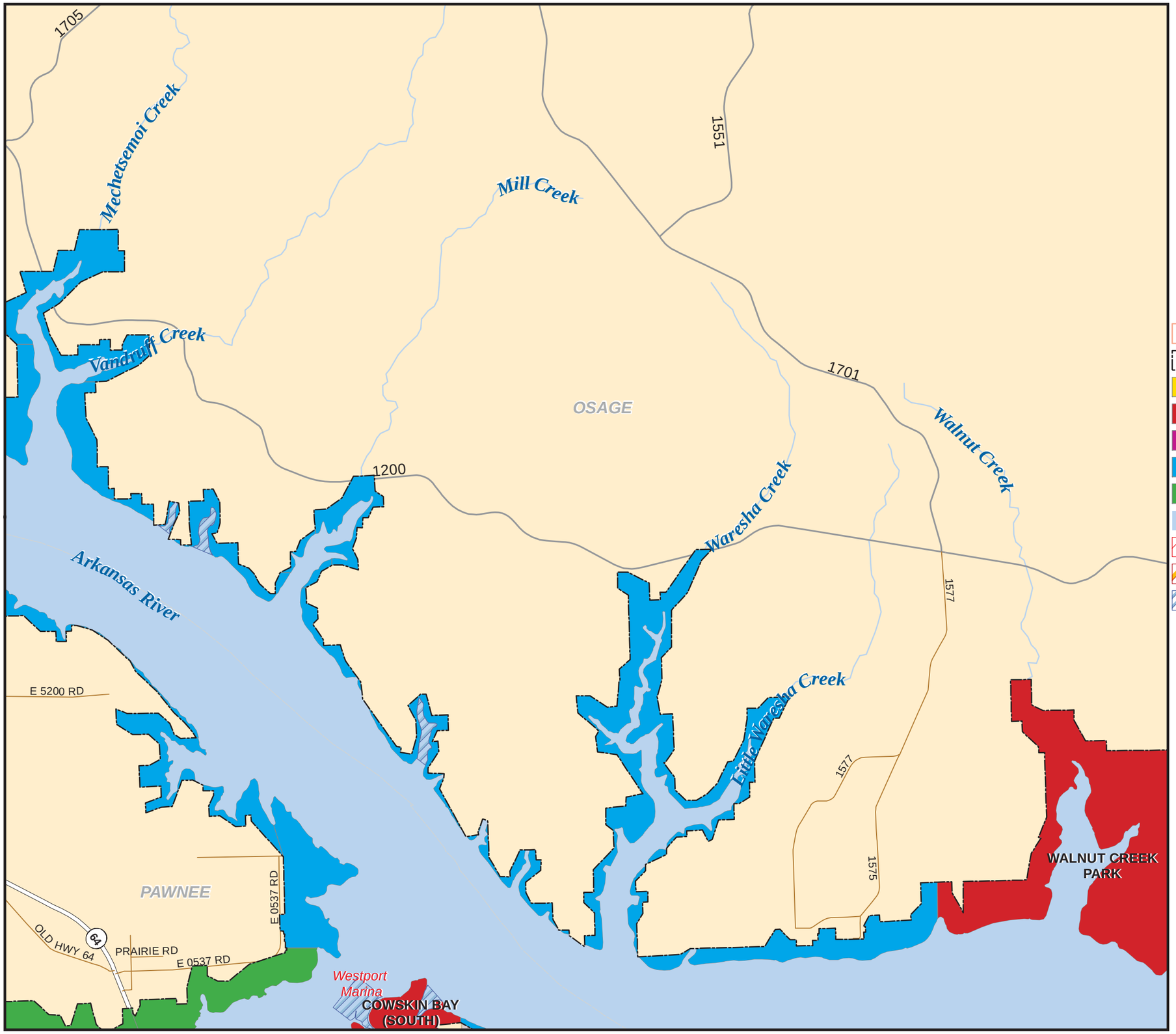
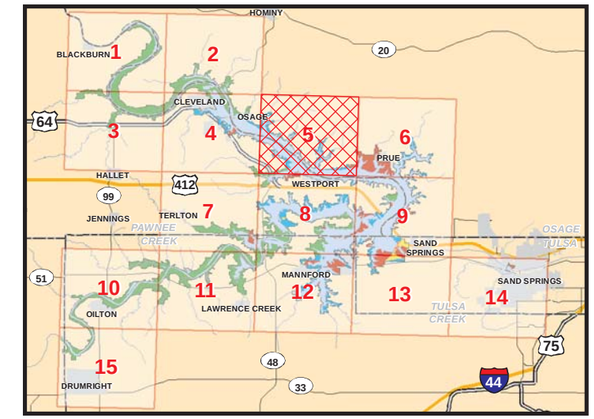
LAND CLASSIFICATION (SHEET 04)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-04





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

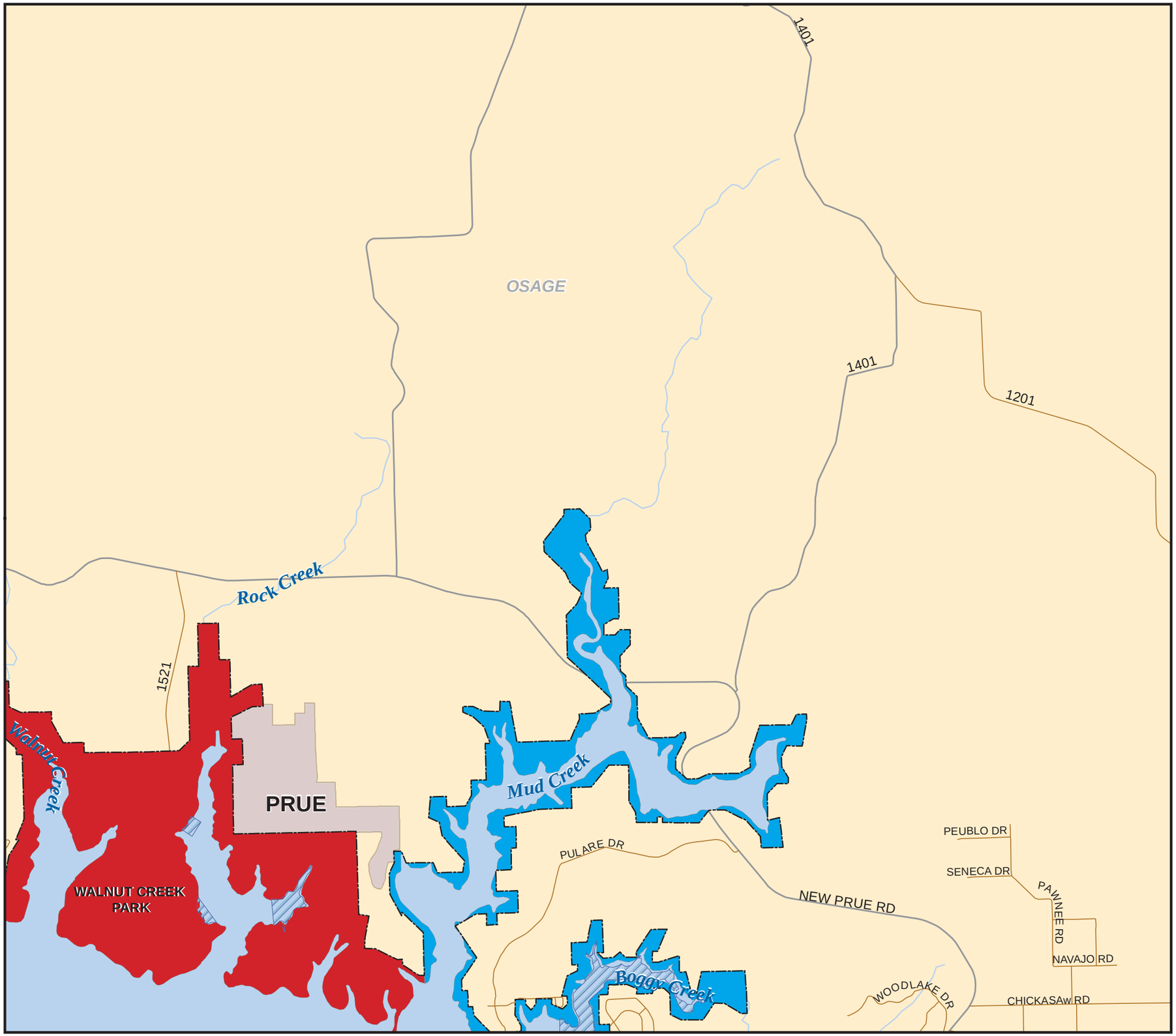
KEYSTONE LAKE MASTER PLAN

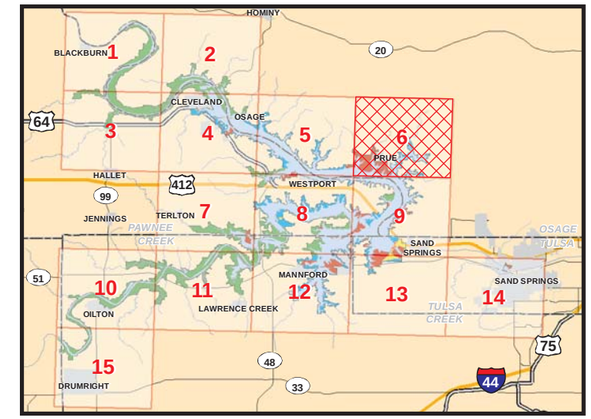
LAND CLASSIFICATION (SHEET 05)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-05





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

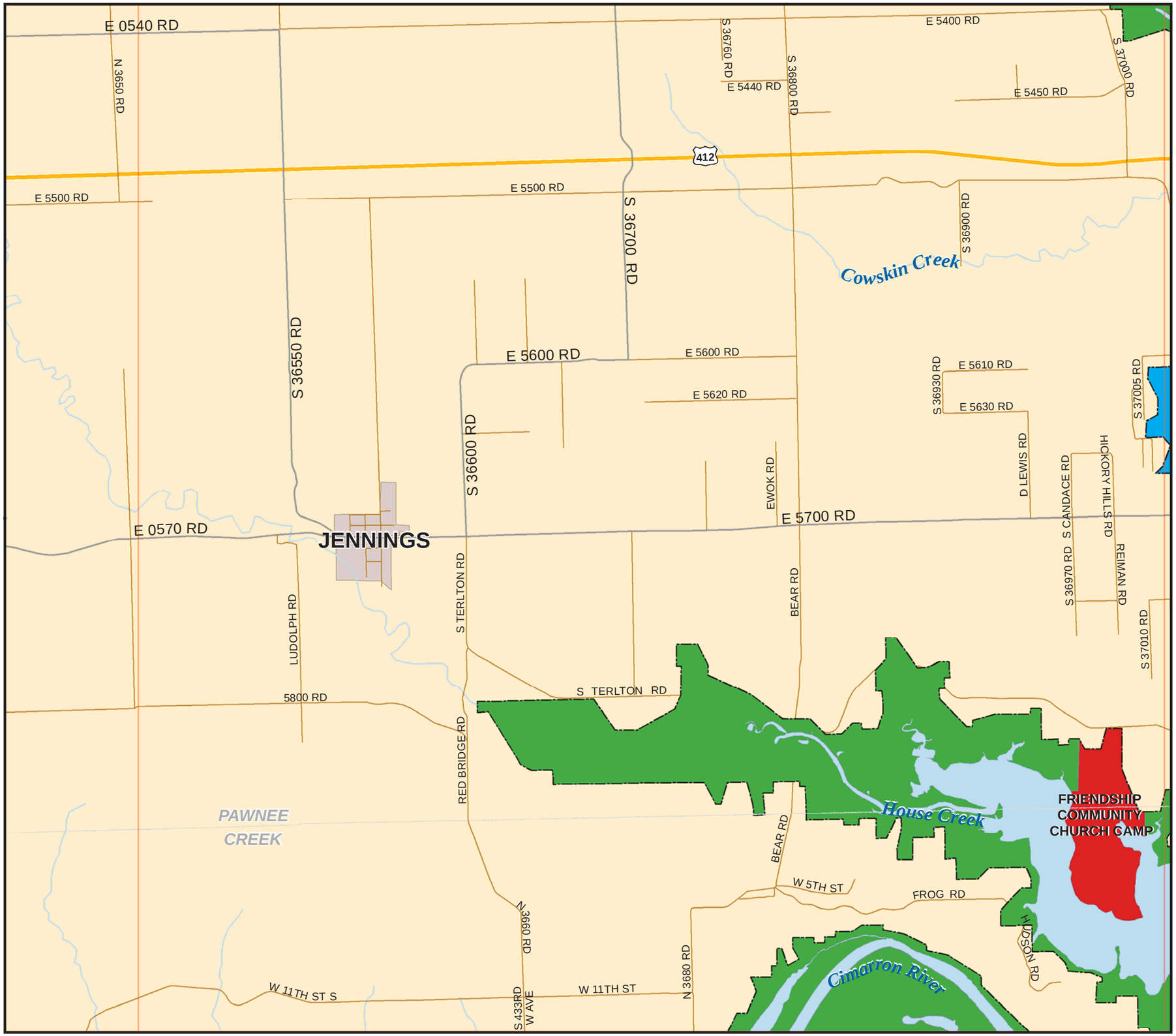
KEYSTONE LAKE MASTER PLAN

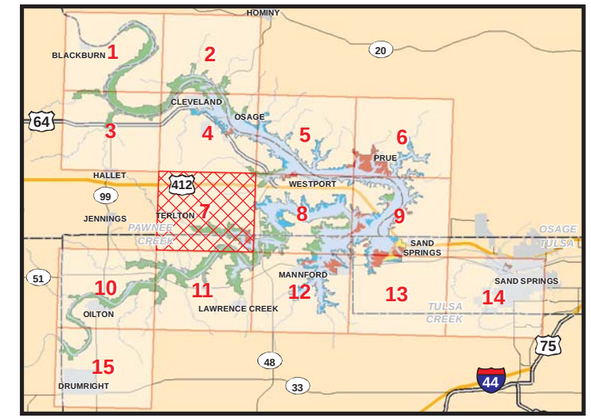
LAND CLASSIFICATION (SHEET 06)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-06





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

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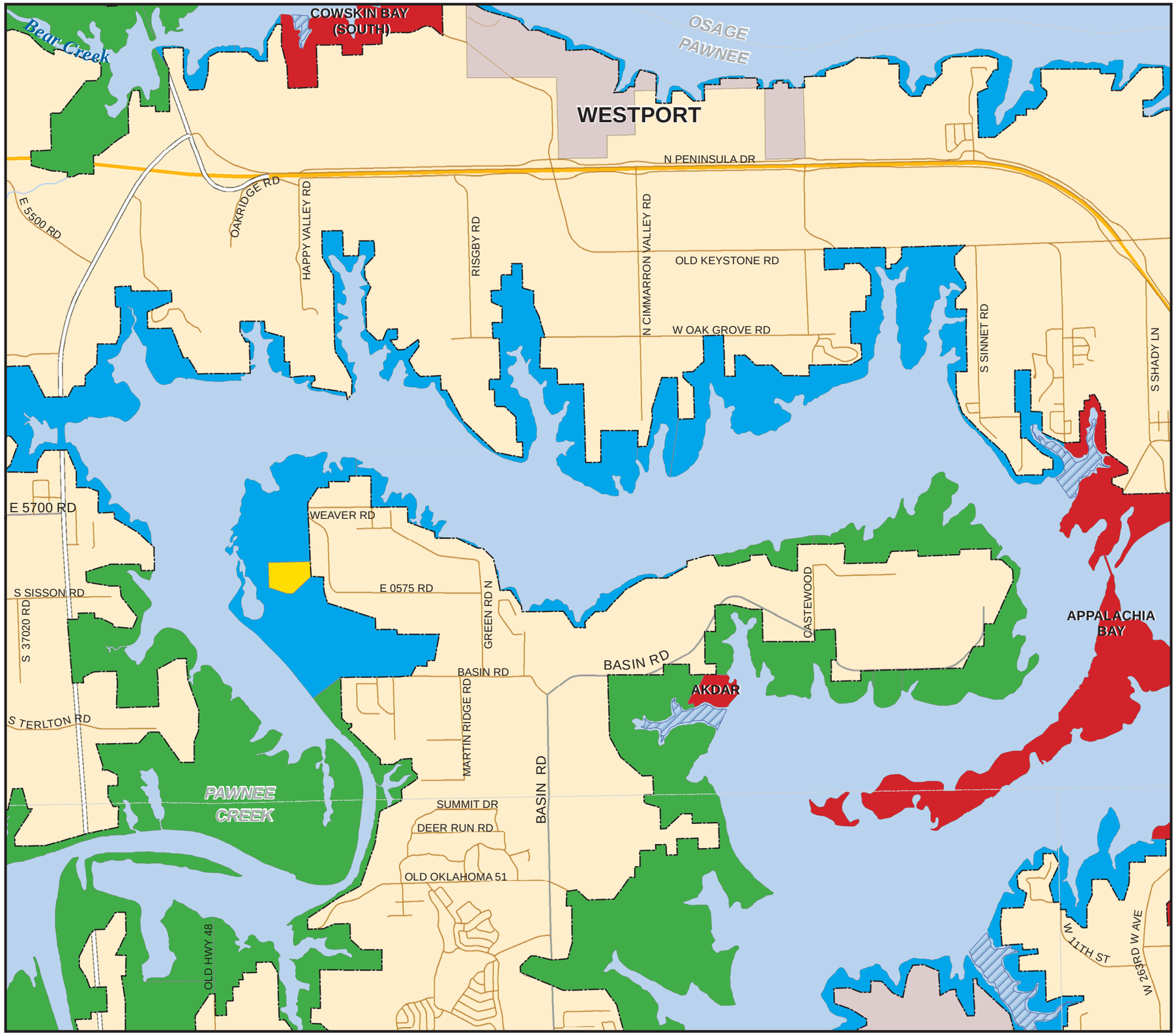
KEYSTONE LAKE MASTER PLAN

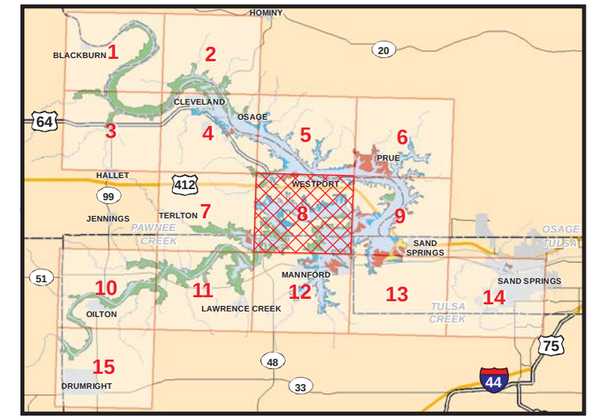
LAND CLASSIFICATION (SHEET 07)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-07





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

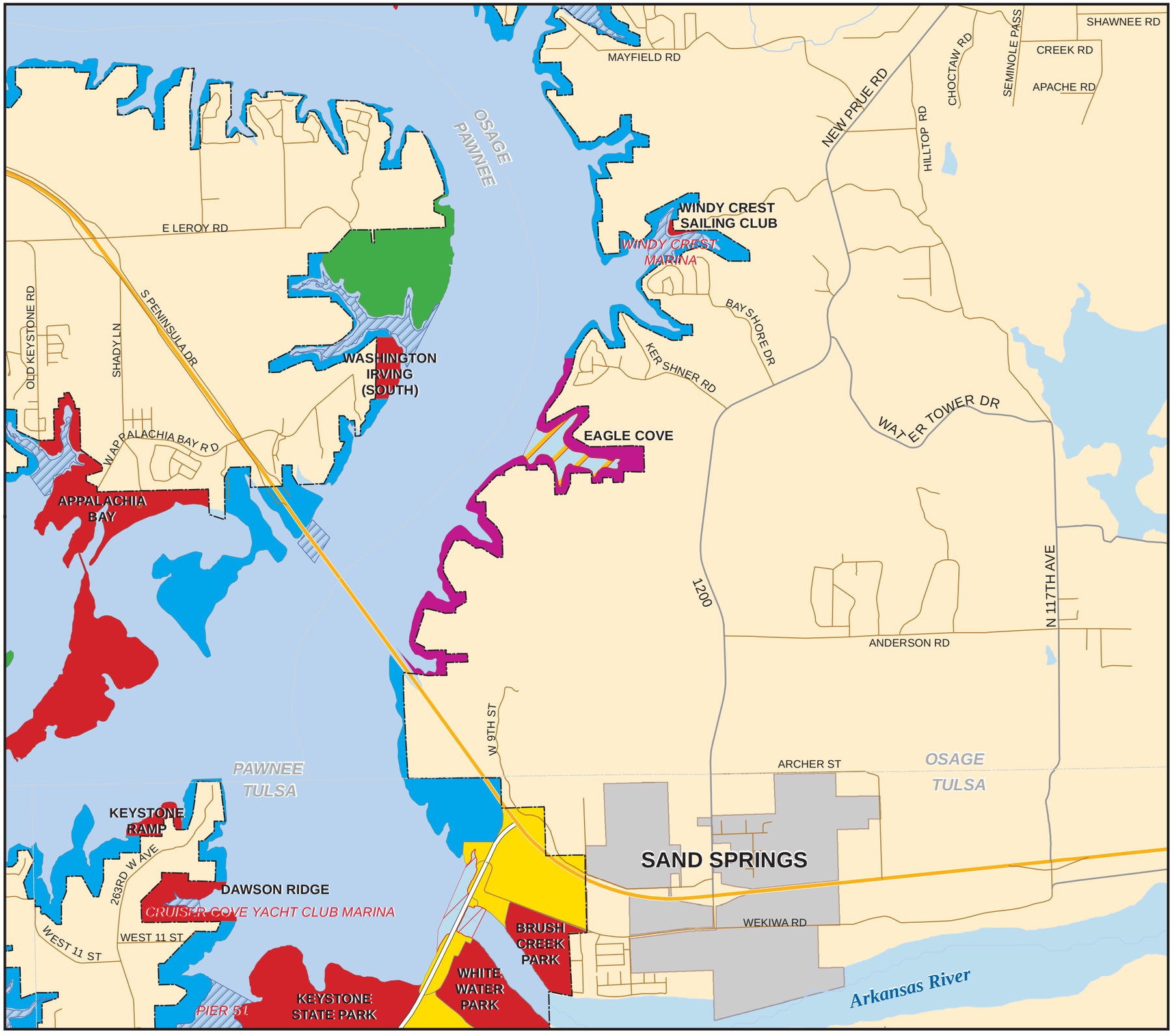
KEYSTONE LAKE MASTER PLAN

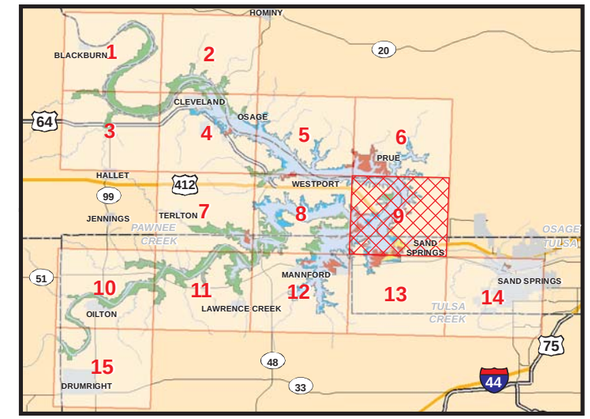
LAND CLASSIFICATION (SHEET 08)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-08





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

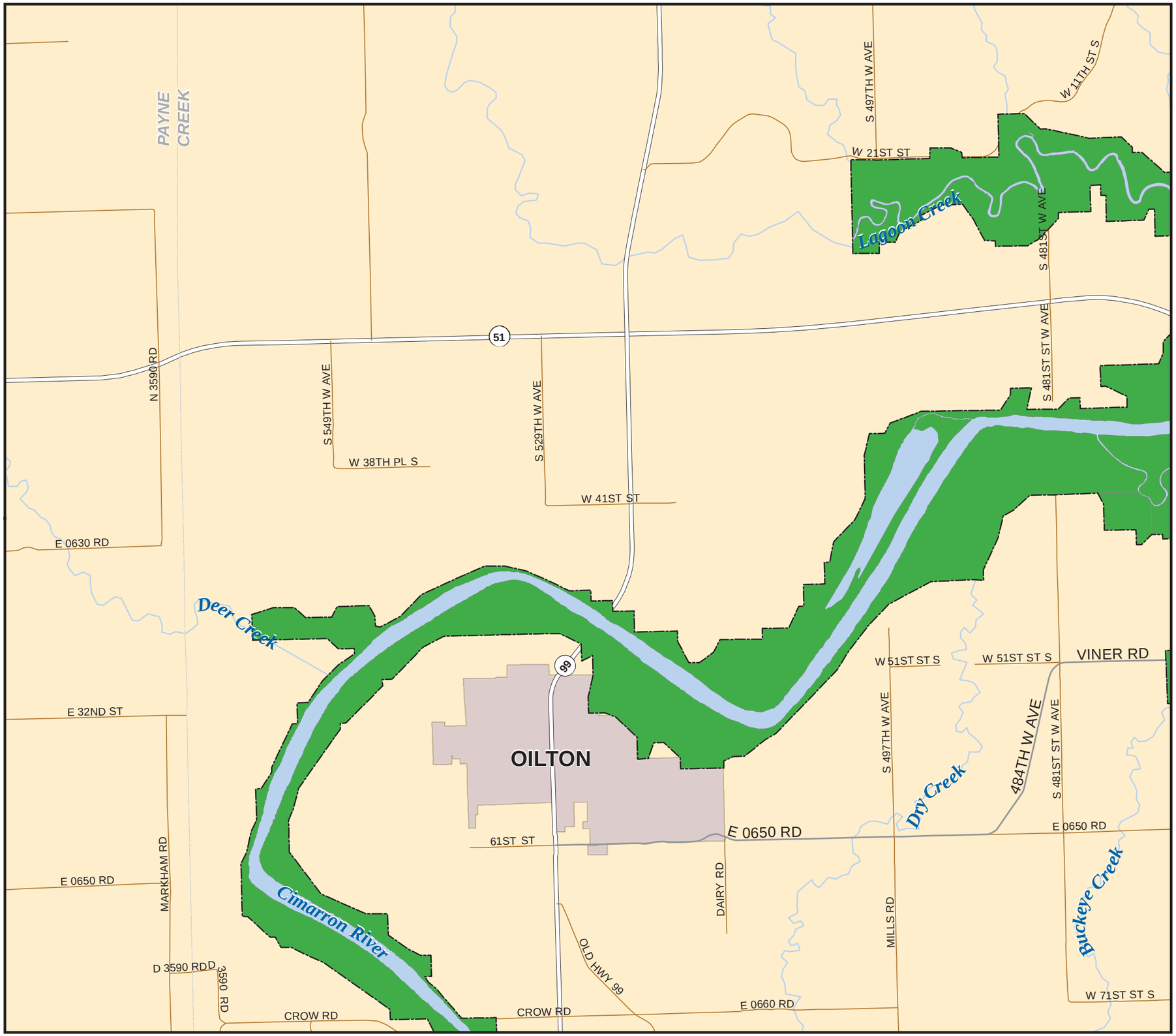
KEYSTONE LAKE MASTER PLAN

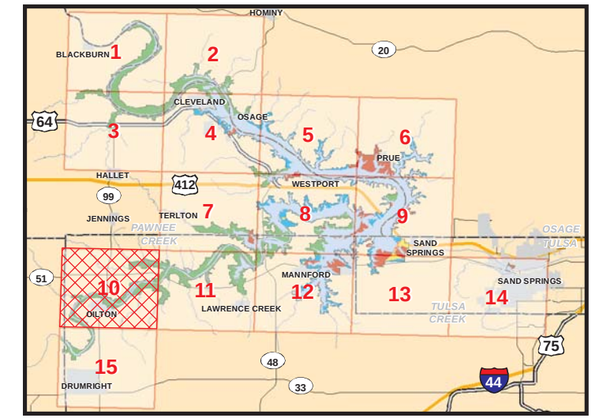
LAND CLASSIFICATION (SHEET 09)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-09





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

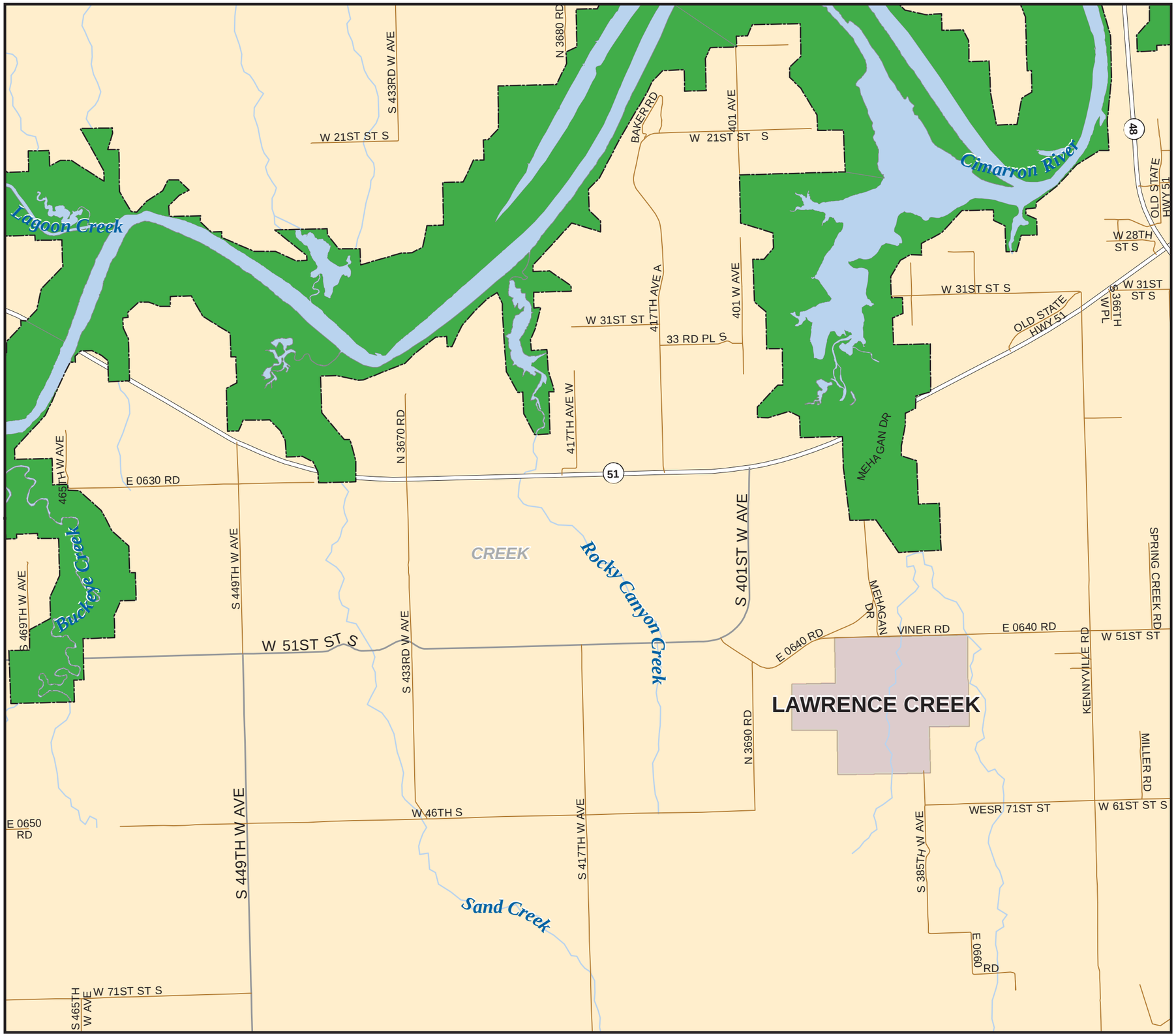
KEYSTONE LAKE MASTER PLAN

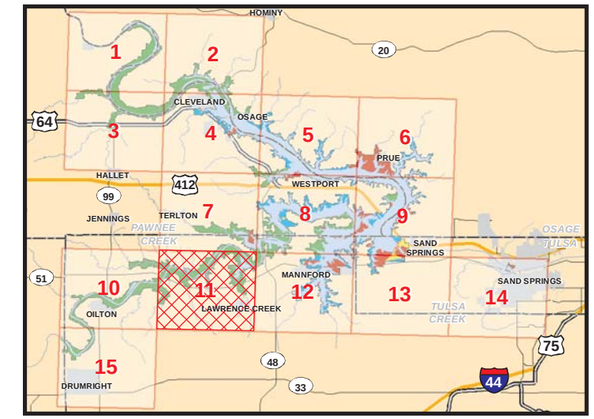
LAND CLASSIFICATION (SHEET 10)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-10





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

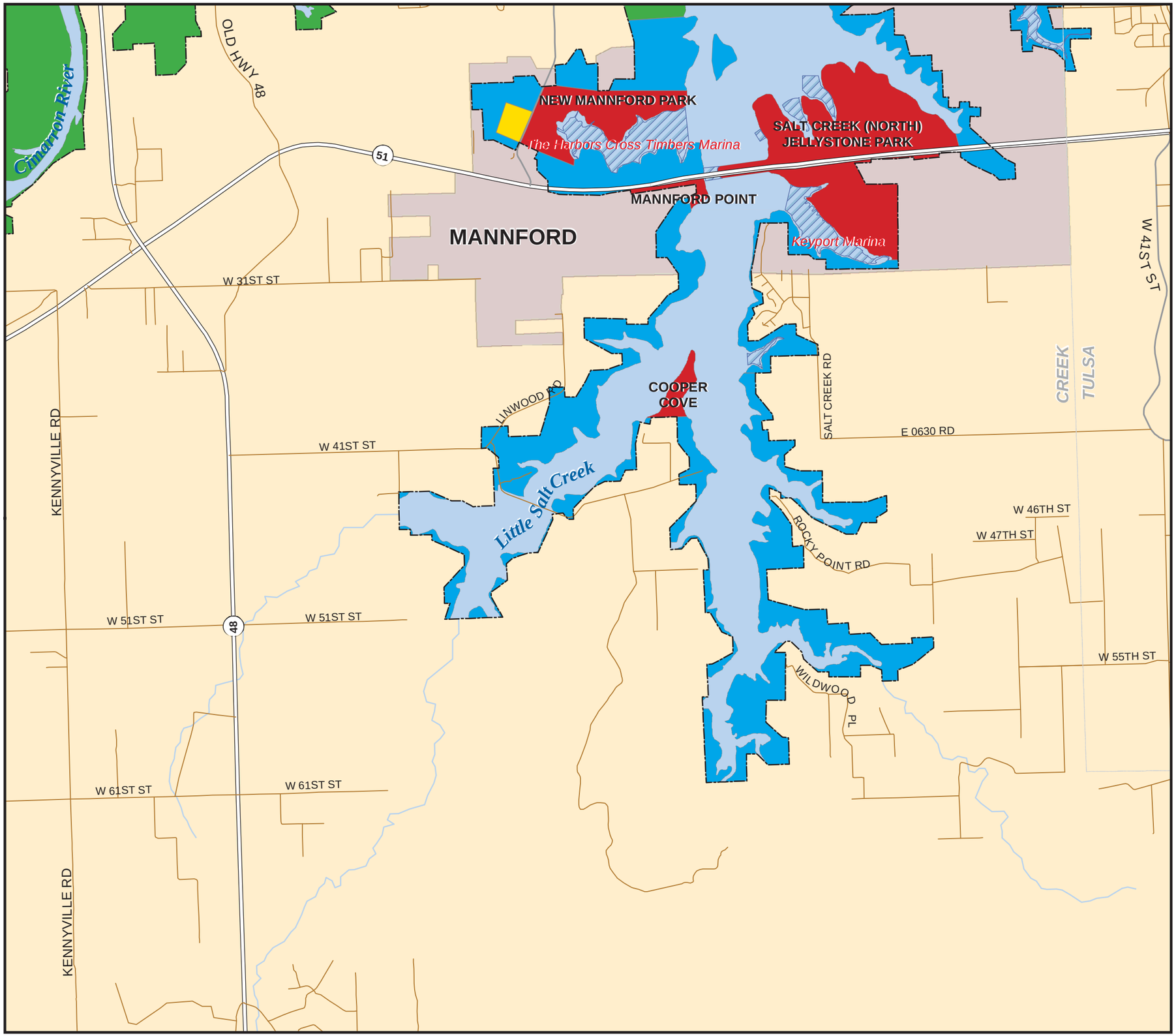
KEYSTONE LAKE MASTER PLAN

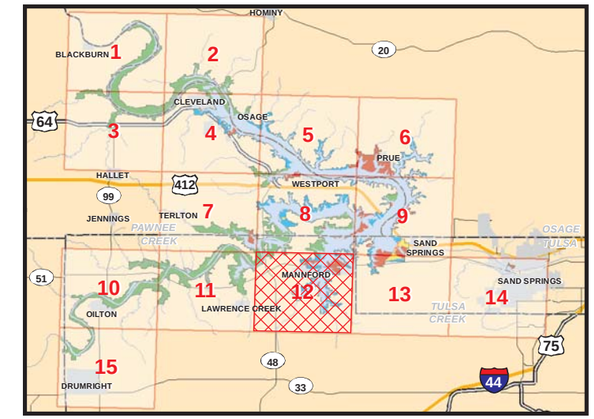
LAND CLASSIFICATION (SHEET 11)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-11





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

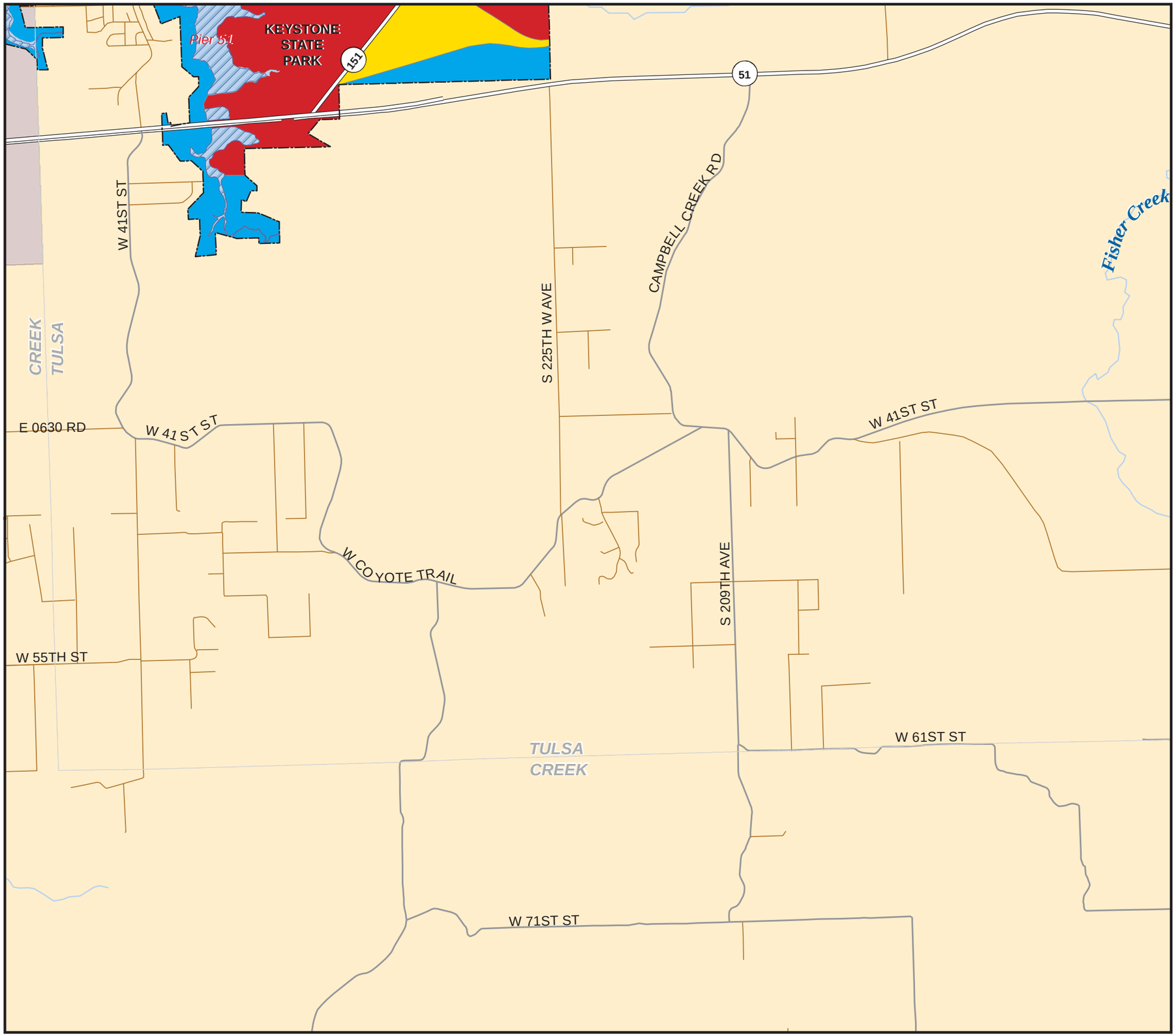
KEYSTONE LAKE MASTER PLAN

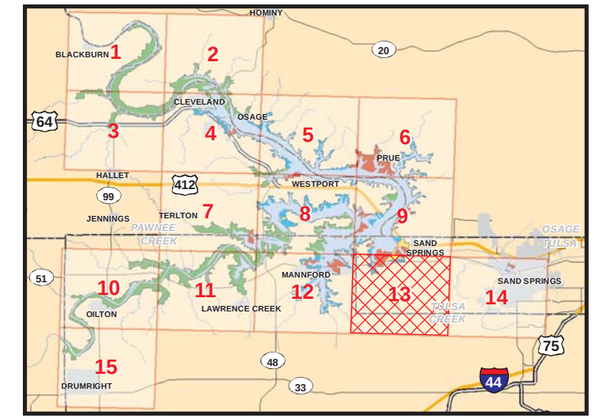
LAND CLASSIFICATION (SHEET 12)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-12





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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

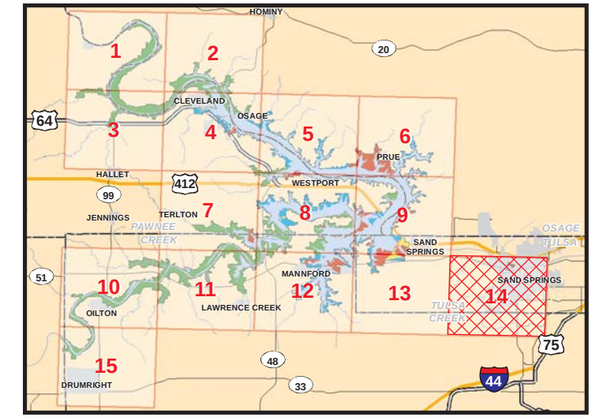
KEYSTONE LAKE MASTER PLAN

LAND CLASSIFICATION (SHEET 13)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-03



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TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

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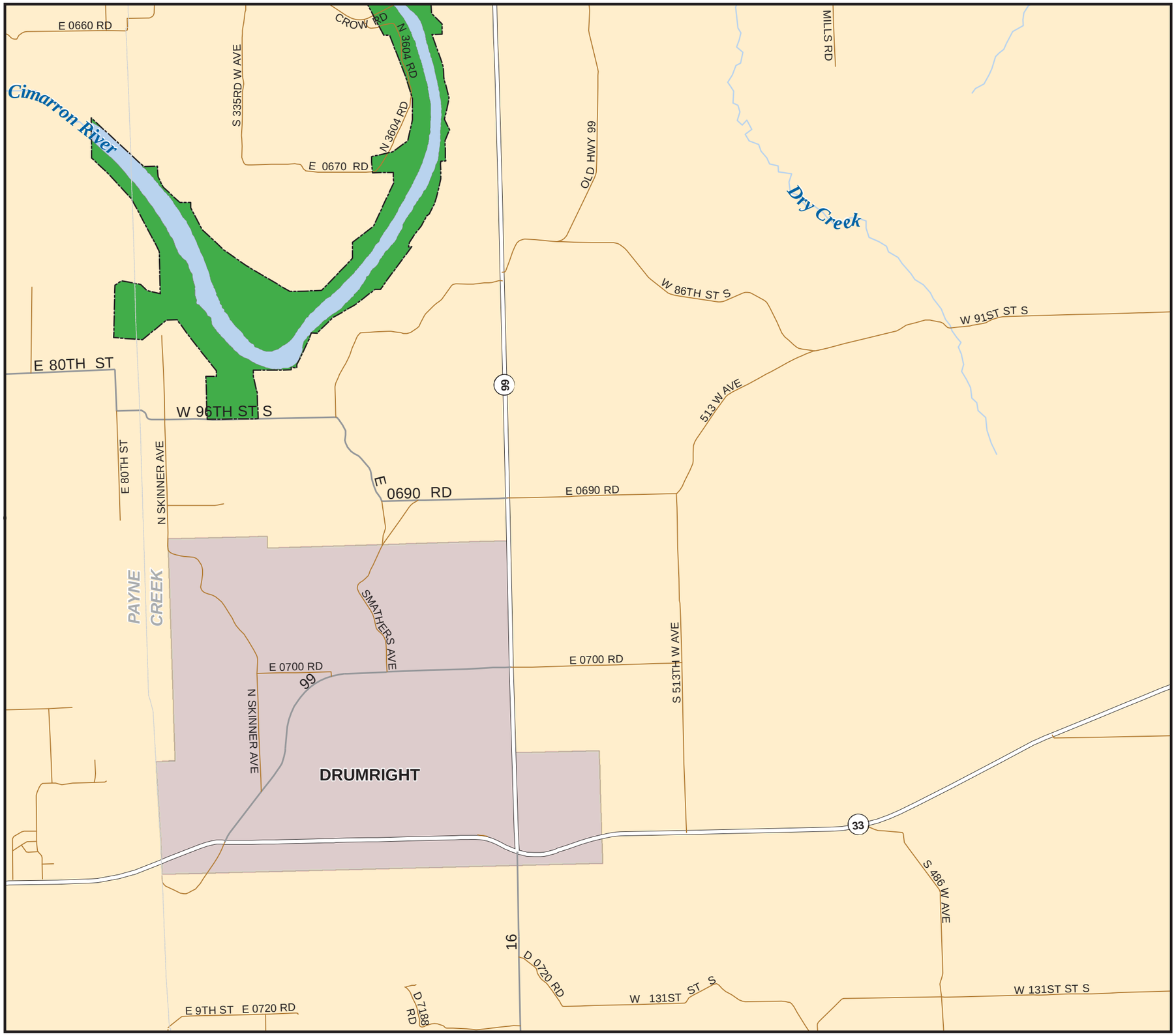
KEYSTONE LAKE MASTER PLAN

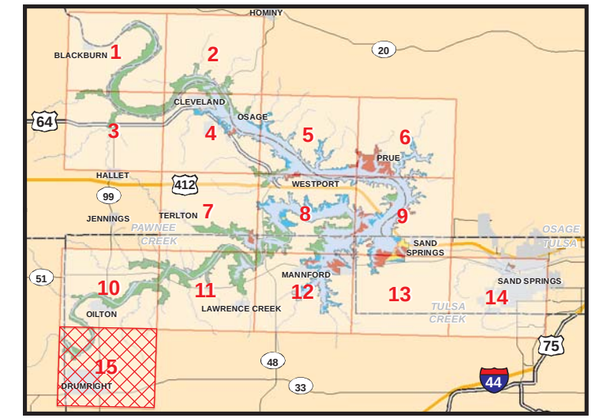
LAND CLASSIFICATION (SHEET 14)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-14





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

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

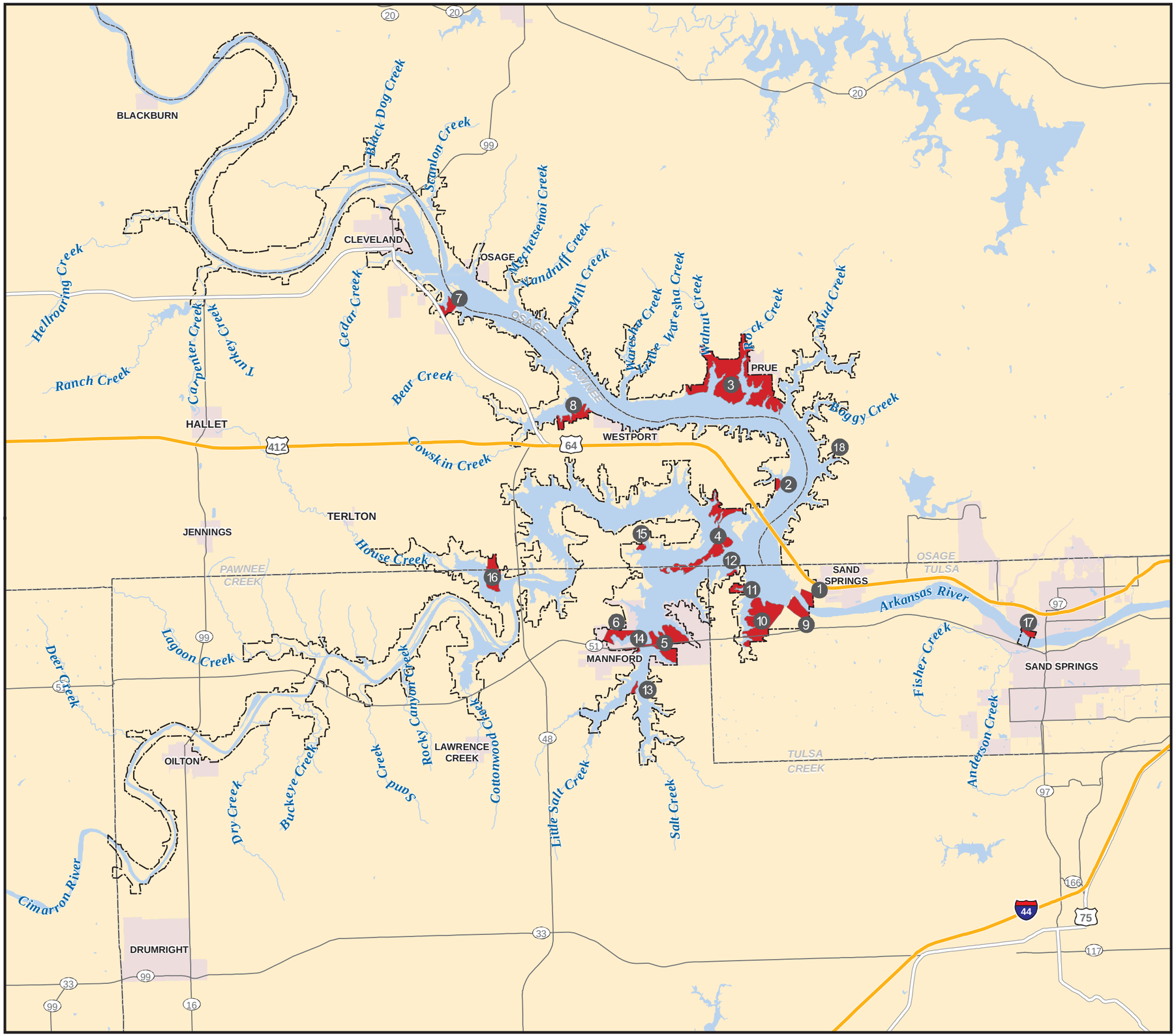
KEYSTONE LAKE MASTER PLAN

LAND CLASSIFICATION (SHEET 15)

N

0 0.25 0.5 1 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OC-15



RECREATIONAL AREAS

1. BRUSH CREEK PARK
2. WASHINGTON IRVING (SOUTH)
3. WALNUT CREEK PARK
4. APPALACHIA BAY
5. SALT CREEK (NORTH) - JELLYSTONE
6. NEW MANNFORD PARK
7. FEYODI CREEK PARK
8. COWSKIN BAY (SOUTH)
9. WHITE WATER PARK
10. KEYSTONE STATE PARK
11. DAWSON RIDGE
12. KEYSTONE RAMP
13. COOPER COVE
14. MANNFORD POINT
15. AKDAR
16. FRIENDSHIP COMMUNITY CHURCH
17. RIVER CITY PARK
18. WINDY CREST SAILING CLUB

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

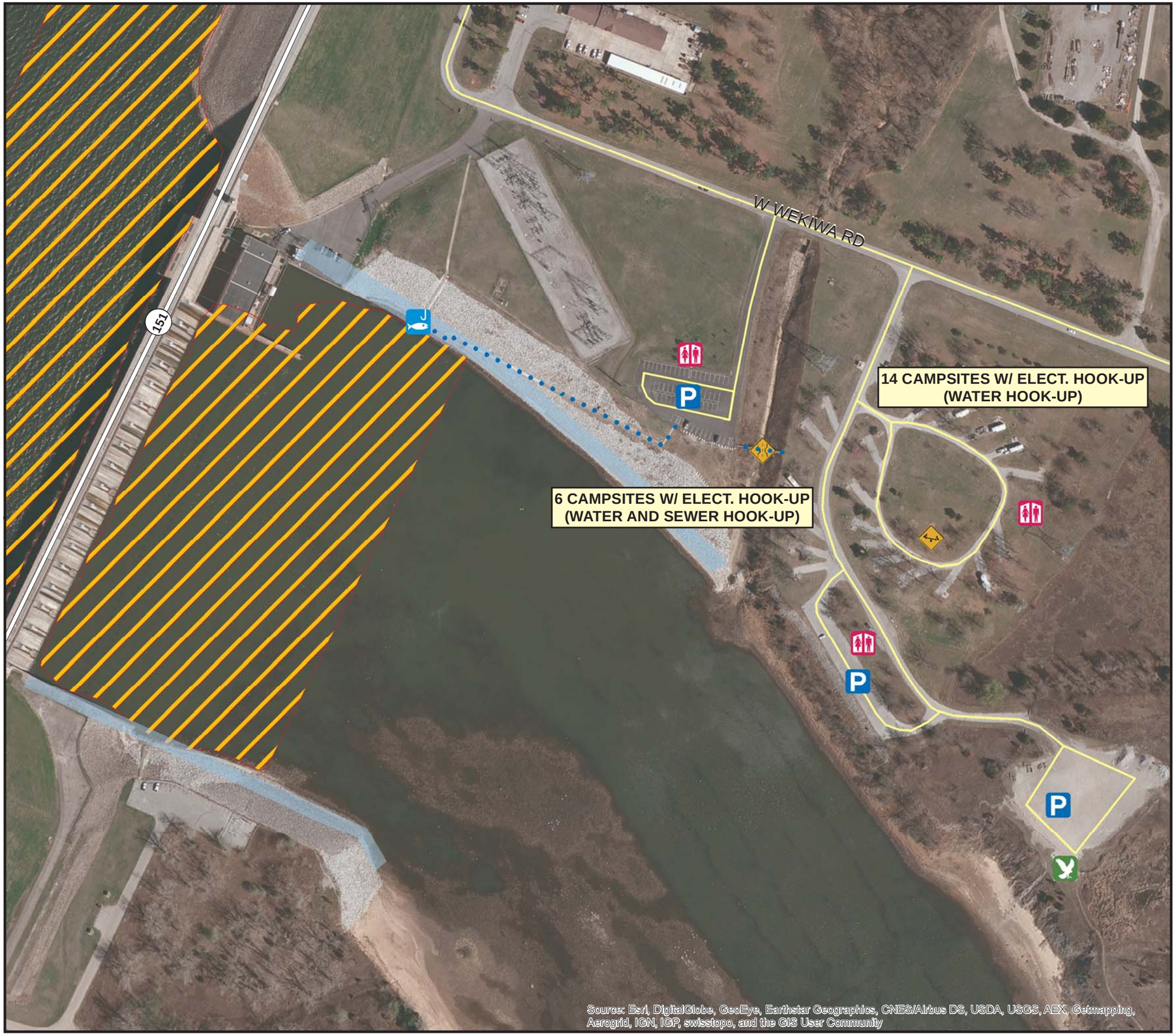
KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS

N

0 1.25 2.5 5 MILES

DATE:	MAP NO.
MAY 2016	NK15MP-OR-00



ITEM	EXISTING
COURTESY DOCK	
GROUP CAMPSITES	
CAMPSITES	20
ELECTRICAL HOOK-UP	20
PEDESTAL COOKERS	
FIRERING	
UTILITY TABLE	
GROUP PICNIC SHELTER	
PICNIC SITES	
RESTROOMS	3
SHOWERS	
DUMP STATION	

FEE BOUNDARY
PLAYGROUND
EAGLE OVERLOOK
FISHING ACCESS
PARKING LOT
RESTROOMS
FISHING TRAILS
WALKING BRIDGE
FISHING AREA
WATER SURFACE: RESTRICTED

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS (BRUSH CREEK)

N

0 125 250 500 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-01

ITEM	EXISTING
BOAT RAMP LANES	2
COURTESY DOCK	1
GROUP CAMPSITES	
CAMPSITES	41
ELECTRICAL HOOK-UP	39
PEDESTAL COOKERS	
FIRERING	
UTILITY TABLE	
GROUP PICNIC SHELTER	1
PICNIC SITES	3
RESTROOMS	1
SHOWERS	2
DUMP STATION	1

FEE BOUNDARY
HIKING TRAILHEAD
COURTESY DOCK
BOAT RAMP
SWIM BEACH
PLAYGROUND
ENTRANCE STATION
PICNIC SITE
GROUP SHELTER
SHOWERS
RESTROOMS
DUMP STATION

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS

(WASHINGTON IRVING -SOUTH)

N

0 125 250 500 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-02

ITEM	EXISTING
BOAT RAMP LANES	4
COURTESY DOCK	1
GROUP CAMPSITES	57
CAMPSITES	11
ELECTRICAL HOOK-UP	57
PEDESTAL COOKERS	
FIRERING	
UTILITY TABLE	
GROUP PICNIC SHELTER	1
PICNIC SITES	7
COMFORT STATIONS	3
VALUT TOILET	4
DUMP STATION	1

- FEE BOUNDARY
- EQUESTRIAN TRAILHEAD
- COURTESY DOCK
- BOAT RAMP
- SWIM BEACH
- PLAYGROUND
- PICNIC SITE
- GROUP PICNIC SHELTER
- PARK MAINTENANCE CENTER
- RANGER STATION
- COMFORT STATIONS
- VAULT TOILET
- DUMP STATION

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS

(WALNUT CREEK PARK)

N

0 625 1,250 2,500 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-03

ITEM	EXISTING
BOAT RAMP LANES	1
COURTESY DOCK	1
GROUP CAMPSITES	
CAMPSITES	28
ELECTRICAL HOOK-UP	
PEDESTAL COOKERS	
FIRERING	
UTLITY TABLE	
GROUP PICNIC SHELTER	
PICNIC SITES	1
RESTROOMS	3
DUMP STATION	

- FEE BOUNDARY
- COURTESY DOCK
- BOAT RAMP
- SWIM BEACH
- ENTRANCE STATION
- PICNIC SITE
- RESTROOMS
- DUMP STATION
- ATV (LOADING/UNLOADING)
- ATV TRAILS ENTRANCE
- ATV STAGING AREA

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS (APPALACHIA BAY)

N

0 750 1,500 3,000 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-04

ITEM	EXISTING
BOAT RAMP LANES	3
COURTESY DOCK	
GROUP CAMPSITES	7
CAMPSITES	124
ELECTRICAL HOOK-UP	105
PEDESTAL COOKERS	
FIRERING	
UTILITY TABLE	
GROUP PICNIC SHELTER	2
PICNIC SITES	2
OUTDOOR AMPITHEATER	1
RESTROOMS	4
SHOWERS	2
DUMP STATION	2

- FEE BOUNDARY
- BOAT RAMP
- SWIM BEACH
- PLAYGROUND
- FISHING ACCESS
- ENTRANCE STATION
- PICNIC SITE
- GROUP PICNIC SHELTER
- OUTDOOR THEATRE
- BOAT TRAILER PARKING
- SHOWERS
- RESTROOMS
- DUMP STATION

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS

(SALT CREEK NORTH - JELLYSTONE)

N

0 125 250 500 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-05

ITEM	EXISTING
BOAT RAMP LANES	3
COURTESY DOCK	1
GROUP CAMPSITES	46
CAMPSITES	3
ELECTRICAL HOOK-UP	46
PEDESTAL COOKERS	
FIRERING	
UTILITY TABLE	
PICNIC SITES	12
GROUP PICNIC SHELTER	1
COMFORT STATION	1
PIT TOILET	5
DUMP STATION	1

- FEE BOUNDARY
- COURTESY DOCK
- BOAT RAMP
- SWIM BEACH
- PLAYGROUND
- ENTRANCE STATION
- PICNIC SITE
- GROUP PICNIC SHELTER
- RESTROOMS
- PIT / VAULT TOILET
- DUMP STATION

U.S. ARMY CORPS OF ENGINEERS

TULSA DISTRICT

KEYSTONE DAM AND RESERVOIR — ARKANSAS RIVER

KEYSTONE DAM AND RESERVOIR

KEYSTONE LAKE MASTER PLAN

RECREATIONAL AREAS

(NEW MANNFORD PARK)

N

0 125 250 500 FEET

DATE:	MAP NO.
MAY 2016	NK15MP-OR-06

APPENDIX B - LIST OF DESIGN MEMORANDA

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KEYSTONE DAM AND RESERVOIR
DESIGN MEMORANDUMS

Eighty-one separate Design Memorandums (DM) plus revised DM and supplements to DM were prepared from 1954 through 1994 setting forth design criteria for all aspects of the project including the prime flood risk management facilities, hydroelectric-power facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the master plan for recreation development and land management. Below is a list of prior Design Memoranda for Keystone Dam and Reservoir.

DM Number	Title	Date Approved
1	Site Selection and Alternate Project Considered	13 May 1954
2-Rev	Hydrology (Revised)	14 Nov 1957
3-Rev	Economics Studies (Revision of 1956)	16 Aug 1956
4	General Design	1 Oct 1956
5	Real Estate for Dam Site	14 Nov 1956
6	Construction of Project Bldgs. And Service Road No. 1	10 Dec 1956
7	Relocations – General	27 Feb 1957
8-Rev	Real Estate for Segments B and C (Town of Keystone) (Revised 24 Jan 1958)	25 Mar 1958
9	Construction of Access Road (Left Abutment)	15 May 1957
10	Relocation of St. Lois-San Francisco Railway Company Facilities	22 Nov 1957
10-Rev	Relocation of St. Lois-San Francisco Railway Company Facilities (Rev of Sept 1957)	28 Apr 1958
11	Rea1Estate for Remainder of Segment A and Segments D, E, F and G (Rev April 10, 1958)	25 Sept 1958
12-1, Rev	Preliminary Master Plan (Revised 9 July 1958)	Sept 1958
12-B	Master Plan for Keystone Reservoir	1 Dec 1962
12-B, Rev	Master Plan Revised	27 Jan 1975
	Supplement No. 1 to 12-B	Aug 1977
	Supplement No. 2 to 12-B	Oct 1979
	Supplement No. 3 to 12-B	Nov 1980
	Supplement No. 4 to 12-B	Aug 1983
	Supplement No. 5 to 12-B	Sept 1984
	Supplement No. 6 to 12-B	Apr 1985
	Supplement No. 7 to 12-B	Jun 1985

DM Number	Title	Date Approved
	Supplement No. 8 to 12-B	Nov 1985
	Supplement No. 9 to 12-B	Nov 1985
	Supplement No. 10 to 12-B	Sept 1986
	Supplement No. 11 to 12-B	Oct 1987
	Supplement No. 12 to 12-B	Oct 1987
	Supplement No. 13 to 12-B	Nov 1987
	Supplement No. 14 to 12-B	Jan 1994
13	Protection of Cleveland, Okla.	29 Aug 1958
13-Rev	Protection of Cleveland, Okla. (Supplement No. 1 submitted 24 Feb 1959)	29 Aug 1958
14	Concrete Aggregate	13 Mar 1958
15	Real Estate – Right-of-way for Relocation of Frisco Railroad	17 Mar 1958
16	Relocation of Oklahoma Hwy. 51	9 Jan 1959
17	Real Estate - Right-of-way for Relocation of State Hwy. 51	26 Sept 1958
18	Construction of Embankment and Spillway	5 Sept 1958
19	Geology, Soils and Structural Foundations	5 Dec 1959
20	Real Estate for Segments P, Q and R (Town of Mannford)	3 Nov 1958
21	Real Estate-Coarse Aggregate Site	20 Nov 1968
22	Real Estate for Segments 10 thru 15 and 23 thru 30	17 July 1959
23	Water Supply Investigation and Relocation of City-Owned Facilities, Mannford, Oklahoma	19 Aug 1960
24	Real Estate for Prue, Oklahoma (Portion of Segment “H”)	17 July 1959
25	Real Estate for Segments 19, 20, and 21 (Town of Osage)	17 July 1959
26	Relocation of U.S. Highway 64	11 Sept 1959
27	Relocation of Oklahoma Highway 99	17 Sept 1959
28	Relocation of Cities Services Gas Company Facilities	8 Sept 1959
29	Relocation of Oklahoma Highway 48	16 Oct 1959
30	Relocation of Public Service Company of Oklahoma Facilities	16 Aug 1960

DM Number	Title	Date Approved
31	Real Estate – Right-of-Way for Relocation of U.S Highway 64	2 Dec 1959
32	Real Estate – Right-of-Way for Relocation of State Highway 99	3 Dec 1959
33	Relocation of Osage County Roads	3 Nov 1959
34	Real Estate – Right-of-Way for Relocation of State Highway 48	3 Dec 1959
35	Relocation of Pawnee County Roads	19 Jan 1960
36	Relocation of Creek County Roads	25 Jan 1960
37	Relocation of Mannford School	19 July 1960
38	Relocation of M-K-T Railroad – Oklahoma Division	4 Jan 1960
39	Real Estate – Right-of-Way for Relocation of Osage County Roads	18 Dec 1959
40	Real Estate – Right-of-Way for Relocation of Creek County Roads	25 Jan 1960
41	Real Estate – Right-of-Way for Relocation of Pawnee County Roads	22 Jan 1960
42	Real Estate – Right-of-Way for Relocation of Tulsa County Roads	11 Dec 1960
43	Relocation of M-K-T Railroad – Tulsa Division	11 Jan 1960
44	Real Estate – Right-of-Way for Relocation of M-K-T Railroad – Oklahoma Division	1 Jan 1960
45	Relocation of Payne County Roads	8 Mar 1960
46	Temporary Relocation of Bell Telephone Company Facilities Required by Construction of Embankment	7 Apr 1960
47	Real Estate – Right-of-Way for Relocation of Missouri-Kansas-Texas Railroad (Tulsa Division)	19 Jan 1960
48	Real Estate – Right-of-Way for Relocation of Payne Co. Roads	25 Jan 1960
49	Relocation of Tulsa County Roads	17 Feb 1960
50	Construction of Service Roads II and III	23 Mar 1960
52	Real Estate for the Remainder of the Reservoir	14 July 1960
53	Relocation of Municipal Facilities, Osage, Oklahoma	21 Feb 1961

DM Number	Title	Date Approved
54	Pumping Station at Cleveland, Oklahoma	2 Aug 1960
55-1	Relocation of Service Pipeline Co. Facilities at Intersection with Relocated M-K-T-Railroad (Okla. Div)	19 Dec 1960
56	Keystone School	27 Sept 1961
60	Relocation of KAMP Electric Cooperative, Inc.	9 Aug 1960
62	Relocation of Sinclair Pipeline Co.	22 May 1961
63	Relocation of Shell Pipeline Corp. Facilities	9 Aug 1961
68	Relocation of Great Lake Pipe Line Company Facilities	20 June 1960
69	Relocation of Aker Oil and Gas Company Facilities	19 Oct 1961
71	Relocation of Verdigris Valley Electric Cooperative, Inc. Facilities	30 Oct 1961(1)
78	Clearing Reservoir	17 July 1961(1)
79	Fallout Shelter	7 Sept 1961
80	Hydroelectric-Power	15 Jan 1962(1)
81	Model Recreational Area – Keystone Park	1 Aug 1962

(1) Date submitted for approval

APPENDIX C - NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTATION

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FINAL
ENVIRONMENTAL ASSESSMENT FOR THE KEYSTONE DAM AND RESERVOIR MASTER PLAN

Arkansas River
Creek, Osage, Pawnee, Payne, and Tulsa Counties, Oklahoma

May 2016

US Army Corps
of Engineers
Tulsa District

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FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT FOR THE
KEYSTONE DAM AND RESERVOIR MASTER PLAN
ARKANSAS RIVER
CREEK, OSAGE, PAWNEE, PAYNE, AND TULSA COUNTIES, OKLAHOMA

In accordance with the National Environmental Policy Act of 1969, including guidelines in 33 Code of Federal Regulations, Part 230, the Tulsa District and the Regional Planning and Environmental Center of the U.S. Army Corps of Engineers (USACE) have assessed the potential environmental impacts of the Keystone Dam and Reservoir (referred to as Keystone Lake) Master Plan revision.

The revised Master Plan will provide guidance for stewardship of natural resources and management for long-term public access to, and use of, the natural resources of Keystone Lake, including the reclassification of the USACE-managed lands. The Master Plan provides a comprehensive description of the project, a discussion of factors influencing resource management and development, the resource plan describing how project lands and waters will be managed, an identification and discussion of special problems, a synopsis of public involvement and input into the planning process, and descriptions of existing development.

Under the No Action Alternative, the USACE would take no action, which means the Master Plan would not be revised. With this alternative, no new resources analysis or land-use classifications would occur. The operation and management of the Keystone Lake would continue as outlined in the current Master Plan.

The Proposed Action includes Master Plan revisions, coordination with the public, updates to comply with USACE regulations and guidance, and reflects changes in land management and land uses that have occurred since 1974. Land classifications were refined to meet authorized project purposes and current resource objectives that address a mix of natural resource and recreation management objectives that are compatible with regional goals. Required land classification changes associated with the Proposed Action include 27 reclassifications to balance resource objectives, to include the following:

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 1	Classify all 44 acres of River City Park to High Density Recreation.	Not clearly marked in previous Master Plan.
Reclassification Proposal 2	Reclassify 197 acres south of Brush Creek from High Density Recreation to Project Operations.	The area includes the lake's radio tower, emergency material storage, and borrow pits, which are in need of project security.
Reclassification Proposal 3	Reclassify 8 acres of riprap along the dam from High Density Recreation to Project Operations.	Project Operations is the correct classification, as the riprap's primary purpose is erosion protection for the dam.
Reclassification Proposal 4	Reclassify 11 acres of land north of the bulkhead to Project Operations.	Area needs to be maintained for staff access to bulkhead for inspections and for emergency operations.
Reclassification Proposal 5	Classify 25 acres of water surface upstream and 12 acres of water surface downstream of the dam totaling 37 acres to Water Surface: Restricted.	Areas are restricted for project security and public safety.
Reclassification Proposal 6	Classify 47 acres of water surface within Eagle Cove to Water Surface: Fish and Wildlife Sanctuary.	Eagle Cove has seasonal restrictions necessary to protect ecological resources.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 7	Reclassify all 166 acres of the Ancient Cross Timbers Forest from Natural Area to Environmental Sensitive Area.	The reclassification more accurately defines management objectives for this area and provides habitat protection. Area is considered sensitive and needs to be protected as such.
Reclassification Proposal 8	Reclassify 5 acres of Whispering Hills boat ramp from High Density Recreation to Low Density Recreation.	A boat ramp is the single asset in this area. No intensive future development is planned.
Reclassification Proposal 9	Reclassify all 154 acres of Osage Point and Osage Ramp from High Density Recreation to Low Density Recreation.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.
Reclassification Proposal 10	Reclassify all 63 acres of Cedar Creek Bay from High Density Recreation to Low Density Recreation.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.
Reclassification Proposal 11	Reclassify 12 acres of High Density Recreation south of State Highway 99 bridge to Wildlife Management.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.
Reclassification Proposal 12	Reclassify 34 acres of Lakeland area from High Density Recreation to Wildlife Management.	No facilities were developed in this area and no future development is planned.
Reclassification Proposal 13	Reclassify all 8 acres of East Levee from High Density Recreation to Project Operations.	Levees are more appropriately classified as Project Operations for safety and security purposes. No recreational facilities were developed, and no future development is planned.
Reclassification Proposal 14	Reclassify all 291 acres of Cowskin North from High Density Recreation to 141 acres of Low Density Recreation and 150 acres of Wildlife Management.	This area is an access point with no additional facilities. No future development is planned under current management objectives.
Reclassification Proposal 15	Reclassify 1 acre of Hill'n Dale boat ramp from High Density Recreation to Low Density Recreation.	This area is an access point with a boat ramp and no additional facilities. No future development is planned under current management objectives.
Reclassification Proposal 16	Reclassify all 212 acres of Washington Irving Cove North from High Density Recreation to Wildlife Management.	The access point and boat ramp are closed. No future development is planned. The area is better used as Wildlife Management under current management objectives.
Reclassification Proposal 17	Reclassify 365 acres of the southern peninsula of Appalachia Bay from Low Density Recreation to High Density Recreation.	Activities permitted in this area are identified as intensive recreational activities.
Reclassification Proposal 18	Reclassify 100 acres west of Pump Jack Island and north of New Mannford Ramp and Cross Timbers Marina from Wildlife Management to Low Density Recreation.	The reclassification more accurately defines management objectives for this area. Passive recreation activities have been proposed for this area.
Reclassification Proposal 19	Reclassify all 175 acres of Sandy Park from Low and High Density Recreation to Wildlife Management.	Facilities were never developed in this area, and current management plans show no future development. Wildlife Management best fits the land's use in this area.
Reclassification Proposal 20	Reclassify New Mannford Ramp's borrow pit totaling 19 acres from High Density Recreation to Project Operations.	This area is an active borrow pit needed by the USACE to maintain facilities.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 21	Reclassify area from Old Mannford Ramp (26 acres) to Pawnee Cove from Low Density Recreation (228 acres) and High Density Recreation (75 acres) totaling 329 acres to Wildlife Management.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 22	Reclassify the 43 acres of Low Density Recreation east of Friendship Community Church Camp to Wildlife Management.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 23	Classify all 35 acres of the Mannford Reservoir as Low Density Recreation.	Lands were not previously classified. Under current management plans, lands are best classified as Low Density Recreation.
Reclassification Proposal 24	Reclassify all 43 acres of Cimarron Park from High Density Recreation to Low Density Recreation.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 25	Reclassify area storing emergency material within Pawnee North totaling 55 acres from High Density Recreation to Project Operations.	This area is an active borrow pit needed by the USACE to maintain facilities.
Reclassification Proposal 26	Reclassify all 332 acres of Pawnee North, excluding the area storing emergency material, from High Density Recreation to Low Density Recreation.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 27	Reclassify 16 acres of Low Density Recreation to High Density Recreation located west of the State Highway 51 bridge in Mannford.	Area is suitable for the future development of High Density Recreation facilities.

The Proposed Action was chosen because it would meet regional goals associated with good stewardship of land and water resources, would meet regional recreation goals, and would allow for continued use and development of project lands without violating national policies or public laws.

The environmental assessment (EA) and comments received from other agencies have been used to determine whether the Proposed Action requires the preparation of an environmental impact statement (EIS). All environmental, social, and economic factors that are relevant to the recommended alternative were considered in this assessment. These include, but are not limited to, climate and climate change, environmental justice, cultural resources, air quality, prime farmland, water quality, wild and scenic rivers, wetlands, fish and wildlife, invasive species, migratory birds, recreational fisheries, and threatened and endangered species.

It is my finding, based on the EA, that the revision of the 1974 Master Plan for Keystone Lake will have no significant adverse impact on the environment and will not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an EIS will not be prepared.

MAY 2 3 2016

Date

Richard A. Pratt
Colonel, U.S. Army
District Commander

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ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the effects of revising the Master Plan for Keystone Dam and Reservoir. This EA will facilitate the decision-making 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 recommended alternative.
SECTION 3	*AFFECTED ENVIRONMENT* describes the existing environmental and socioeconomic setting. *ENVIRONMENTAL CONSEQUENCES* identifies the potential environmental and socioeconomic effects of implementing the Proposed Action and alternatives. *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 impacts 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.
APPENDIX A	NEPA Coordination and Scoping

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FINAL ENVIRONMENTAL ASSESSMENT

Master Plan Revision

Keystone Dam and Reservoir
Arkansas River
Creek, Osage, Pawnee, Payne, and Tulsa Counties, Oklahoma

SECTION 1: INTRODUCTION

The Master Plan is the strategic land use management document that guides the comprehensive management and development actions related to all project recreational, natural, and cultural resources throughout the life of the water resource project. The Master Plan guides the execution of efficient and cost-effective management, development, and use of project lands. The Master Plan is a vital tool for the responsible stewardship and sustainability of project resources for the benefit of present and future generations.

1.1 PROJECT LOCATION AND SETTING

Keystone Dam is located approximately 2 miles downstream from the confluence of the Arkansas and Cimarron Rivers, at mile 538.8 of the Arkansas River, and about 15 miles west of Tulsa, Oklahoma (See Figure in Appendix A of the Master Plan). Keystone Lake extends westward from the dam near the Tulsa-Creek County line to the vicinity of Blackburn, Oklahoma, on the Arkansas River and the Payne-Creek County line on the Cimarron River.

The Keystone Dam and Reservoir (referred to as Keystone Lake) was authorized for construction by the Flood Control Act approved May 17, 1950 (Public Law 516, 81st Congress, Chapter 188, 2nd Session) as a modification of the general comprehensive plan for flood control and other purposes approved by the Flood Control Act of June 28, 1938, and the multiple-purpose plan for the Arkansas River and tributaries, Arkansas and Oklahoma, approved by the River and Harbor Act of July 24, 1946. Keystone Lake is a unit in the comprehensive plan for development of the Arkansas River Basin for flood control, hydroelectric power, and navigation.

The U.S. Army Corps of Engineers (USACE) began construction in January 1957, and the project was placed in flood control operation in September 1964. The Number 2 generating unit became operational on May 2, 1968, and the Number 1 generating unit became operational on May 21, 1968.

The dam embankment is constructed of rolled earth-filled material. The total length of the dam, including a 1,600-foot-long concrete section, is 4,600 feet. The maximum height is about 121 feet above the streambed. The concrete section consists of a spillway that is 856 feet wide, a non-overflow section, and a power intake structure. State Highway 151 crosses the dam to connect relocated State Highway 51 on the south with relocated U.S. Highway 64 on the north. The spillway is a gated, concrete, ogee-weir with a net width of 720 feet, surmounted by eighteen 40- by 35-foot tainter gates. Spillway capacity at the top of maximum pool (elevation 766 feet above mean sea level [msl]) is 939,000 cubic feet per second (cfs) and at the top of the flood control pool (elevation 754.0 feet msl) is 565,000 cfs. The spillway is also equipped with nine 5.67- by 10-foot sluices located between alternate intermediate piers. Channel capacity of

the Arkansas River below Tulsa, Oklahoma, is about 90,000 cfs. The powerhouse and power intake structure are located between the spillway and the left non-overflow sections and include two penstocks, each 27 feet in diameter, controlled by two 14- by 30-foot gates. The capacity of the power and water supply pool (conservation pool) at elevation 723 feet msl is 431,920 acre-feet (USACE 2012).

1.2 PURPOSE OF AND NEED FOR THE ACTION

The Master Plan for Keystone Lake was last approved in November 1974. Over time, several factors such as those listed below have influenced variations in usage and management of lands associated with Keystone Lake. In order to record the most current land uses and land classifications associated with day-to-day operations and measure any potential impacts resulting from actions relating to Keystone Lake (also referred to as the 'Project'), it is necessary to revise the existing Master Plan to ensure compliance with USACE regulations and guidance.

The USACE began planning to revise the Keystone Lake Master Plan in the fall of 2014. The objectives for a Master Plan revision were to 1) update land classifications to reflect changes in USACE land management policies since 1974 and 2) update the Master Plan to reflect current agency requirements for Master Plan documents in accordance with Engineer Regulation (ER) 1130-2-550, Change 7, January 30, 2013, and EP 1130-2-550, Change 5, January 30, 2013.

<u>The following factors may influence reevaluation of management practices and land uses</u>:

- Changes in national policies or public law mandates
- Operations and management 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
- Evolving public concerns

As part of the master planning process, the project delivery team held a workshop to evaluate public comments and current land uses, determine any necessary changes to land classifications, and formulate proposed alternatives. As a result of public coordination and a public information meeting, alternatives were developed, of which this EA was undertaken.

1.3 SCOPE OF THE ACTION

This EA was prepared to evaluate existing conditions and potential impacts of proposed alternatives associated with the Master Plan revision for Keystone Lake. The alternative considerations were formulated to include all of Keystone Lake, as well as its appurtenant structures comprising the earthfill embankment, concrete spillway, water supply connections, outlet works, and surrounding lands up to an elevation commensurate with the top of the flood control pool. These lands comprise all properties historically acquired to build the project, including USACE lands and lands leased by the USACE to or presently owned and operated by other governmental entities. This EA was prepared pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [C.F.R.] 1500–1517), and the USACE implementing regulation, Policy and Procedures for Implementing NEPA, ER 200-2-2 (1988).

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SECTION 2: PROPOSED ACTION AND ALTERNATIVES

The project need is to revise the existing Master Plan so that it is compliant with USACE regulations and guidance. As part of this process, which includes public outreach and comment, five alternatives were developed for evaluation, including a No Action Alternative. The alternatives were developed using land classifications that indicate the primary use for which project lands are managed. There are five categories of land classifications: Project Operations, High Density Recreation, Mitigation, Environmentally Sensitive Areas, and Multiple Resource Managed Lands. Multiple Resource Managed Lands are divided into four subcategories: Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas.

Alternatives evaluated in this EA are compared to each other and to the No Action Alternative to identify the Preferred Alternative. The USACE guidance recommends the establishment of resource goals and objectives for purposes of development, conservation, and management of natural, cultural, and man-made resources for a project. Goals describe the desired end state of overall management efforts, whereas objectives are concise statements describing measurable and attainable management activities that support the stated 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 10 project-wide resource goals established for Keystone Lake that were used in determining the Preferred Alternative are detailed in Section 3.1 of the Master Plan.

2.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

The No Action Alternative serves as a basis for comparison to the anticipated effects of the other action alternatives, and its inclusion in this EA is required by NEPA and CEQ regulations (40 C.F.R. § 1502.14(d)). Under the No Action Alternative, the USACE would take no action and would not revise the 1974 Master Plan (USACE 1974). The operation and management of Keystone Lake would continue as outlined in the current Master Plan. No new resource analysis or land-use classifications would occur at the project.

2.2 ALTERNATIVE 2: PROPOSED ACTION

Under this alternative, the Master Plan would be reviewed, coordinated with the public, revised to comply with USACE regulations and guidance, and revised to reflect changes in land management and land uses that have occurred over time. The key to this alternative would be the revision of land classifications to USACE standards and the preparation of resource objectives that would reflect current and projected needs and be compatible with regional goals. Required changes associated with the Proposed Action would include 27 reclassifications, classification of the water surface, adoption of new resource objectives, and preparation of a resource plan describing how each land classification would be managed for the foreseeable future (See Figure in Appendix A of the Master Plan). This action would result in the following land and water surface reclassifications (Table 2-1) covering all Federal land at Keystone Lake:

- 601 acres Project Operations
- 4,223 acres High Density Recreation
- 166 acres Environmentally Sensitive Area
- 7,128 acres Low Density Recreation
- 19,389 acres Wildlife Management
- 37 acres Water Surface: Restricted
- 681 acres Water Surface: Designated No-Wake
- 47 acres Water Surface: Fish and Wildlife Sanctuary
- 26,815 acres Water Surface: Open Recreation

The Proposed Action would meet regional goals associated with good stewardship of land and water resources, would meet regional recreation goals, would address identified recreational trends, and would allow for continued use and development of project lands without violating national policies or pubic laws. Therefore, this alternative is the Preferred Alternative and will carry forward as the Proposed Action. Components of the Proposed Action reclassifications are presented in Table 2.1.

Table 2.1 Reclassification Proposals

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 1	Classify all 44 acres of River City Park to High Density Recreation.	Not clearly marked in previous Master Plan.
Reclassification Proposal 2	Reclassify 197 acres south of Brush Creek from High Density Recreation to Project Operations.	The area includes the lake's radio tower, emergency material storage, and borrow pits, which are in need of project security.
Reclassification Proposal 3	Reclassify 8 acres of riprap along the dam from High Density Recreation to Project Operations.	Project Operations is the correct classification, as the riprap's primary purpose is erosion protection for the dam.
Reclassification Proposal 4	Reclassify 11 acres of land north of the bulkhead to Project Operations.	Area needs to be maintained for staff access to bulkhead for inspections and for emergency operations.
Reclassification Proposal 5	Classify 25 acres of water surface upstream and 12 acres of water surface downstream of the dam totaling 37 acres to Water Surface: Restricted.	Areas are restricted for project security and public safety.
Reclassification Proposal 6	Classify 47 acres of water surface within Eagle Cove to Water Surface: Fish and Wildlife Sanctuary.	Eagle Cove has seasonal restrictions necessary to protect ecological resources.
Reclassification Proposal 7	Reclassify all 166 acres of the Ancient Cross Timbers Forest from Natural Area to Environmental Sensitive Area.	The reclassification more accurately defines management objectives for this area and provides habitat protection. Area is considered sensitive and needs to be protected as such.
Reclassification Proposal 8	Reclassify 5 acres of Whispering Hills boat ramp from High Density Recreation to Low Density Recreation.	A boat ramp is the single asset in this area. No intensive future development is planned.
Reclassification Proposal 9	Reclassify all 154 acres of Osage Point and Osage Ramp from High Density Recreation to Low Density Recreation.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 10	Reclassify all 63 acres of Cedar Creek Bay from High Density Recreation to Low Density Recreation.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.
Reclassification Proposal 11	Reclassify 12 acres of High Density Recreation south of State Highway 99 bridge to Wildlife Management.	This area has never been developed for High Density Recreation, and future management objectives do not support High Density Recreation.
Reclassification Proposal 12	Reclassify 34 acres of Lakeland area from High Density Recreation to Wildlife Management.	No facilities were developed in this area and no future development is planned.
Reclassification Proposal 13	Reclassify all 8 acres of East Levee from High Density Recreation to Project Operations.	Levees are more appropriately classified as Project Operations for safety and security purposes. No recreational facilities were developed, and no future development is planned.
Reclassification Proposal 14	Reclassify all 291 acres of Cowskin North from High Density Recreation to 141 acres of Low Density Recreation and 150 acres of Wildlife Management.	This area is an access point with no additional facilities. No future development is planned under current management objectives.
Reclassification Proposal 15	Reclassify 1 acre of Hill'n Dale boat ramp from High Density Recreation to Low Density Recreation.	This area is an access point with a boat ramp and no additional facilities. No future development is planned under current management objectives.
Reclassification Proposal 16	Reclassify all 212 acres of Washington Irving Cove North from High Density Recreation to Wildlife Management.	The access point and boat ramp are closed. No future development is planned. The area is better used as Wildlife Management under current management objectives.
Reclassification Proposal 17	Reclassify 365 acres of the southern peninsula of Appalachia Bay from Low Density Recreation to High Density Recreation.	Activities permitted in this area are identified as intensive recreational activities.
Reclassification Proposal 18	Reclassify 100 acres west of Pump Jack Island and north of New Mannford Ramp and Cross Timbers Marina from Wildlife Management to Low Density Recreation.	The reclassification more accurately defines management objectives for this area. Passive recreation activities have been proposed for this area.
Reclassification Proposal 19	Reclassify all 175 acres of Sandy Park from Low and High Density Recreation to Wildlife Management.	Facilities were never developed in this area, and current management plans show no future development. Wildlife Management best fits the land's use in this area.
Reclassification Proposal 20	Reclassify New Mannford Ramp's borrow pit totaling 19 acres from High Density Recreation to Project Operations.	This area is an active borrow pit needed by the USACE to maintain facilities.
Reclassification Proposal 21	Reclassify area from Old Mannford Ramp (26 acres) to Pawnee Cove from Low Density Recreation (228 acres) and High Density Recreation (75 acres) totaling 329 acres to Wildlife Management.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 22	Reclassify the 43 acres of Low Density Recreation east of Friendship Community Church Camp to Wildlife Management.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 23	Classify all 35 acres of the Mannford Reservoir as Low Density Recreation.	Lands were not previously classified. Under current management plans, lands are best classified as Low Density Recreation.
Reclassification Proposal 24	Reclassify all 43 acres of Cimarron Park from High Density Recreation to Low Density Recreation.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 25	Reclassify area storing emergency material within Pawnee North totaling 55 acres from High Density Recreation to Project Operations.	This area is an active borrow pit needed by the USACE to maintain facilities.
Reclassification Proposal 26	Reclassify all 332 acres of Pawnee North, excluding the area storing emergency material, from High Density Recreation to Low Density Recreation.	Recreation facilities were never developed and future management plans do not support intensive recreation activities.
Reclassification Proposal 27	Reclassify 16 acres of Low Density Recreation to High Density Recreation located west of the State Highway 51 bridge in Mannford.	Area is suitable for the future development of High Density Recreation facilities.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

Alternative 3: Revise Master Plan to Only Reflect Changes in Land Classification Names with No Change in Operation and Use

Under this alternative, the Master Plan would be reviewed, coordinated with the public, and revised with the limitation that the land classification names would be changed to the extent that the new land classifications would essentially match the old classifications. The new classifications would comply with USACE regulations and guidance and would result in the following:

- 232 acres Project Operations
- 5,506 acres High Density Recreation
- 150 acres Environmentally Sensitive Area
- 10,066 acres Low Density Recreation
- 16,697 acres Wildlife Management
- 26,020 acres Water Surface: Open Recreation

Alternative 3 would meet USACE regulations and guidance. However, this action would not reflect changes in land management and land uses that have occurred over time or that are needed to meet regional goals and objectives. Therefore, this alternative was eliminated from further consideration.

Alternative 4: Revise Master Plan to Meet Authorized Project Purposes and to Maximize Recreation

Under this alternative, the Master Plan would be reviewed, coordinated with the public, and revised with the provision that all project lands (excluding Project Operations lands) would

be reclassified to High Density Recreation to intensify highly developed recreational use such as full-service campgrounds, day-use areas, comprehensive resorts, and concession facilities. This alternative would result in the following classifications of project lands:

- 601 acres Project Operations
- 30,906 acres High Density Recreation
- 27,580 acres Water Surface: Open Recreation

Alternative 4 would provide recreation opportunities and economic uses to the public. However, it would eliminate Environmentally Sensitive Area, Low Density Recreation, and Wildlife Management land classifications, which would not support regional goals associated with good stewardship of land and water resources. This action would not be compatible with cultural resource management plans and could violate national policies or public laws. Therefore, this alternative was eliminated from further consideration.

Alternative 5: Revise Master Plan to Meet Authorized Project Purposes and to Maximize Natural Resource Management

Under this alternative, the Master Plan revisions would be reviewed, coordinated with the public, and revised with the provision that all project lands (excluding Project Operations lands) would be reclassified to a category that would intensify natural resource management. This would include reclassification of all project lands to either Multiple Resource Managed Lands - Wildlife Management, Vegetation Management, or Environmentally Sensitive Area. This alternative would result in the following classification of project lands:

- 601 acres Project Operations
- 30,906 acres Wildlife Management/Vegetation Management/Environmentally Sensitive Area
- 27,580 acres Water Surface: Restricted

Alternative 5 would support regional goals associated with good stewardship of land and water resources. However, it would eliminate classifications such as Low and High Density recreation, which would reduce recreation opportunities and would not meet regional recreation goals. This action could violate national policies or public laws. Therefore, this alternative was eliminated from further consideration.

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SECTION 3: AFFECTED ENVIRONMENT AND CONSEQUENCES

This section describes the natural and human environments that exist at the project and the potential impacts of the No Action Alternative (Alternative 1) and Proposed Action (Alternative 2), outlined in Section 2.0 of this document. Only those resources that have the potential to be affected by any of the alternatives are described, per CEQ guidance (40 C.F.R. § 1501.7 [3]). Some topics are limited in scope due to the lack of direct effect from the Proposed Action on the resource or because that particular resource is not located within the project area. For example, no body of water in the Keystone Lake watershed is designated as a Federally Wild or Scenic River and no hazardous materials or solid waste sites are present at Keystone Lake, so these resources will not be discussed.

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 C.F.R. § 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 C.F.R. § 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 C.F.R. § 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

Keystone Lake was developed for flood control, water supply, hydroelectric power, navigation, and recreation purposes. The USACE holds fee title to approximately 59,087 acres,

and an additional 26,705 acres in flowage easement at Keystone Lake. Land uses associated with Keystone Lake are designated to support the overall goal of providing good stewardship of land and water resources while providing safe recreation opportunities and economic uses to the public. In order to implement authorized purposes and support regional management goals for recreation and natural resources, the project office maximizes resources through the use of cooperative agreements and leases with Federal, state, and local agencies. USACE has licensed 12,280 acres of land to ODWC for wildlife management. These lands are part of the 21,592-acre Keystone Wildlife Management Area (WMA) operated by ODWC in portions of Creek, Osage, and Pawnee Counties in north-central Oklahoma. The lands within Keystone Lake include infrastructure to support hydroelectric power and navigation activities, and various parks, campgrounds, and marinas to support recreation.

3.1.1 Alternative 1: No Action Alternative

The No Action Alternative for Keystone Lake is defined as the USACE taking no action, which means the Master Plan would not be revised, and there would be no new resources analysis or land-use classifications. The operation and management of Keystone Lake would continue as outlined in the existing Master Plan. Although this alternative does not result in a Master Plan that meets current guidance and regulations, there would be no significant impacts on land uses on project lands.

3.1.2 Alternative 2: Proposed Action

The objectives for revising the Keystone Lake Master Plan are to capture current land use, management, and the USACE policies that have evolved to meet day-to-day operational needs. The reclassification changes required for the Proposed Action were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued use and development of project lands. Therefore, implementation of the Proposed Action would not result in significant impacts on land uses on project lands.

3.2 WATER RESOURCES

3.2.1 Hydrology and Groundwater

Keystone Lake has two major tributaries: the Arkansas and Cimarron Rivers. The Cimarron River, with its headwaters in northeastern New Mexico, extends 698 miles across New Mexico, Colorado, and Kansas, with the majority of its length in Oklahoma. The 1,469-mile Arkansas River, with its headwaters in the high Colorado Rocky Mountains, flows through Colorado, Kansas, and Oklahoma, finally emptying into the Mississippi River in Arkansas. The Cimarron River enters the confluence from the west-southwest, while the Arkansas River enters the confluence from the northwest. Other tributaries, such as the Salt Fork, also feed the lake, affecting the lake levels, sedimentation, pollution, minerals, and nutrients in the reservoir.

At conservation pool elevation, 723 feet msl, there are 431,920 acre-feet of water stored and 16,740 surface acres (USACE 2012). At flood control pool elevation, 754 feet msl, there are 1,560,560 acre-feet of water stored, and 53,030 surface acres (USACE 2012). The flood of record occurred on May 14, 1993, when the pool level crested at 756.49 feet msl. September 29 to October 21, 1986, was the record of maximum release, which had a volume of 4,444,000 acre-feet, which is equivalent to 3.73 inches of runoff. Peak inflow to the lake was 344,000 cfs.

The upstream watershed of Keystone Lake is 74,506 square miles. Approximately 22,351 square miles contributes to runoff. Keystone Lake provides flood protection on the Arkansas River downstream from the dam to the mouth of the Verdigris River and contributes to flood protection downstream to Pine Bluff, Arkansas, and to some extent on the Mississippi River.

The floodplains around Keystone Lake were inundated by the construction. The floodplains within the conservation pool elevation of 723.0 feet msl are permanently inundated. The floodplains along the Arkansas River and its tributaries between the conservation pool and top of the flood control surcharge pool (756.0 feet msl) may become inundated at various frequencies. As a result, habitable structures and other similar development features around the lake are limited by flood pool elevations.

The Vamoosa-Ada and the Arkansas River Aquifers are located beneath Keystone Lake. The Vamoosa-Ada Aquifer spans across the Arkansas River south to the Cimarron River on the western end of the lake. The Arkansas River Aquifer is located on the northwestern end beneath the Arkansas River and on the downstream side of the dam.

3.2.2 Wetlands

In accordance with standard USACE natural resources inventory requirements, wetlands are inventoried using the USFWS *Classification of Wetlands and Deepwater Habitats of the United States.* Table 3.1 lists the acreages of various types of wetlands present at Keystone Lake. Data was retrieved from the FY2014 Project Wetland Classes Records reported in the Operations and Maintenance Business Information Link (OMBIL).

Table 3.1 Wetland Classes

System	Sub-System	Class	Class Acres
Lacustrine	Limnetic	Unconsolidated Bottom	23,610
Palustrine	No Sub-System	Emergent Wetland	994
Palustrine	No Sub-System	Forested Wetland	2,880
Riverine	Lower Perennial	Unconsolidated Bottom	13,021

3.2.3 Water Quality

The chemical aspect of the Keystone pool is dependent upon the loading of nutrients and minerals deposited by the Cimarron and Arkansas Rivers. The Cimarron River is highly mineralized. The Oklahoma Water Resources Board (OWRB) Beneficial Use Monitoring Program (BUMP) report for the 2002-2003 time period detailing the water quality upstream from Keystone near Oilton, states that beneficial use for Warm Water Aquatic Community-Fish and Wildlife Propagation (WWAC) is “not supported”. Nine out of 24 turbidity samples exceeded criteria levels; however pH, dissolved oxygen and toxicant samples met criteria levels. The pH values vary at this site but are generally between 7.00 and 9.00 (neutral-alkaline). Total dissolved solids (TDS) in the Cimarron before entering Keystone range from 0.0 to 6,000 parts per million (ppm). Sulfates range from 0.0 to approximately 600 ppm. Chlorides are higher ranging to 3000 ppm. Nitrates, nitrites, and total phosphorous were below threshold values (BUMP 2002-2003). A BUMP report detailing the water quality upstream from Keystone at Ralston from May 2002 to 2007 lists WWAC “not supported” (11 of 39 samples exceeded criteria of 50), but does state that, like the Cimarron, the levels of pH, TDS, dissolved oxygen and toxicant samples all “met criteria” for WWAC.

Conductivity values for the lake also vary greatly depending on drainage from specific watersheds. Generally they will range from the mid-800s microsiemens per centimeter (µS/cm) to mid-7,000s µS/cm. Salinity in the pool can be very high as it ranges from 0.45 to 4.03 parts per trillion (ppt). The OWRB BUMP Report for 2006-2007 indicated pH values that ranged from 7.16 to 8.56. These values fall within guidelines supporting the fish and wildlife beneficial use. The data also indicate that the dissolved oxygen at the dam was below 2.0 ppm for 62 percent (%) of the profile (July 10, 2006). Historic ODWC data reflects the same profile trends.

Additional studies have classified the lake as being hypereutrophic, although it may fall to a more eutrophic or mesotrophic state depending on environmental factors. It would be expected to be more hypereutrophic during the spring and early summer with the surge of inflows. Fertile soils and minerals from Kansas and western Oklahoma ensure Keystone Lake remains highly productive; however, the excessive productivity, heavy sedimentation, and increased turbidity have negative impacts on water quality affecting spawning and overall fish health. There is some indication in the BUMP report regarding the nitrogen-to-phosphorus ratio that the lake may be co-limited. Implications on management objectives include negative impacts on growth rates resulting from turbidity, ongoing siltation of preferred spawning areas, and water quality issues in the pool. These parameters are directly correlated with the excessive primary production. The high rate of water exchange results in emigration, and sudden water level drops negatively affect recruitment and ultimately adult fish abundance.

The unique thermal, chemical, and oxygen profile of the Keystone pool is a result of the two large prairie rivers converging at the pool. A study conducted in the summers of 1986 to 1988, examined profiles in depth. Temperatures in the summer peak at between 82 degrees (°) Fahrenheit (F) and 86° F, and temperatures above 80° F were common and could last for a month. Stratification begins to occur very early in summer, influenced heavily by the high salinity of the lake. Although stratified early in the summer, by mid- to late August, water temperatures become homogeneous from top to bottom in the pool and other nearby locations. This is due in large part to the unique mixing that the two large rivers converging at the pool create. The high conductivity of the Cimarron River also seems to play a role in this phenomenon. Although the temperatures are homogeneous, a chemocline is usually still present year-round. At peaks between 83° F and 86° F combined with oxygen values dropping below 3.0 ppm at 20 to 29 feet, the pool is a harsh environment for fish. Species, such as striped bass (*Morone saxatilis*), stop feeding under these conditions and eventually starve. This scenario is responsible for what is almost an annual striped bass kill in Keystone Lake.

The USACE conducted a water quality study for Keystone Lake between April and October 1996 and found that waters impounded by the reservoir are too highly mineralized to be suitable for municipal and industrial uses without extensive treatment. Keystone Lake presents an unusual situation in that the Cimarron River carries significantly higher dissolved salts to the lake than the Arkansas River. Higher specific conductance and chloride levels were consistently observed at depth at lacustrine stations. The water in Keystone Lake was classified as very hard, and total dissolved solids levels in the lake exceed levels acceptable for domestic uses.

Trophic classification of Keystone Lake using epilimnetic total phosphorus concentrations resulted in a classification of hyper-eutrophic. Because phosphorus has a high affinity to attach to suspended particulates, this trophic state classification may be an overestimate given the short retention time (42 days) and relatively high turbidity of the

reservoir. More than one-third of all turbidity observations during the study exceeded the Oklahoma Water Quality Standard of 25 Nephelometric Turbidity Units. Based on chlorophyll a concentrations, trophic classification of Keystone Lake would fall into a meso-eutrophic category. The lower index values are indicative of the effects of inorganic turbidity limiting algal productivity. Iron and manganese were also found in relatively high concentrations. During times of oxygen depletion in the hypolimnion, water users would experience staining problems. Results of the USACE study indicate that, overall, the water in Keystone Lake is of a reasonably good water quality when considering its primary uses of flood control, hydroelectric power, and navigation.

3.2.4 Alternative 1: No Action Alternative

There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on water resources as a result of implementing the No Action Alternative, since there would be no change to the existing Master Plan.

3.2.5 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of water resources; therefore, there would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on water resources.

3.3 CLIMATE

Keystone Lake lies in a region characterized by moderate winters and comparatively long summers with relatively high temperatures. The summer rains usually occur as thunderstorms of short duration and limited extent but with intense rainfall. The winter rains are generally of low intensities but cover large areas and are several days in duration. Normal annual precipitation over the watershed is about 37.1 inches. May is normally the wettest month and December the driest; however, major storms may occur at any time during the year. Nearly two-thirds of the precipitation occurs during the growing season, which occurs April through September. Annual snowfall averages around 8.9 inches per year.

The mean temperature is around 60° F, with record extremes ranging from -26° F to 115° F. The Keystone Lake watershed is in an area of prevailing southerly winds. The greatest wind movements occur in the spring months. A study of available wind velocity data indicates that 45 miles per hour is the highest wind velocity that can be reasonably expected for the duration of 1 hour or more.

3.3.1 Alternative 1: No Action Alternative

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

3.3.2 Alternative 2: Proposed Action

Revision of the Keystone Lake Master Plan would have no impact on the climate of the project area. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on climate as a result of the Proposed Action Alternative.

3.4 CLIMATE CHANGE AND GREENHOUSE GASES

CEQ drafted guidelines for determining meaningful greenhouse gas (GHG) decision-making analysis. The CEQ guidance states that if a project would be reasonably anticipated to cause direct emissions of 25,000 U.S. tons or more of carbon dioxide (CO_2)-equivalent (CO_2e) GHG emissions per year, the project should be considered in a qualitative and quantitative manner in NEPA reporting (CEQ 2014). CEQ proposes this as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHG (CEQ 2014).

According to the most recent estimating tools from the U.S. Environmental Protection Agency (USEPA), the closest major contributing facility is the American Environmental Landfill located in Sand Springs, Oklahoma. The general navigation operations, hydroelectric operations, and recreation facilities associated with the reservoir do not approach the proposed reportable limits. The project does have management plans in place, such as routine equipment maintenance, holistic vegetative management plans, natural resource management plans, and public education and outreach programs to protect regional natural resources. In addition, the project will continue monitoring programs as required to meet applicable laws and policies.

Two Executive Orders (EOs), EO 13514 and EO 13653, as well as the President's Climate Action Plan (CAP), set forth requirements to be met by Federal agencies. These requirements range from preparing general preparedness plans to meeting specific goals to conserve energy and reduce GHG emissions. The USACE has prepared an Adaptation Plan in response to the EOs and CAP. The Adaptation Plan includes the following USACE policy statement:

> "It is the policy of USACE to integrate climate change preparedness and resilience planning and actions in all activities for the purpose of enhancing the resilience of our built and natural water-resource infrastructure and the effectiveness of our military support mission, and to reduce the potential vulnerabilities of that infrastructure and those missions to the effects of climate change and variability."

3.4.1 Alternative 1: No Action Alternative

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

3.4.2 Alternative 2: Proposed Action

Under the Proposed Action, current Keystone Lake project management plans and monitoring programs would not be changed. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on climate change or contributions to GHG emissions as a result of implementing the proposed revisions to the Keystone Lake Master Plan. In the event that GHG issues become significant enough to impact the current operations at Keystone Lake, the Master Plan and all associated documents would be reviewed and revised as necessary.

3.5 AIR QUALITY

The USEPA published a Conformity Rule on 30 November 1993, requiring all Federal actions to conform to appropriate State Implementation Plans that were established to improve ambient air quality. At this time, the Conformity Rule only applies to Federal actions in non-attainment areas. A non-attainment area is an area which does not meet one or more of the National Air Quality Standards for the criteria pollutants designated in the Clean Air Act (CAA).

To comply with this rule, a conformity determination based on air emission analysis is required for each proposed Federal action within a non-attainment area. This geographical region is in attainment and meets the National Air Quality Standards for the criteria pollutants designated in the CAA. Consequently, a conformity determination is not required.

3.5.1 Alternative 1: No Action Alternative

There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on air quality as a result of implementing the No Action Alternative, since there would be no change to the existing Master Plan.

3.5.2 Alternative 2: Proposed Action

Existing operation and management of Keystone Lake is compliant with the CAA and would not change with the Master Plan revision. No short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on air quality would occur as a result of implementing the proposed revisions to the Keystone Lake Master Plan.

3.6 TOPOGRAPHY, GEOLOGY, AND SOILS

3.6.1 Topography

Land forms surrounding Keystone Lake range from strongly sloping hills around the dam and lower reaches of the lake to gently sloping grasslands at the upper reaches. The lake is located in the Eastern Sandstone Cuesta Plains subdivision of the Interior Central Lowland physiographic province. The majority of the shoreline can be described as sharply sloping toward Keystone Lake, with short rocky bluffs making up some of the shoreline.

The degree of variation does not pose a problem for recreational development as the majority of the designated public use areas possess sufficient topographic interest to provide or enhance visual appeal and the general recreation experience. Some of the public use areas located on gently sloping grasslands are easily developed but lack visual interest for the recreationist.

3.6.2 Geology

The geology of the area is dominated by materials of the Pennsylvanian system. The principal geologic formations found in the project area are Vamoosa, Barnsdall, Tallant, Wann and Ada.

3.6.3 Soils

Although several different soil types are present, the predominant soil type within the project area is the Niotaze-Darnell complex. The Niotaze-Darnell complex consists of small areas of Niotaze and Darnell soils that are so intermingled that distinct separation is often not

possible on a small mapping scale. The Niotaze-Darnell soil complex, which forms on the crests and side slopes of uplands, range from moderately deep (Niotaze) to thin (Darnell), somewhat poorly drained (Niotaze) to well drained (Darnell), and are very gently sloping (3%) through moderately steep (25%) in slope.

In typical Niotaze soils, the surface layer to a depth of about 3 inches consists of very dark grayish brown silt loam that grades to a brown silt loam down to 6 inches. The upper part of the subsoil is reddish brown silty clay to a depth of 15 inches. The middle part is mottled in shades of red, brown, and olive silty clay to a depth of 28 inches. The lower part is olive silty clay to a depth of 36 inches. The underlying material of Niotaze soils is shale bedrock. The permeability of the Niotaze soil is slow and available water capacity is medium.

The Niotaze-Darnell soil complex supports commercial range management operations, but is also well suited for the growth of native woodlands consisting primarily of a Post Oak-Blackjack Oak complex, including Chinquipin oak (*Quercus muehlenbergii*), hickory (*Carya* spp.), and eastern redcedar (*Juniperus virginiana*). The woodlands provide excellent wildlife habitat, as well as firewood and wooden post products. The smoother, less stony areas are also suited to domestic pasture grasses.

Further detailed information on all soil types surrounding Keystone Lake is available on websites maintained by the NRCS.

3.6.4 Alternative 1: No Action Alternative

The No Action Alternative for Keystone Lake 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; or beneficial or adverse impacts on topography, geology, or soils as a result of implementing the No Action Alternative.

3.6.5 Alternative 2: Proposed Action

Topography, geology, and soils resources were considered during the process of refining the land reclassifications. No intrusive actions are proposed, and Keystone Lake project resource management plans would not be changed, as the intent of the Proposed Action is to reflect current land uses. Therefore, no significant adverse impacts on topography, geology, or soils would occur as a result of implementing revisions to the Keystone Lake Master Plan.

3.7 NATURAL RESOURCES

Natural resources include the fisheries and aquatic resources, wetland, vegetation, and wildlife, present in the vicinity of Keystone Lake. The protection and enhancement of natural and man-made resources will receive equal consideration to other project purposes. Proper resource management is imperative to the long life and use of project resources.

3.7.1 Fisheries and Aquatic Resources

The waters of Keystone Lake provide habitat for many warm-water fish species. Recreational fishing is and will continue to be an important aspect of the overall recreational program enjoyed by visitors to the lake. Native species commonly sought by fisherman are channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), blue catfish (*Ictalurus furcatus*), white crappie (*Pomoxis annularis*), white bass (*Morone chrysops*), largemouth bass

(*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), and various sunfish species (*Lepomis* spp.). Keystone Lake also supports an extremely active striped bass fishery that was artificially introduced in the 1960s. Forage for the sport fish population is provided by gizzard shad (*Dorosoma cepedianum*), various minnows (family Cyprinidae), and shiners (family Cyprinidae).

Fish habitat consists of extended shorelines made up of rock (primarily sandstone) or sand. There are limited amounts of standing timber, which are confined to a few cove areas, as the impoundment ages. Vegetative coverage is limited by the vast amount of rocky shoreline. The upper reaches of the Arkansas River arm of the lake have silted in with rich soils from upstream creating an area that is suitable for water willow (*Justicia americana*). Rocky shorelines consist of sand stone gravel, rock boulder, and bedrock. The use of riprap can be found along the dam and on the sides of State Highway 51 at Salt Creek and State Highway 412. A small area of riprap can be found upstream from Cowskin Bay. Primary substrate is sandstone, loamy silt, and clay. Each year (water levels allowing), local anglers in cooperation with the USACE and the ODWC create new brush piles in different areas of the lake and recharge previous piles.

As stated in the water quality section, Lake Keystone is hypereutrophic. Heavy nutrient and sediment loading causes an excessive amount of primary production, and the heavy silting affects spawning beds and egg survivability. Constant water fluctuations in dry or flooded spawning beds cause habitat disruption and have the potential for degrading water quality. Aquatic nuisance species, such as white perch (*Morone americana*), compete for resources and displace native species. The overall health of the white bass will have to be monitored as white perch begin to grow in numbers. Education of anglers and concessions will need to be provided to control the spread of these species to neighboring lakes.

3.7.2 Wildlife

The major wildlife habitats are upland forests, bottomland forests, and tallgrass prairie. Each of these vegetative types provides habitat for a variety of organisms. The transition zones between these areas are especially productive. Principal wildlife species include bobwhite quail (*Colinus virginianus*), grey and fox squirrels (*Sciurus carolinensis* and *Sciurus niger*), cottontail rabbits (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), songbirds, waterfowl, wild turkeys (*Meleagris gallopavo*), raccoons (*Procyon lotor*), bobcats (*Lynx rufus*), and various birds of prey, including the bald eagle (*Haliaeetus leucocephalus*).

USACE has licensed 12,280 acres of land to ODWC for wildlife management. These lands are part of the 21,592-acre Keystone WMA operated by ODWC in portions of Creek, Osage, and Pawnee Counties in north-central Oklahoma. Located near the towns of Cleveland, Mannford, and Oilton, Keystone WMA is composed of the Arkansas and Cimarron rivers and adjacent floodplains and bottomlands. The remaining wildlife management lands not managed by ODWC are managed by USACE. Management efforts focus on producing native wildlife foods, as well as nesting and foraging habitat. Prescribed burns are conducted when conditions permit. Supplemental forage is provided through management of farming leases where needed to support the needs of species of greatest conservation need. Wetland development units are managed to provide additional waterfowl habitat and hunting opportunity. Hunting and fishing activities are regulated by federal and state laws.

3.7.3 Vegetative Resources

Three basic vegetation zones can be found in the project area. The upland forest, Post Oak-Blackjack (Central Great Plains and the Cross Timbers regions) types, represents a mixture of forest and grassland ecosystems characteristic of most of the lake shoreline and recreation areas. The Cross Timbers region is a transition area between the once-prairie, now winter-wheat growing regions to the west, and the forested low mountains of eastern Oklahoma. The region does not possess the arability and suitability for crops such as corn and soybeans that are common in the Central Irregular Plains to the northeast. The Cross Timbers stretch across Oklahoma from north to south, with portions extending into Kansas to the north and Texas to the south, and are sometimes described as containing some of the most extensive tracts of ancient forests in the eastern United States. Included in this ecoregion for Keystone Lake is the Keystone Ancient Forest, with 300-year-old post oaks and 500-year-old cedars. This forest type exists because of its limited commercial value for timber production, and is protected through its designation of an Environmentally Sensitive Area by USACE. Transitional "cross-timbers" (little bluestem grassland with scattered blackjack oak [*Quercus merilandica*] and post oak trees [*Quercus stellata*]) is the native vegetation, and rangeland and pastureland comprise the predominant land cover.

The Central Great Plains is slightly lower, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland. The eastern boundary of the region marks the eastern limits of the major winter wheat growing area of the United States.

The Bottomland Hardwood type has, for the most part, been inundated by the lake, but some stands of the forest type remain in the extreme reaches of the lake. The principal tree species found on the river bottoms are northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), chinquapin oak (*Quercus muehlenbergi*), overcup oak (*Quercus lyrata*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), black walnut (*Juglans nigra*), pecan (*Carya illinoensis*), river birch (*Betula nigra*), winged elm (*Ulmus alata*), slippery elm (*Ulmus ruba*), hackberry (*Celtis laevigata*), sassafras (*Sassafras albidum*), hawthorn (*Crataegus sp.*), redbud (*Cercis canadensis*), honey locust (*Gleditsia triacanthus*), red maple (*Acer rubrum*), box elder (*Acer negundo*), flowering dogwood (*Cornus florida*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvania*), swamp privit (*Forestiera acuminata*), and button bush (*Cephalanthus occidentalis*). The shallow upland soils support the growth and vitality of the native blackjack forest vegetation. The overall visual character of the forested area is good, however, due to protection and management resulting from USACE ownership.

The tall prairie grass vegetation type is a very desirable native grass ecosystem. Better soils in the rolling plains area of the lake support such desirable grasses such as big bluestem (*Andropogon gerardi*), Indian grass (*Sorghastrum nutans*), purple top (*Tridens flavus*), and little bluestem (*Andropogon scoparius*). Unfortunately, at the time of Federal acquisition, virtually no virgin vegetation remained in the area and the quality of existing vegetation was degraded by erosion, fires, and historic overgrazing. However, 50 years of Federal ownership has resulted in beneficial tall prairie grass vegetative succession.

The vegetative data of the Keystone Lake was obtained using information derived from FY2014 Project Site Vegetation Classification Records reported in OMBIL. This data and the results are displayed in Table 3.2.

Table 3.2 Vegetation Classification Records

Order	Class	Sub-Class	Acreage
Non-Vegetated(1)	Non-Vegetated	Non-Vegetated	40%
Herb Dominated	Herbaceous Vegetation	Perennial forb vegetation	9%
Shrub Dominated	Shrubland (Scrub)	Mixed evergreen-deciduous shrubland (scrub)	17%
Tree Dominated	Closed Tree Canopy	Deciduous closed tree canopy	34%

(1) Includes lakebed

3.7.4 Alternative 1: No Action Alternative

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

3.7.5 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of natural resources. The Proposed Action for revising the Keystone Lake Master Plan would allow project lands to continue supporting the USFWS and the ODWC missions associated with wildlife conservation and implementation of operational practices that would protect and enhance wildlife and fishery populations. While only 100 acres of previous Wildlife Management land is changing to LDR, approximately 955 acres of LDR or HDR are changing to Wildlife Management. Also, to ensure the preservation of Keystone Lake's Ancient Cross Timbers Forest, 166 acres would be reclassified as an ESA. The ESA reclassification would also include the water surface within the cove adjacent to the Ancient Cross Timbers Forest. Seasonal restrictions would be implemented to protect the ESA. The Proposed Action would be compatible with conservation principles and measures to protect migratory birds as mandated by EO 13186. No long-term, major, moderate or minor, beneficial or adverse impacts on natural resources would occur as a result of implementing revisions to the Keystone Lake Master Plan.

3.8 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) of 1973 (16 U.S. Code [U.S.C.] § 1531 et seq., as amended) defines an endangered species as a species "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 proposed in the *Federal Register* (FR) to be listed under Section 4 of the ESA. Species may be considered endangered or threatened "because of any of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purpose; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affecting continued existence." 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 the USFWS has sufficient information to support proposals to list as endangered or threatened under the ESA.

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 appreciably reduce 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.

Table 3.3 lists the native species that have potential to occur in the Keystone Lake project area and are Federally listed as threatened, endangered, or a candidate species by the USFWS Information for Planning and Conservation report.

Table 3.3 Threatened, Endangered, and Candidate Species

	Status	Federal and State List	Has Critical Habitat
Birds			
Least Tern *Sternula antillarum*	Endangered	Federal	No
Piping Plover *Charadrius melodus*	Threatened	Federal	No
Red Knot *Calidris canutus*	Threatened	Federal	No
Whooping Crane *Crus americana*	Candidate	Federal	No
Clams			
Neosho Mucket *Lampsilis rafinesqueana*	Endangered	Federal	Yes(1)
Insects			
American Burying Beetle *Nicrophorus americanus*	Endangered	Federal	No
Rattlesnake-master Borer Moth *Papaipema eryngii*	Candidate	Federal	No
Mammals			
Northern Long-eared Bat *Myotis spetentrionalis*	Threatened	Federal	No

(1) There is no critical habitat within the Keystone Lake area.

Considerations for Federally listed threatened and endangered species at Keystone Lake are in accordance with the USACE Tulsa District's current Biological Opinion (BO) issued by the USFWS. Past and potential future actions include such measures as construction and management of nesting habitat for the endangered interior least tern (ILT) (*Sterna antillarum*) and the American burying beetle (ABB) (*Nicrophorus americanus*). Should Federally listed species change in the future (e.g., delisting of the ILT or other species or listing of new species), associated requirements will be reflected in a revised BO from the USFWS. Natural resources needs and management for listed species at Keystone Lake would change accordingly.

The ILT is a Federally listed endangered bird that nests on sand bars along the Arkansas River in Oklahoma and Arkansas. The preferred nesting habitat for the ILT is bare sand substrate

located a considerable distance from trees or other potential roosting spots for avian predators. In accordance with a BO issued by the USFWS, the USACE Tulsa District is required to construct and maintain a given quantity of suitable nesting habitat for the ILT at varying civil works projects. The ILT nesting success is monitored by Tulsa District biologists.

The ABB can be found at Keystone Lake. It was proposed for Federal listing in October 1988 (53 FR 39617), designated as an endangered species on July 13, 1989 (54 FR 29652), and retains this status. The ABB is an annual species and typically reproduces once in its lifetime. It competes for carrion with other invertebrate species as well as vertebrate species. Although ABBs are considered feeding habitat generalists, they are believed to be more selective regarding breeding habitat.

3.8.1 Alternative 1: No Action Alternative

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

3.8.2 Alternative 2: Proposed Action

Under the Proposed Action, the USACE would continue cooperative management plans with the USFWS to preserve, enhance, and protect critical wildlife habitat resources. To expand management opportunities to increase habitat diversity, the Master Plan revisions include reclassifying 166 acres of Natural Area within the Ancient Cross Timbers Forest to an Environmentally Sensitive Area. In addition, soil-disturbing activities associated with land management, public recreation area maintenance, out-granted recreation area maintenance and improvements, and other routine operation and maintenance activities would be assessed individually as they arise. Therefore, no significant adverse impacts would occur as a result of implementing revisions to the Keystone Lake Master Plan. Any future activities that could potentially result in impacts on Federally listed species shall be coordinated with USFWS through Section 7 of the ESA.

3.9 INVASIVE SPECIES

The Arkansas River basin has been identified as a major pathway for the introduction of aquatic nuisance species. The following vegetative species are considered special concerns in Oklahoma: alligator weed (*Alternanthera philoxeroides*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), purple loosestrife (*Lythrum salicaria*), salvinia (*Salvinia molesta*), and water hyacinth (*Eichhornia crassipes*). Due to its proximity to the McClellan-Kerr Arkansas River Navigation System, Keystone Lake is particularly vulnerable to the transport by boaters of these invasive plants, as well as some invasive animal species.

Salvinia and water hyacinth have been documented to occur in Keystone Lake, but are not yet at population levels that allow them to have widespread impacts on the lake. Salvinia refers to a genus of perennial, aquatic ferns from South America that are common in water gardens and aquarium industries. In Oklahoma, giant salvinia has established in ponds, lakes, and slow-moving streams. It prefers nutrient rich waters and forms extensive mats that can completely cover water surfaces, resulting in the degradation of natural habitats by shading native plants, reducing available dissolved oxygen, and creating large amounts of decaying plant

material. Giant salvinia can clog water intakes, which interferes with irrigation, water supply, and electrical generation. Human transport aids in the spread of this species, with plants adhering to anything entering infested waters including boats, trailers, vehicular wheels, intakes, and gear. Water hyacinth is common in Gulf Coast states, and its presence has caused massive problems with navigation, water-based recreation, canal systems, pumping stations, and water intakes. While the risk of establishment in Oklahoma is low due to cold winter air temperatures, its continued popularity in water gardens poses the threat that it could adapt to colder temperatures or become established in thermal refugia.

In addition to aquatic invasive plants, Oklahoma has a total of 22 invasive plant species on the Oklahoma Invasive Plant Council problem list. Invasive terrestrial plants known to occur on Keystone Lake lands include Japanese honeysuckle (*Lonicera japanica*), Chinese lespedeza (*Lespedeza cuneata*), Japanese climbing fern (*Lygodium japonicum*), kudzu (*Puearia lobata*), and autumn olive (*Elaeagnus umbellata*).

The zebra mussel (*Dreissena polymorpha*) is an invasive, freshwater invertebrate that has a high filtration rate, high reproductive rate, strong byssal threads for substrate attachment, and a limited number of natural predators. Due to these characteristics, zebra mussels are able to populate an aquatic ecosystem relatively quickly and out-compete native mussel populations. Economic impacts caused by the invasive species include fouling water intake pipes, cooling systems, filtration systems, and fouling boat engine cooling systems. Zebra mussels fouling filtration systems associated with fire suppression at facilities using raw water can impede the effectiveness of the system, increasing the potential of damage to the facility, and danger to human welfare. When a zebra mussel "die-off" occurs, thousands of shells can wash up on the shoreline or beach area; the sharp edges of the mussels' shells could potentially cause harm to humans and may result in public beach closures for safety reasons.

Zebra mussels were introduced to North America via trans-Atlantic barges to the commercial waterways of the U.S. from Europe in the 1980s. Once established, the spread of zebra mussels to inland waters occurred via navigation system traffic, overland transportation of private boats from an infested water body to an uninfested water body, and natural downstream flows that carried the free-floating larva form of the species. Within the Tulsa District, zebra mussels were first confirmed in Oklahoma in the McClellan-Kerr Arkansas River Navigation System (MKARNS) in January 1993 inside Locks 14 (W.D. Mayo), 15 (Robert S. Kerr), and 16 (Webbers Falls). The invasive species were subsequently found in the Verdigris River of the MKARNS at Lock 17 (Chouteau) in June 1993 and at Lock 18 (Newt Graham) January 1994. In conjunction with zebra mussel infestation at the locks along the MKARNS, the species were also observed to be in the powerhouses associated with Keystone Lake. Upon confirmation of zebra mussel establishment, monitoring efforts at locks and dams along the MKARNS were conducted by USACE biologists and Northeastern State University research faculty at boat ramps that provide access to the reservoirs along the MKARNS. Signs were posted to educate the public concerning the presence of invasive species and assist in the prevention of spreading the species to other water bodies. Zebra mussels continue to populate the navigation system, and populations are monitored via routine maintenance activities associated with the facilities along the MKARNS. In 2012, USACE facilities at Keystone Lake noted an increase in manual maintenance of the powerhouse cooling systems during the summer months, when zebra mussel activity is greatest.

White perch *(Morone americana)* was introduced by accident into Cheney and Wilson reservoirs in Kansas. This introduction was a result of a striped bass stocking contaminated with white perch. Since white perch were found in Kaw reservoir in 2000, ODWC has continued monitoring competition with native species such as white bass (*Morone chrysops*). In 2004, white perch were found in Keystone during fall gillnetting samples.

Table 3.4 lists the invasive species that occur on Keystone Lake fee lands. Data was retrieved from the FY2014 Project Site Invasive Species Records reported in OMBIL (USACE 2015).

Table 3.4 Invasive Species

Species Group	Common Name	Type of Occurrence	Acreage Impacted	Percent Acreage Impacted	Acreage Treated
Aquatic and Wetlands	Zebra mussel (*Dreissena polymorpha*)	Significant/Major	23,610	40.24%	0
Terrestrial Plants	Kudzu (*Pueraria lobata*)	Moderate	100	0.17%	0
Terrestrial Plants	Red cedar (*Juniperus virginiana*)	Significant/Major	15,000	25.57%	0
Terrestrial Plants	Russian olive (*Elaeagnus angustifolia*)	Minor	200	0.34%	0
Terrestrial Plants	Sericea Lespedeza (*Lespedeza cuneata*)	Significant/Major	8,000	13.64%	0

3.9.1 Alternative 1: No Action Alternative

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions; thus, so the Keystone 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; or beneficial or adverse impacts from invasive species as a result of implementing the No Action Alternative.

3.9.2 Alternative 2: Proposed Action

The land reclassifications required to revise the Master Plan are compatible with Keystone Lake invasive species management practices. Therefore, invasive species would continue to be managed, and no significant adverse impacts on resources would occur as a result of implementing revisions to the Master Plan.

3.10 CULTURAL, HISTORICAL, AND ARCHAEOLOGICAL RESOURCES

Cultural resources preservation and management is an equal and integral part of all resource management at Civil Works operating projects. The term “cultural resources” is a broad term meant to include anything that is of cultural significance to humans and that has some historical value, and generally includes, but is not limited to, the following categories of resources: archaeological sites (historic and prehistoric), historic standing structures, traditional cultural properties, and sacred sites. There are approximately 400 known archaeological sites located on project lands associated with Keystone Lake. Twenty-five of these sites are documented as completely inundated. Some archaeological sites have high sensitivity because of past recoveries of human remains and associated funerary objects.

Numerous cultural resources laws 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. Stewardship of cultural resources on USACE Civil Works water resources projects is an important part of the overall Federal responsibility.

3.10.1 Cultural History Sequence

Six broad cultural divisions are applicable to a discussion of the cultural history of the Keystone Lake region: Paleo-indian, Archaic, Woodland, 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.

- Paleo-indian: 12,000 to 8000 Before Present (BP)
- Archaic: 8000 to 2000 BP
- Woodland: anno Domini (AD) 1 to 800
- Plains Village: AD 800 to 1500
- Protohistoric (Contact Period): AD 1500 to 1825
- Historic: AD 1825 to present

Paleo-Indian Period

While it is becoming increasingly evident that humans may have arrived in the Southern Plains as early as 30,000 years ago, the Paleo-indian period is the earliest well-substantiated archaeological period in the project region. Signature stone tools include unnotched lanceolate projectile points, fluted (Clovis and Folsom), and unfluted (Plainview, Dalton, and others), often found in contexts where mammoth or bison remains also occur. During this period, small bands of hunters and gatherers relied largely on the hunting of megafauna such as mammoth and bison; however, several sites to the east have exhibited evidence of reliance on a wide variety of plant and animal species.

Paleo-indian points are found in the project area, but usually on eroded surfaces lacking context or in river beds. Clovis, Folsom, Scottsbluff, Eden, Meserve, Plainview, and Scottsbluff points, as well as a Cody knife, have been documented from a local private collection. The well-documented Clovis sites in Oklahoma are the Domebo site in Caddo County, where people killed an imperial mammoth 11,800 years ago, and Jake Bluff in Harper County, which is a bison kill site which has yielded both Clovis and later Folsom points. Two additional Folsom sites are the Cooper (a bison kill site) and Waugh (a possible camp) sites. Dalton points have been found more often on sites in eastern Oklahoma, and are associated with more diverse artifact assemblages.

Archaic Period

A larger variety of floral and faunal resources were utilized during the Archaic period. An increase in seasonal variability of resources and increasing populations resulted in changing settlement and subsistence patterns. 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. Increased diversity of stone tools through time reflects the increasing variability of resources and diversity of activities taking place at

habitation sites. Projectile points from the Archaic period are stylistically quite different (typically notched and stemmed) from those of the Paleo-indian period. Archaic assemblages in the Project area include a variety of contracting and expanding stemmed large dart points, scrapers, and grinding implements. The Archaic period is traditionally divided into Early, Middle, and Late periods, the overall extent of which was approximately 8,500 BP to 2,000 BP.

Woodland Period

The Woodland period in eastern Oklahoma was a time of continuity marked by incorporation of new technologies and intensification of resources. The appearance in the archaeological record of small corner-notched projectile points indicates that the bow and arrow was in use. Cultivation of plants began during this period and is often referred to as "insipient agriculture". The presence of ceramic sherds indicates that ceramic use in the form of pottery for storage and cooking had become widespread. Archaeological assemblages from this period indicate that people were living in semi-permanent villages and dispersed communities, using settlement strategies such as seasonal mobility, targeted long-distance resource procurement by portions of the community or household, and intensification of wild and domestic plants to meet their needs. Small game and aquatic resources remained essential to subsistence. Projectile points from this period include, in addition to the small corner-notched points, large contracting stem points and large 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.

Rather than an abrupt change in lifeways from the Archaic to the Woodland, the archaeological record indicates continuity even as populations in the area adopted new technologies and intensified resource use, which in turn drove increasing residential stability, community identity, and possibly territoriality. In northeastern Oklahoma, the principal Woodland manifestation is known as the Cooper Focus, which shares many material culture traits and settlement patterns with the Fourche Maline to the south, and symbols and styles with groups to the north in southeast Kansas that mirror those characteristic of earlier Hopewellian sites in northeast Kansas and to the east in Ohio and Illinois.

Plains Village

During the Plains Village period, people lived in small to moderate-sized villages and in dispersed communities. Villages were often situated in lowland terraces of waterways where floodplain horticulture was viable. House structures were pole-framed with waddle and daub, and subsistence was more focused on domesticated plants, supplemented by hunting and gathering. Groups traded and traveled to obtain needed resources, resulting in additional site types for this time period: temporary hunting camps, bison kill and processing sites, limited activity areas, and quarry/workshop localities.

Agricultural tools of stone and bone are present in artifact assemblages, along with small triangular unnotched and side- and corner-notched arrowpoints for hunting and warfare. Pottery types are plain and cordmarked, and are greatly increased in variability in form and function. Personal items provide evidence for complex cultural traditions, ranks, and widespread trade and interaction.

The Protohistoric (Contact) Period

The period from A.D. 1500-1825 is referred to as the Protohistoric (or Contact) Period. Villagers aggregated into large fortified villages situated along major rivers during this time period. Also 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 change. Protohistoric sites in Oklahoma appear to be directly related to an earlier manifestation of similar village sites located further north in Kansas, including the Great Bend Aspect, with sites in central, south-central, and southeast Kansas. Great Bend sites represent the villages encountered by Francisco Coronado in 1541. People 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. This way of life continued into the eighteenth century.

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 Oklahoma and had developed trading relationships with Wichita groups in the Arkansas Valley and the Osage to the east. Diseases swept through the region during this time period, dramatically reducing local populations. This, combined with increased intergroup violence, resulted in the coalescence of communities into large villages, often with defensive fortifications. Competition between rivals intensified through time as the fur trade brought significant and lasting changes to the economic systems of Villages. These economic systems in turn brought changes in social structure, including gender roles. During this time the Caddo were in the process of emigrating toward the Red River, largely due to the constant raiding by the Osage from the north.

The Wichita and Affiliated Tribes were historically known as the Wichitas, Wacos, Taovayas, Tawakonis, and Kichais. Protohistoric Wichita sites from the early 1700s have been identified in Kay County, north-central Oklahoma, including the Bryson Paddock (34KA5) and Deer Creek sites (34KA3), and in south-central Oklahoma at the Longest site (34JF1). These Protohistoric Wichita sites, dating from the early 1700s, provide evidence of the extent of French influence on the central and southern Plains, as artifact assemblages from these sites contain metal musket parts from French firearms, glass trade beads, copper kettle pieces, and European gunflints. Villagers did not dramatically change the function of material culture in spite of this influx of European goods. Rather, they incorporated French goods into existing material culture frameworks. Guns were used until no longer viable, and then were hammered into hoes similar in shape to bison scapula hoes (which had seen long use on the Plains). Copper kettles were hammered flat and used to create tinklers (copper cones sewn to clothing) and other items of personal adornment. The Osage had villages to the east of the protohistoric Wichita villages, and they often fought the Wichita over access to trade goods.

The Caddo, Wichita, Osage, and Quapaw hunted in the Arkansas Valley. By 1760 the Wichita moved south to the Red River, and the hunting grounds of the area became contested by the Osage, Kiowa, Kiowa Apache, Comanche, and Wichita. Territorial claims shifted between France and Spain during the rest of the eighteenth century; however, France controlled the land until it was acquired by the United States in the 1803 Louisiana Purchase. After the Louisiana Purchase in 1803, military and political expeditions in the region included those by James B.

Wilkinson (1806), George C. Sibley (1811), Stephen H. Long (1821), Thomas James (1821), and Jacob Fowler (1821).

The Historic Period

Congress created Arkansas Territory on March 2, 1819, and this territory included present-day Oklahoma. Between 1820 and 1907, Oklahoma was designated as Indian Territory on maps of the United States, and, during this time period, it was an Indian resettlement zone for tribes from various parts of the country. In May 1830, Congress passed the Indian Removal Act, which resulted in lasting consequences for all native groups in the United States. By 1838, most of Indian Territory was assigned to five Indian nations from the eastern United States. These included the Cherokee, Choctaw, Chickasaw, Creek, and Seminole nations.

Land south of the Arkansas and Canadian Rivers in Oklahoma was ceded by the United States to the Choctaws residing in Arkansas Territory in 1825. In 1816, Osage hunting territory north of the Arkansas River was transferred to their rivals, the Cherokee residing in Arkansas during the late 1700s and early 1800s. In 1828, the Cherokee ceded all their Arkansas land for a tract of land that later became the Cherokee Nation and the Cherokee Outlet. This treaty required that all Cherokees (including those residing in the Southeast) move to the land in Indian Territory. The Arkansas River was established as the territorial boundary between the Cherokee and the Choctaw.

Historic site types in the area include historic Indian villages, camps, towns and agencies, European trading posts, Euroamerican homesteads and ranches, Indian plantations, homes, and farmsteads, and freed slave homesteads and farms. Related types of resources include wells, cisterns, privies, rock walls, railroad lines, cattle trails, roads, schools, cemeteries, and water diversion features.

3.10.2 Previous Investigations

In 1952, the University of Oklahoma (OU), the Smithsonian Institution, and the National Park Service sponsored an archaeological survey of the Keystone Lake area prior to construction and impoundment. Harold Brighton, under direction of Dr. Robert Bell of OU, located 84 archaeological sites in April and May of 1952. Limited testing was conducted at some of the sites, and funding was unavailable for salvage excavations. In 1978, Jack Hofman surveyed the project area on behalf of the Oklahoma Archaeological Survey, for the Oklahoma Department of Parks and Tourism. He identified eight sites in an area slated for facilities construction.

In 1979, the Tulsa District contracted Archaeological Research Associates (ARA) to conduct additional surveys of the Keystone Lake lands to locate, describe, and evaluate cultural resources located between the approximate top of the power pool and the project boundary. Fieldwork was conducted from October through December of 1979. The results of the survey and testing were reported in Moore (1980). ARA documented 270 sites in the Keystone Lake project area and reassessed the conditions of previously recorded sites. ARA also interviewed local artifact collectors and documented their collections, making every effort to tie the collections to the site locations. Test excavations were also conducted at a number of sites.

Additional limited investigations have been carried out at Keystone Lake for compliance with Section 106 of the National Historic Preservation Act (NHPA). In the larger regional area there are hundreds of archaeological sites and historic standing structures on record with the Oklahoma State Historic Preservation Office (SHPO) and Oklahoma Archeological Survey.

3.10.3 Alternative 1: No Action Alternative

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

3.10.4 Alternative 2: Proposed Action

Impacts on cultural, historical, and archaeological resources were considered during the refinement processes of land reclassifications. Based on previous surveys of Keystone Lake, the required reclassifications would not change current cultural resource management plans or alter areas where these resources exist. Therefore, no significant adverse impacts on cultural, historical, and archaeological resources would occur as a result of implementing revisions to Keystone Lake.

3.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The region of interest for the socioeconomic analysis consists of Creek, Osage, Pawnee, Payne, and Tulsa Counties in Oklahoma. These counties are part of the Tulsa Metropolitan Statistical Area and include 20% of the state's Native American population.

3.11.1 Population

Population estimates for the region are 837,572 for 2013 as shown in Table 3.5. From 2013 to 2060, regional population is expected to increase to 1,157,259, an annual growth rate of approximately 0.7% per year. The population of Oklahoma is also projected to increase at an annual rate of 0.6% per year. The distribution of the gender in the population of interest is approximately 49% male and 51% female in most geographical regions, with the male/female ratio reversed only in Osage County as shown in Table 3.6.

Table 3.5 2013 Population Estimates and 2060 Projections

Geographical Region	2013 Population Estimate	2060 Projection
Oklahoma	3,853,118	5,140,129
Creek County	70,698	100,498
Osage County	47,924	66,415
Pawnee County	16,527	22,980
Payne County	79,457	110,069
Tulsa County	622,966	857,297
Region of Interest Totals	**837,572**	**1,157,259**

Source: "Oklahoma State and County Population Projections Through 2075" Oklahoma Department of Commerce, U.S. Bureau of the Census, American Fact Finder (2013 Estimate)

Table 3.6 2013 Percent of Population Estimate by Gender

Geographical Region	Male	Female
Creek	49.4%	50.6%
Osage	50.3%	49.7%
Pawnee	48.8%	51.2%
Payne	51.1%	48.9%
Tulsa	48.7%	51.3%
Region of Interest Totals	**49.1%**	**50.9%**

Source: U.S. Bureau of the Census, American Fact Finder (2013 Estimate)

Population by race or Hispanic origin is displayed in Table 3.7. For the region of interest, approximately 68% of the population is White alone. American Indian or Native Alaskan account for 7% of the inhabitants of the region. Two or more races make up 5% of the total, Hispanic and Black each make up 10% of the region's population. The remainder of the races makes up less than 2% of the total regional population. By comparison, for the State of Oklahoma, 69% of the population is White alone, 9% Hispanic, 8% American Indian/Native Alaskan, 7% Black, 5% two or more races, and 2% Asian. The region of interest contains 17% of the state's Native American residents.

Table 3.7 2014 Population Estimate by Race or Hispanic Origin

Region	White Alone	Black Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Two or more races	Hispanic or Latino
Oklahoma	2,575,381	272,071	308,733	64,154	3,977	192,074	332,007
Creek County	54,821	1,528	6,834	230	43	4,321	2,152
Osage County	30,709	5,355	6,704	118	11	3,195	1,366
Pawnee County	13,216	116	1,908	42	6	943	336
Payne County	61,655	2,757	3,494	2,679	34	3,670	2,990
Tulsa County	393,401	63,737	34,615	13,892	383	30,165	66,582
Region of Interest Totals	**553,802**	**73,493**	**53,555**	**16,961**	**477**	**42,294**	**73,426**

Source: U.S. Census Bureau, Census Data Quick Facts (2014)

3.11.2 Education and Employment

In the zone of interest, 12% of the population 25 years old and older have attended some amount of high school but have never received a diploma. Another 29% of the population 25 years old and older have received a high school diploma or equivalent. Twenty-four percent have some college, but no degree, 19% have a Bachelor's degree, 8% have an Associate's degree, and 9% have a graduate or professional degree. For Oklahoma, 86% of the population aged 25 and over have at least a high school diploma, 24% have some college but no degree; 7% have an associate's degree, 16% have a bachelor's degree, 8% have a graduate or professional degree.

3.11.3 Households and Income

There are 1.4 million households with an average size of 2.55 in Oklahoma. There are approximately 323,000 total households in the region of interest where the average household size is also 2.59. As shown in Table 3.8, income in Creek, Osage, and Pawnee Counties are

lower than the state average of $45,000 per year. Only Tulsa County has a higher median income than the state average. Median household income in Creek County is approximately $43,000 and in both Osage and Pawnee Counties it is approximately $44,000 per year. Tulsa County has a median household income of approximately $48,000 per year. County per capita income follows the same pattern as median household income.

Table 3.8 Households and Income

Region	Total Number of Households	Average household size	Median Household Income	Per Capita Income
Oklahoma	1,444,081	2.55	45,339	24,208
Creek County	26,296	2.64	43,026	22,327
Osage County	18,512	2.5	44,195	22,353
Pawnee County	6,341	2.59	44,375	21,220
Payne County	30,010	2.33	36,812	20,868
Tulsa County	241,915	2.48	48,181	27,676
Region of Interest Totals	**293,064**	**2.59**	**NA**	**NA**

Source: U.S. Census Bureau, Census Data Quick Facts (2014)

The number of persons whose income was below the poverty level was slightly lower in the region of interest (14.8%) as compared to Oklahoma (16.9%). All counties in the region of interest showed poverty levels between 14.1% and 15.9%.

3.11.4 Alternative 1: No Action Alternative

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

3.11.5 Alternative 2: Proposed Action

Keystone Lake is beneficial to the local economy through indirect job creation and local spending by visitors, and also offers a variety of free recreation opportunities and uses innovative maintenance and planning programs to minimize usage fees. Since recreational opportunities remain abundant, there would be no adverse impacts on area economic stability or environmental justice populations resulting from the revision of the Master Plan.

3.12 PRIME FARMLAND

Prime Farmland is one of several kinds of important farmland defined by the USDA. Unique Farmland is defined by USDA as land other than Prime Farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Approximately 11,970 acres within the Keystone Lake project are considered Prime Farmland.

3.12.1 Alternative 1: No Action Alternative

There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on Prime or Unique Farmlands as a result of implementing the No Action Alternative, as there would be no changes to the existing Master Plan.

3.12.2 Alternative 2: Proposed Action

The Proposed Action would result in potential impacts on Prime Farmlands particularly in the reclassification of 100 acres of Prime Farmland located west of Pump Jack Island and Cross Timbers Marina from Wildlife Management to Low Density Recreation and the reclassification of 16 acres of Prime Farmland west of the State Highway 51 bridge in Mannford from Low Density Recreation to High Density Recreation. Although High Density Recreation activities and facilities have been proposed for these areas, any soil-disturbing activities associated with land management, public recreation area maintenance, out-granted recreation area maintenance and improvements, and other routine operation and maintenance activities would be assessed individually as they arise. Given the abundance of Prime Farmlands within the project area (11,970 acres), no significant adverse impacts would occur as a result of implementing revisions to the Keystone Lake Master Plan.

3.13 HEALTH AND SAFETY

As mentioned earlier in this document, Keystone Lake authorized purposes include flood control, water supply, water quality, and recreation. Compatible uses incorporated in project operation management plans include conservation and fish and wildlife habitat management components. The Keystone Lake 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 in place to protect the public. These include safe boating and swimming regulations, safe hunting regulations, and speed limit and pedestrian signs for park roads. Keystone Lake also has solid waste management plans in place for camping and day-use areas. Keystone Lake has personnel in place to enforce these policies, rules, and regulations during normal park hours.

3.13.1 Alternative 1: No Action Alternative

Under the No Action Alternative, the 1974 Master Plan would not be revised. No significant adverse impacts on human health or safety would be anticipated.

3.13.2 Alternative 2: Proposed Action

Under the Proposed Action, the required revisions to the Keystone Lake Master Plan would be compatible with project safety management plans. The project would continue to have reporting guidelines in place should water quality become a threat to public health. The Proposed Action would potentially result in long-term and moderate beneficial impacts on public health and safety with the reclassification of 37 acres of Water Surface near the dam to Restricted for project safety and security purposes and the reclassification of 8 acres of riprap along the dam to Project Operations for safety and security purposes. Existing regulations and safety programs throughout the Keystone Lake area would continue to be enforced to ensure public safety. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on public health and safety as a result of implementing the Proposed Action.

3.14 RECREATION

The recreational opportunities and potential of Keystone Lake are considered to be of great importance within the project's region of interest. The Keystone Lake project area offers many recreational activities such as swimming, boating, water skiing, fishing, hunting, picnicking, and camping, as well as multiple trails for hiking and biking. There are 12 High Density Recreation Areas on Keystone Lake, numerous boat ramps, four marinas, a yacht club, and one sailing club. Keystone Lake visitors are a diverse group ranging from campers who utilize the campgrounds around the lake, full-time and part-time residents of the immediate area, hunters who utilize the Keystone Wildlife Management Area around the lake, fishermen launching from boat ramps or setting up on the shoreline, trail users who enjoy the scenic terrain, day users who picnic, and many other user groups. There are nine developed swimming beaches. The parks have campsites, picnic areas, drinking water, restrooms, playgrounds, boat ramps, and courtesy docks.

Approximately 17,000 acres are open for public hunting. White-tailed deer, bobwhite quail, mourning dove, ducks, geese, cottontail rabbit, and squirrel are among the principal game species. Numerous parks have been developed by the USACE, and the State of Oklahoma maintains two parks. The cities of Cleveland and Mannford also maintain parks on Keystone. There are nine developed swimming beaches. The parks have campsites, picnic areas, drinking water, restrooms, playgrounds, boat ramps, and courtesy docks. Fish and wildlife resources at Keystone Lake provide a wide variety of outdoor recreation opportunities. White bass, black bass, crappie, and catfish are also in abundance.

Washington Irving Scenic Nature Trail begins on the northern end of Washington Irving South Public Use Area and winds nearly a mile along sandstone bluffs dotted with gnarled cedars. The trail meanders in and out of wooded areas and passes through rock formations. Two Rivers Scenic Nature Trail begins on the northwest end of the Keystone Dam and meanders over a mile near the shoreline. The trail offers panoramic views of Keystone Lake and is often used by fishermen. Similar to Washington Irving Trail, this trail passes through heavily wooded areas. While hiking, numerous bird species may be observed.

The majority of the visitors originate within 100 miles of the project area. The peak visitation months are April through September. July is typically the highest visitation month. The majority of visits occur in USACE-managed recreation areas. Annually, there are thousands of visitors to Keystone Lake. An Oklahoma Tourism and Recreation Department study in 2010 indicated that, in general, people are migrating toward counties with recreational lake opportunities, and these counties are among the fastest growing in Oklahoma (Eaton et. al. 2014).

3.14.1 Alternative 1: No Action Alternative

Under the No Action Alternative, the 1974 Master Plan would not be revised. No significant adverse impacts on recreational opportunities would be anticipated.

3.14.2 Alternative 2: Proposed Action

The primary objective for revising the Keystone Lake Master Plan is to capture current land use and management that has evolved to meet day-to-day operational needs. Under the Proposed Action, the required revisions to the Keystone Lake Master Plan would be compatible

with current recreation management plans. The reclassification changes required for the Proposed Action were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued recreational use and development of project lands. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on recreational opportunities as a result of implementing the Proposed Action.

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SECTION 4: CUMULATIVE IMPACTS

The CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 C.F.R. § 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time by various agencies (Federal, state, or local) or individuals. CEQ guidance on cumulative impacts requires the definition of the scope of the other actions and their interrelationship with the Proposed Action (CEQ 1997). The scope must consider geographic and temporal overlaps with the Proposed Action and all other actions occurring within the zone of interest. Informed decision making is served by consideration of cumulative impacts resulting from activities that are proposed, under construction, recently completed, or anticipated to be implemented in the reasonably foreseeable future. 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 CURRENT AND REASONABLY FORESEEABLE PROJECTS WITHIN AND NEAR THE ZONE OF INTEREST

Potential projects include the construction of a commercial marina (boat docks and on-water facilities, sales/service buildings, and parking) and other recreational amenities on Federal lands at Keystone Lake in Creek County, Oklahoma. The proposed marina project and other facilities would require approximately 6 acres of land and 19 acres of water. All land for the proposed project is within the current existing lease area; however, the water portion would need to be added to the existing lease. This alternative would provide a high-quality, "clean marina" facility along with service and sales buildings. The "clean marina" concept of marina development and operation seeks to minimize any environmental impact of the construction and operations of the marina. BMPs are employed to improve petroleum control, waste management, stormwater control, among many others. The construction of structures is designed to minimize excavation and reduce disturbance to native vegetation and natural topography. Proposed structures on land would include the following: boat showroom, service building, recreational area, caretaker facility, and parking lot. Proposed on-water structures would include fueling station, pump-out station, food service, and ship store. Initially, 150 commercial marina slips would be proposed for construction. In addition, a public heated fishing dock would be constructed and operated adjacent to existing Prairie View recreational facilities. Depending upon future market demand, small rental cottages could be constructed on the east end of the lease area and minor recreational amenities such as playgrounds, a swimming pool, sports courts (e.g., basketball and volleyball), nature trails, and picnic areas could be constructed within the existing lease area as appropriate. Landscaping and plantings would include native grasses, trees, and shrubs. Buildings would be constructed in concert with the local environment, not at the expense of the local environment. All of the proposed facilities would be public facilities.

The City of Mannford, Oklahoma, through its proposed sublessee, Keystone Resort & Yacht Club (Keystone Resort), maintains and operates a themed recreational park facility and commercial marina serving the region as a recreational destination and has increased tourism in the area, thus improving the overall recreational opportunities at Keystone Lake. The Jellystone

Camp Resort and Commercial Marina is located at the existing Salt Creek Cove North Recreation Area on Keystone Lake, 1 mile east of the City of Mannford on the north side of State Highway 51, in Creek County, Oklahoma. The project area is located in portions of Sections 11, 12, 13 and 14, Township 19 North, Range 9 East of the Indian Meridian. The project area encompasses the approximately 246 acres of the existing Salt Creek Cove North public use recreation area, which is under USACE jurisdiction as part of Keystone Lake, Oklahoma. Keystone Resort & Yacht Club (Keystone Resort) subleases the property from the City of Mannford, which currently leases the property from the USACE.

A new 32,000-square-foot grocery store, McDonald's restaurant, three national chains, and a 40-unit senior independent living apartment complex are planned to be constructed within the city limits of Mannford (Nunneley 2015).

Within the next few years, the Oklahoma Department of Transportation plans to begin several projects, including the Cedar Creek Bridge, State Highway 48 Cimarron River Bridge, State Highway 151 onramp/bridge, and State Highway 51 Cimarron River Bridge replacements.

The Town of Osage has expressed an interest in leasing a closed park, Osage Park and Osage Point. Potential development may occur within the Westport Marina, Salt Creek Marina, and Cruiser Cove Yacht Club due to a change in ownership. Additionally, the Osage Nation has a strong interest in Walnut Creek Park, which may lead to future development.

4.2 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 are defined in Section 3.0. Minimal growth and development are expected to continue in the vicinity of Keystone 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 is presented below.

4.2.1 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. 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 enhance regional goals associated with good stewardship of land and water resources that would allow for continued use and development of project lands. Therefore, cumulative impacts on land use within the area surrounding Keystone Lake, when combined with past and proposed actions in the region, are anticipated to be minimal.

4.2.2 Water Resources

Keystone Lake was developed for flood control, water supply, hydroelectric power, navigation, and recreation purposes. The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good

stewardship of water resources. Therefore, negative cumulative impacts on water resources and water quality within the area surrounding Keystone Lake are not anticipated to increase when combined with past and proposed actions in the region.

4.2.3 Air Quality

For the area surrounding Keystone Lake, activities that could add to air emissions in the area are likely few and minor in nature. The Proposed Action and No Action Alternative would not adversely impact air quality within the area. The planned development projects would result in potential short-term, localized, minor, adverse impacts on air quality owing to minor, temporary emissions from construction equipment. Vehicle traffic along area roadways and routine daily activities in the communities contribute to current and future emission sources. Minor improvements to the communities, such as construction of new business buildings and highway improvement projects, could also contribute to minor future emissions. Therefore, there would be no significant cumulative impacts on air quality resulting from the revision of the Keystone Lake Master Plan when combined with past and proposed actions in the area.

4.2.4 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. Very few new projects are proposed within the Keystone Lake project area, and past, present, and future projects are not anticipated to impact the viability of any plant species or community, rare or sensitive habitats, or wildlife. No identified projects would threaten the viability of natural resources. Therefore, there would be no significant cumulative impacts on natural resources resulting from the revision of the Keystone Lake Master Plan when combined with past and proposed actions in the area.

4.2.5 Threatened and Endangered Species

The Proposed Action and No Action Alternative would not adversely impact threatened and endangered species within the area. Considerations for Federally listed threatened and endangered species at Keystone Lake are in accordance with the USACE Tulsa District's current BO issued by the USFWS. Past and potential future actions include such measures as construction and management of nesting habitat for the ILT and the ABB. Should Federally listed species change in the future (e.g., delisting of the ILT or other species or listing of new species), associated requirements will be reflected in a revised BO from the USFWS. The USACE would continue cooperative management plans with the USFWS to preserve, enhance, and protect critical wildlife habitat resources. Very few new projects are proposed within the Keystone Lake project area, and past, present, and future projects are not anticipated to impact threatened and endangered species. Therefore, there would be no significant cumulative impacts on threatened and endangered species resulting from the revision of the Keystone Lake Master Plan when combined with past and proposed actions in the area.

4.2.6 Invasive Species

Zebra mussels are present in Keystone Lake. Potential adverse impacts include infestation of other water bodies through equipment that is not properly cleaned and movement of water and sediment infested with zebra mussels. Additional current and future activities, such as recreational boating and other in-lake operation and maintenance activities, could result in the transport of zebra mussels to other water bodies. Continued information and education, as well as

construction permit requirements, will help reduce the potential transport of these invasive species.

Invasive species control has and will continue to be conducted on various areas across the project lands. Control work has been focused on sericea lespedeza, kudzu, Russian olive, and red cedar. Implementing BMPs will control 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 Master Plan are compatible with Keystone Lake invasive species management practices. Therefore, cumulative impacts from invasive species within the area surrounding Keystone Lake are not anticipated to increase when combined with past and proposed actions in the region.

4.2.7 Prime or Unique Farmlands

Over half of the area within the Keystone Lake project area is classified as Prime Farmland. Although High Density Recreation activities and facilities have been proposed for a few small areas that contain Prime Farmland (approximately 116 acres), the Prime Farmland is not currently utilized for agricultural purposes. Any soil-disturbing activities associated with land management, public recreation area maintenance, out-granted recreation area maintenance and improvements, and other routine operation and maintenance activities would be assessed individually as they arise. Very few new projects are proposed within the Keystone Lake project area, and past, present, and future projects are not anticipated to impact Prime Farmlands. Therefore, there would be no significant cumulative impacts on Prime Farmland resulting from the revision of the Keystone Lake Master Plan when combined with past and proposed actions in the area.

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 C.F.R. Parts 1500 – 1508, and the USACE's ER 200-2-2, *Environmental Quality: Procedures for Implementing NEPA*. The revision of the Master Plan 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 – Because no construction or change in operation of the reservoir is proposed, there is no plan to coordinate under the Act; however, information provided by USFWS and the ODWC on fish and wildlife resources has been utilized in the development of this assessment.

ESA of 1973, as amended – Current lists of threatened or endangered species were compiled for the revision of the Master Plan. There will be no impact on threatened or endangered species resulting from the revision of the Master Plan.

EO 13186 (Migratory Bird Habitat Protection) – Sections 3a and 3e of EO 13186 directs 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 Master Plan revision will not result in impacts on migratory bird habitat.

Migratory Bird Treaty Act of 1918 (MBTA) – The MBTA 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 ESA. The timing of resource management activities would be coordinated to avoid impacts on migratory and nesting birds.

Clean Water Act of 1977 – The Proposed Action is in compliance with all state and Federal Clean Water Act regulations and requirements and is regularly monitored by the USACE for water quality. A state water quality certification pursuant to Section 401 of the Clean Water Act is not required for the Master Plan revision. There will be no change in the existing management of the reservoir that would impact water quality.

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 National Register of Historic Places. All surveys and site salvages were coordinated with the Oklahoma SHPO. Known sites are mapped and avoided by maintenance activities. Areas that have not undergone cultural resources surveys and/or evaluations will need to do so prior to any earth-moving or other potentially impactful activities.

CAA of 1977 – The USEPA established nationwide air quality standards to protect public health and welfare. Existing operation and management of the reservoir is compliant with the CAA and will not change with the Master Plan 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. Prime Farmland is present on Keystone Lake project lands. The Proposed Action would not impact Prime Farmland present on Keystone Lake project lands.

EO 11990, Protection of Wetlands – Executive Order 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.

EO 11988, Floodplain Management – This Order 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 that is also available for these uses. The Proposed Action would not result in significant impacts on Prime Farmland present on Keystone Lake project lands.

EO 12898, Environmental Justice – This Order 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 revision of the Master Plan 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 renew. The impacts for this project from the reclassification of land would not be considered an irreversible commitment because much of the land could be converted back to prior use at a future date. 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 Keystone Lake Master Plan.

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SECTION 7: PUBLIC AND AGENCY COORDINATION

In accordance with 40 C.F.R. §§1501.7, 1503 and 1506.6, the USACE initiated public involvement and agency scoping activities to solicit input on the Master Plan revision process, as well as identify reclassification proposals, and identify significant issues related to the Proposed Action. The first action was a public scoping meeting on March 10, 2015, at the Senior Citizen's Center in Mannford, Oklahoma, to provide an avenue for the public and agency stakeholders to ask questions and provide comments. The USACE Tulsa District placed commercial advertisements on the USACE webpage and social media 2 weeks prior to the public scoping meeting. Appendix A includes the ads published in the local newspaper, the agency coordination letters, and the distribution list for the coordination letters. Please refer to Section 7.1 of the Master Plan for a summary of comments received at the public meeting. The EA was coordinated with agencies having legislative and administrative responsibilities for environmental protection. A copy of the correspondence from the agencies that provided comments and planning assistance for preparation of the EA are included in Appendix A.

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SECTION 8: REFERENCES

Brighton, Harold D. 1952. The Archaeological Survey of Keystone Reservoir: A Preliminary Report. Ms. on file, USACE, Tulsa District, Tulsa, Oklahoma.

Council on Environmental Quality (CEQ). 1997. *Considering Cumulative Effects: Under the National Environmental Policy Act.* January 1997. Internet URL: http://ceq.hss.doe.gov/nepa/ccenepa/exec.pdf.

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Eaton, Andy, Mark Aragona, and Joseph Ventura. 2014. Economic and Feasibility Study, Yogi Bear's Jellystone Park, Camp-Resort and Marina at Keystone Lake. December 1, 2014.

Moore, Bruce M. 1980. A Cultural Assessment of the Archaeological Resources in the Keystone Lake Project Area, North-Central Oklahoma. Report submitted to USACE, Tulsa District, under Contract No. DACW56-79-C-0259. Archeological Research Associates.

Nunneley, Mike. City of Mannford. Telephone conversation RE: planned future projects, water supply, sewage lagoon, traffic conditions. By Mike Zorba of Cardinal on January 5 and February 10, 2015.

U.S. Army Corps of Engineers (USACE). 1974. Design Memorandum No. 12-B, Keystone Lake Master Plan (Revised). USACE, Tulsa District, Oklahoma.

USACE. 2012. Keystone Lake Water Control Manual. USACE, Tulsa District, Oklahoma.

USACE. 2013. Transmittal of USFWS Biological Opinion to USFWS, Tulsa District, in reply to FWS/R2/OKES/2012-F-0391, 2013-F-0935. April 10, 2013.

USACE. 2015. OMBIL Environmental Stewardship Module. USACE, Tulsa District, Oklahoma.

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SECTION 9: ACRONYMS/ABBREVIATIONS

°	Degrees
µS/cm	Microsiemens per Centimeter
ABB	American Burying Beetle
AD	Anno Domini
ARA	Archaeological Research Associates
BMP	Best Management Practice
BO	Biological Opinion
BUMP	Beneficial Use Monitoring Program
CAA	Clean Air Act
CAP	Climate Action Plan
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
cfs	Cubic Feet per Second
CO_2	Carbon Dioxide
CO_2e	CO2-equivalent
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ER	Engineer Regulation
ESA	Endangered Species Act
F	Fahrenheit
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	Fiscal Year
GHG	Greenhouse Gas
ILT	Interior Least Tern
MBTA	Migratory Bird Treaty Act
MKARNS	McClellan-Kerr Arkansas River Navigation System
msl	Above Mean Sea Level
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NHPA	National Historic Preservation Act
ODWC	Oklahoma Department of Wildlife Conservation
OMBIL	Operations and Maintenance Business Information Link
OU	University of Oklahoma
OWRB	Oklahoma Water Resources Board
ppm	Parts per Million
ppt	Parts per Trillion
SHPO	State Historic Preservation Office
TDS	Total Dissolved Solids
TSI	Trophic State Index
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture

USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WWAC	Warm Water Aquatic Community-Fish and Wildlife Propagation

SECTION 10: LIST OF PREPARERS

Sherry Ethell – NEPA specialist with Gulf South Research Corporation; 24 years of experience.

Robert Morrow – Natural Resource Specialist of Regional Planning and Environmental Center, USACE; 8 years of experience.

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APPENDIX A
NEPA COORDINATION AND SCOPING

US Army Corps of Engineers
BUILDING STRONG®

Corps to hold open house workshop for Keystone Lake master plan review, revision

Posted 2/20/2015

Release no. 15-008

Contact
Sara Goodeyon 918-669-7342

TULSA, Okla. — The Tulsa District, U.S. Army Corps of Engineers will host an open house workshop to review and revise the project master plan for Keystone Lake, at the City of Mannford Senior Citizen Center, 169 Greenwood Avenue, Mannford, Okla., March 10 from 6-8 p.m.

This will be an informal come-and-go open house with no formal presentation. Interested persons can attend the open house workshop to visit the information tables and discuss the project with Corps personnel.

Photos

The Tulsa District, U.S. Army Corps of Engineers will host an open house workshop to review and revise the project master plan for Keystone Lake, at the City of Mannford Senior Citizen Center, 169 Greenwood Avenue, Mannford, Okla., March 10 from 6-8 p.m. (Photo by USACE)

Forms will be available for attendees to use to provide input and comments about the revision of the lake master plan. Comments are also welcome in any form throughout the master plan revision process.

The master plan is a strategic land management document that guides the comprehensive management and development of all project recreational, natural and cultural resources throughout the life of a Corps project. It is a vital tool for efficient and cost-effective management, development and use of project lands.

It is important to note that the master plan does not address issues associated with private boat docks or permits for shoreline vegetation modification. These issues are specifically addressed in the shoreline management plan for a lake project. The shoreline management plan for Keystone Lake will be reviewed and potentially revised at a later date. Private dock and shoreline vegetation modification permits will be addressed at that time, and not in the current master plan review process.

Please direct comments and questions regarding the open house workshop or master plan review process for Keystone Lake to Keystone Lake Manager William Jeffries, 23115 Wekiwa Road, Sand Springs, Okla., 74063-5333.

-30-

DEPARTMENT OF THE ARMY
UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101 EAST AVENUE
TULSA OK 74128-4609

Operations Division
Natural Resources and Recreation Branch

Stakeholder/Resource Agency
Address

Dear Stakeholder/Resource Agency:

The Tulsa District is initiating a review and revision of the master plan (MP) for Keystone Lake, Oklahoma. The MP is the strategic land management document that guides the comprehensive management and development of all project recreational, natural, and cultural resources throughout the life of a Corps lake project. It is a vital tool for efficient and cost-effective management, development, and use of project lands. We welcome your comments and participation in review and revision of the MP for Keystone Lake.

It is important to note that a master plan does not address issues associated with private boat docks or permits for shoreline vegetation modification. These issues are specifically addressed in the shoreline management plan (SMP) for a lake project. The SMP for Keystone Lake will be reviewed and revised at a later date. Private dock and shoreline vegetation modification permits will be addressed at that time and not in the current MP revision process.

An informal public workshop for discussion of the MP revision for Keystone Lake is scheduled for 6:00 to 8:00 p.m. on March 10, 2015 at the City of Mannford Senior Citizens Center, 169 Greenwood Avenue, Mannford, Oklahoma. The workshop will be come-and-go format with no formal presentation. We invite and encourage you to attend this workshop anytime between listed times, visit the information tables, and discuss MP issues with our staff. Comment forms will be provided at the workshop or you are welcome to submit comments in any form throughout the MP revision process.

Thank you for your interest in Keystone Lake. We welcome your comments and participation at the public workshop and throughout the master plan review process. Questions should be directed to Mr. William Jeffries, Keystone Lake Manager, at 918-865-2621 or e-mail William.R.Jeffries@usace.army.mil.

Sincerely,

Stephen L. Nolen
Chief, Natural Resources
and Recreation Branch

DISTRIBUTION LIST (February 2015)

Mr. Jontie Aldrich, Acting Field Supervisor U.S. Fish and Wildlife Service Oklahoma Ecological Services Field Office 9014 E. 21st St. Tulsa, OK 74129- 1428	Dr. Bob Blackburn State Historic Preservation Officer Oklahoma Historical Society Oklahoma History Center 800 Nazih Zuhdi Drive Oklahoma City, OK 73105
Sharon Osowski Morgan, Ph.D. Ecologist/Environmental Scientist Office of Environmental Justice and Tribal Affairs US EPA Region 6 Mailcode 6RA-DA 1445 Ross Ave Dallas, TX 75202	Mr. Ron Curry Federal Region VI Administrator U. S. Environmental Protection Agency 1445 Ross Ave., Suite 1200 Dallas, TX 75202
Mr. Gary O'Neill State Conservationist USDA, Natural Resources Conservation Service 100 USDA, Suite 206 Stillwater, OK 74074-2655	Mr. Richard Hatcher Director Oklahoma Department of Wildlife Conservation 1801 N. Lincoln Blvd. Oklahoma City, OK 73105
Mr. Scott Thompson Executive Director Oklahoma Department of Environmental Quality P.O. Box 1677 Oklahoma City, OK 73101-1677	Kristi Roy ODEQ- Water Quality Division PO Box 1677 Oklahoma City, OK 73130 405-702-8144
Mr. J. D. Strong Executive Director Oklahoma Water Resources Board 3800 N. Classen Boulevard Oklahoma City, OK 73118	Mr. Derek Smithee Chief, Water Quality Programs Division Oklahoma Water Resources Board 3800 North Classen Boulevard Oklahoma City, OK 73118
Mr. Trey Lamb Executive Director Oklahoma Conservation Commission 2800 N. Lincoln Blvd., Suite 160 Oklahoma City, OK 73105	Ms. Shanon Phillips Director Water Quality Programs Oklahoma Conservation Commission 2800 N. Lincoln Blvd., Suite 160 Oklahoma City, OK 73105
Mr. Ian H. Butler Oklahoma Natural Heritage Inventory Oklahoma Biological Survey 111 E. Chesapeake Street Norman, OK 73019-0575	Dr. Robert L. Brooks University of Oklahoma Oklahoma Archeological Survey 111 E. Chesapeake Norman, OK 73019-0575

Mr. Tim Vermillion NEPA Project Manager, Division 4 Oklahoma Department of Transportation Environmental Programs Division 200 N.E. 21st Street, Room 3D2a Oklahoma City, OK 73105	Ms. Deby Snodgrass Executive Director Oklahoma Tourism and Recreation Department 120 N. Robinson, 6th Floor Oklahoma City, OK 73102
Mr. Mike Nunneley City Administrator City of Mannford 300 Coonrod Mannford, OK 74044-0327	Mr. Elzie Smith, City Manager City of Cleveland 201 N. Broadway Street Cleveland, OK 74020
Ms. Elizabeth Gray, City Manager City of Sand Springs P.O. Box 338 Sand Springs, OK 74063	Mr. Patrick Kennedy, Mayor City of Oilton 101 West Main Street Oilton, OK 74052
Chief Tarpie Yargee Alabama-Quassarte Tribal Town, Oklahoma P.O. Box 187 Wetumka, OK 74883	Mekko Jeremiah Hobia Kialegee Tribal Town, Oklahoma P.O. Box 332 Wetumka, OK 74883
Principal Chief George Tiger Muscogee (Creek) Nation, Oklahoma P.O. Box 580 Okmulgee, OK 74447	Principal Chief Geoffrey Standing Bear Osage Nation, Oklahoma P.O. Box 779 Pawhuska, OK 74056
President Marshall Gover Pawnee Nation of Oklahoma P.O. Box 470 Pawnee, OK 74058	Principal Chief George Thurman Sac & Fox Nation, Oklahoma Route 2, Box 246 Stroud, OK 74079
Principal Chief Leonard Harjo Seminole Nation of Oklahoma P.O. Box 1498 Wewoka, OK 74884	Mekko George Scott Thlopthlocco Tribal Town, Oklahoma P.O. Box 188 Okemah, OK 74859
President Terri Parton Wichita and Affiliated Tribes of Oklahoma P.O. Box 729 Anadarko, OK 73005	CrossTimbers The Harbor Marina 1989 CrossTimbers Lane Mannford, OK 74044
Keyport Marina 1200 S. Keyport Road Mannford, OK 74044	Pier 51 Marina 1926 S. Hwy 151 Sand Springs, OK 74063
Westport Marina Rt. 3, Box 3-4 Cleveland, OK 74020	Mr. Chris Turner, Administrator Southwestern Power Administration One West Third Street Tulsa, OK 74103-3502

J. D. STRONG
EXECUTIVE DIRECTOR

MARY FALLIN
GOVERNOR

STATE OF OKLAHOMA
WATER RESOURCES BOARD
www.owrb.ok.gov

OKLAHOMA WATER RESOURCES BOARD
Planning & Management Division
Oklahoma City, OK

PUBLIC NOTICE REVIEW

___ We have no comments to offer. _X_ We offer the following comments.

WE RECOMMEND THAT YOU CONTACT THE LOCAL FLOODPLAIN ADMINISTRATOR FOR POSSIBLE PERMIT REQUIREMENTS FOR THIS PROJECT. THE OWRB WEB SITE, www.owrb.ok.gov, contains a directory of floodplain administrators and is located under forms/floodplain management/floodplain administrators, listed alphabetically by name of community. **If this development would fall on STATE OWNED or operated property, a floodplain development permit is required from OWRB.** The Chapter 55 Rules and permit application for this requirement can be found on the OWRB web site listed above. If this project is proposed in a non-participating community, try to ensure that this project is completed so that it is reasonably safe from flooding and so that it does not flood adjacent property if at all possible.

IF THE MP INCLUDES DEVELOPMENT, FILL, OR EXCAVATION, A CITY, COUNTY, OR STATE FLOODPLAIN PERMIT WILL BE REQUIRED. See below.

Reviewer: _Cathy Poage, CFM_____ **Date:** _04/13/2015_

Project Name: Review and Revision of MP for Keystone Lake, Located in Creek, Osage, and Pawnee Counties, OK

FIRM Name: USACE, Stephen L. Nolen, Chief, Natural Resources & Recreation
CC: Craig Southern, CFM, FPA, Creek County
Jake Bruno, FPA, Osage County

* Creek and Osage Counties participate in the NFIP and have a floodplain development permitting system. Pawnee County does not. Please see paragraph above.

Keystone Mailing list
February 2016

Ms. Jonna Polk, Team Leader
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 E. 21st St.
Tulsa, OK 74129- 1428

Dr. Bob Blackburn
State Historic Preservation Officer
Oklahoma Historical Society
Oklahoma History Center
800 Nazih Zuhdi Drive
Oklahoma City, OK 73105

Sharon Osowski Morgan, Ph.D.
Ecologist/Environmental Scientist
Office of Environmental Justice and Tribal Affairs
US EPA Region 6
Mailcode 6RA-DA
1445 Ross Ave
Dallas, TX 75202

Mr. Ron Curry
Federal Region VI Administrator
U. S. Environmental Protection Agency
1445 Ross Ave., Suite 1200
Dallas, TX 75202

Mr. Gary O'Neill
State Conservationist
USDA, Natural Resources Conservation Service
100 USDA, Suite 206
Stillwater, OK 74074-2655

Mr. Richard Hatcher
Director
Oklahoma Department of Wildlife Conservation
1801 N. Lincoln Blvd.
Oklahoma City, OK 73105

Mr. Scott Thompson
Executive Director
Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

Kristi Roy
ODEQ- Water Quality Division
PO Box 1677
Oklahoma City, OK 73130
405-702-8144

Mr. J. D. Strong
Executive Director
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118

Mr. Derek Smithee
Chief, Water Quality Programs Division
Oklahoma Water Resources Board
3800 North Classen Boulevard
Oklahoma City, OK 73118

Mr. Trey Lamb
Executive Director
Oklahoma Conservation Commission
2800 N. Lincoln Blvd., Suite 160
Oklahoma City, OK 73105

Ms. Shanon Phillips
Director Water Quality Programs
Oklahoma Conservation Commission
2800 N. Lincoln Blvd., Suite 160
Oklahoma City, OK 73105

Mr. Ian H. Butler
Oklahoma Natural Heritage Inventory
Oklahoma Biological Survey
111 E. Chesapeake Street
Norman, OK 73019-0575

Dr. Amanda Regnier
University of Oklahoma
Oklahoma Archeological Survey
111 E. Chesapeake
Norman, OK 73019-0575

Mr. Tim Vermillion
NEPA Project Manager, Division 4
Oklahoma Department of Transportation
Environmental Programs Division
200 N.E. 21st Street, Room 3D2a Oklahoma City, OK 73105

Ms. Deby Snodgrass
Executive Director
Oklahoma Tourism and Recreation Department
120 N. Robinson, 6th Floor
Oklahoma City, OK 73102

Mr. Mike Nunneley
City Administrator
City of Mannford
300 Coonrod
Mannford, OK 74044-0327

Mr. Elzie Smith, City Manager
City of Cleveland
201 N. Broadway Street
Cleveland, OK 74020

Ms. Elizabeth Gray, City Manager
City of Sand Springs
P.O. Box 338
Sand Springs, OK 74063

Mr. Patrick Kennedy, Mayor
City of Oilton
101 West Main Street
Oilton, OK 74052

Chief Tarpie Yargee
Alabama-Quassarte Tribal Town, Oklahoma
P.O. Box 187
Wetumka, OK 74883

Mekko Jeremiah Hobia
Kialegee Tribal Town, Oklahoma
P.O. Box 332
Wetumka, OK 74883

Principal Chief James Floyd
Muscogee (Creek) Nation, Oklahoma
P.O. Box 580
Okmulgee, OK 74447

Principal Chief Geoffrey Standing Bear
Osage Nation, Oklahoma
P.O. Box 779
Pawhuska, OK 74056

President W. Bruce Pratt
Pawnee Nation of Oklahoma
P.O. Box 470
Pawnee, OK 74058

Principal Chief Kay Rhoads
Sac & Fox Nation, Oklahoma
Route 2, Box 246
Stroud, OK 74079

Principal Chief Leonard Harjo
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

Mr. Ryan Morrow, Town King
Thlopthlocco Tribal Town, Oklahoma
P.O. Box 188
Okemah, OK 74859

President Terri Parton
Wichita and Affiliated Tribes of Oklahoma
P.O. Box 729
Anadarko, OK 73005

CrossTimbers The Harbor Marina
1989 CrossTimbers Lane
Mannford, OK 74044

Keyport Marina
1200 S. Keyport Road
Mannford, OK 74044

Pier 51 Marina
1926 S. Hwy 151
Sand Springs, OK 74063

Westport Marina
Rt. 3, Box 3-4
Cleveland, OK 74020

Mr. Scott Carpenter, Administrator
Southwestern Power Administration
One West Third Street
Tulsa, OK 74103-3502

Mr. Clark Miller
109 Craven Dr.
Mannford, OK 74044

Mr. Tyler Buttram
130 Birch
Mannford, OK 74044

Bell Timmons
P.O. Box 1967
Mannford, OK 74044

Mr. Larry Chasteen
P.O. Box 1116
Mannford, OK 74044

Mr. William E. Barrett
168 Glendale Circle
Mannford, OK 74044

Willard Walbridge
P.O. Box 521
Oilton, OK 74052

Mr. Matt Meyer
River Parks Authority
2424 E. 21st Street, Suite 300
Tulsa, OK 74114

Jimmie D. Copeland
1606 Lakeview Drive
Mannford, OK 74044

Jearld McAfee
308 W. 49th Street
Sand Springs, OK 74063

Jim Selzen
P.O. Box 952
Jenks, OK 74037

DEPARTMENT OF THE ARMY
UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101 EAST AVENUE
TULSA OK 74128-4609

MARCH 1, 2016

Operations Division
Natural Resources and Recreation Branch

TO INTERESTED PARTIES

The Tulsa District and Regional Planning and Environmental Center (RPEC) have revised the existing Keystone Lake, OK Master Plan and have assessed the environmental impacts of this Master Plan revision. 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 resource project.

The revised Master Plan and Environmental Assessment (EA) were prepared in accordance with U.S. Army Corps of Engineers Regulation 1130-2-550, Project Operations - Recreation Operations and Maintenance Policies, and 33 Code of Federal Regulations, Part 230, Policy and Procedures for Implementing the National Environmental Policy Act, respectively. It has been determined from the referenced EA that adoption of the Master Plan revision will have no significant adverse impacts on the natural or human environment.

The Draft Master Plan and Draft Environmental Assessment are available on the Tulsa District web page for your review (http://www.swt.usace.army.mil). If you have comments they should be submitted by **April 1, 2016** to the U.S. Army Corps of Engineers, Tulsa District, ATTN: OD-NR (Keystone Lake Master Plan Revision), 1645 South 101st East Avenue, Tulsa, Oklahoma 74128 or via email to Mr. Stephen Nolen at Stephen.L.Nolen@usace.army.mil.

Should you have any questions, I can be reached at 918.669.7660 or at the above email address. Thank you for your interest in Keystone Lake.

Sincerely,

Stephen L. Nolen
Chief, Natural Resources and Recreation Branch

WILDLIFE CONSERVATION COMMISSION

John P. Zelbst, CHAIRMAN
John D. Groendyke, VICE CHAIRMAN
Danny Robbins, SECRETARY
Ed Abel, MEMBER
Bill Brewster, MEMBER
Leigh Gaddis, MEMBER
Robert S. Hughes II, MEMBER
Bruce Mabrey, MEMBER

OKLAHOMA

MARY FALLIN, GOVERNOR
RICHARD T. HATCHER, DIRECTOR
wildlifedepartment.com

DEPARTMENT OF WILDLIFE CONSERVATION

P.O. Box 53465 Oklahoma City, OK 73152 PH. (405) 521-3851

March 14, 2016

U.S. Army Corps of Engineers, Tulsa District
ATTN: OD-NR (Keystone Lake Master Plan Revision)
1645 South 101st East Avenue
Tulsa, OK 74128

RE: KEYSTONE LAKE MASTER PLAN, COMMENTS AND CONCERNS

Gentlemen:

1. In section 2.4, **WATER QUALITY**, paragraph 4, there is a brief mention of the water quality impact on striped bass and the "almost annual striped bass kill in Keystone Lake." Research conducted by Zale, et al. (1992) recommended the evaluation and implementation of "active reservoir manipulation strategies" for a small area of the reservoir near the dam to create an oxygenated thermal refuge for striped bass. Since striped bass are still a highly prized sportfish within Keystone Lake, the public relations and financial benefits should outweigh the costs of implementing such a strategy. If no other course of action is suitable for the COE to explore, then the operation of the sluice gates during times of flood water releases is the next best option for reducing, but not eliminating, the threat of a striped bass fish kill. Water releases through the sluice gates helps remove the anoxic hypolimnetic water from the reservoir, increasing the metalimnion depth, making it more resistant to summer heating.

2. In section 2.8, **RESOURCE ANALYSIS**, sub-section 2.8.1, Fish and Wildlife Resources, we would recommend the following:
   a) In the first paragraph, adding blue catfish to the list of species sought by fishermen.
   b) In paragraph 3, even though the striped bass population is self-sustaining, it is still subject to almost annual die-offs as a result of water quality issues mentioned in section 2.4.
   c) In Paragraph 4, the list of regulations is almost all outdated. The following is how the paragraph should probably read:

   Currently, statewide creel and length limits apply to all sportfish at Keystone Lake including: Largemouth and smallmouth bass (6 fish combined daily, 14 inch minimum length limit), spotted bass (no daily limit, no length limit), blue catfish and channel catfish (15 fish combined daily, one blue catfish over 30 inches), striped bass (5 fish daily, no length limit), flathead catfish (5 fish daily, no length limit), and crappie (37 combined, no length limit), though this could change over time. Current fishing regulations are published annually in the Oklahoma Fishing Guide through the Oklahoma Department of Wildlife.

Sincerely,

Chris Whisenhunt
Fisheries Biologist, Oklahoma Department of Wildlife Conservation

cc: Josh Johnston, NER Fisheries Supervisor, ODWC
Barry Bolton, Chief of Fisheries, ODWC
Ken Cunningham, Assistant Chief of Fisheries, ODWC

Encs.: Abstract: Zale, et. al.; *Analysis of the Suitability of Keystone Reservoir, Oklahoma, for Habitation by Adult Striped Bass*. 1992.

The Oklahoma Department of Wildlife Conservation is the state agency responsible for managing fish and wildlife. The Wildlife Department receives no general tax appropriations and is supported by hunting and fishing license fees and federal excise taxes on hunting and fishing equipment.

FINAL REPORT

STATE: OKLAHOMA PROJECT NUMBER: F-41-R

PROJECT TITLE: Factors Influencing Fish Populations in Oklahoma Waters

STUDY TITLE: Analysis of the Suitability of Keystone Reservoir, Oklahoma, for Habitation by Adult Striped Bass

PERIOD COVERED: July 1, 1989 to June 30, 1992

OBJECTIVE NUMBER: 12 JOB NUMBER: 12

ABSTRACT

Summer mortalities of adult striped bass (*Morone saxatilis*) caused by unsuitable water quality occurred in Keystone Reservoir throughout the 1980's. To improve limnological conditions in the reservoir, the U.S. Army Corps of Engineers, Tulsa District, modified procedures for floodwater releases at Keystone Dam beginning in March 1989. The revised procedure involved enhancement of hypolimnetic discharges via the dam's sluice gates in combination with tainter-gate releases whenever floodwater discharges occurred. We evaluated the effectiveness of the revised discharge procedure by monitoring water quality and striped bass mortalities in 1989, 1990, and 1991.

The revised discharge procedure was successful in decreasing the volume of the anoxic hypolimnion and increasing the depth of the metalimnion in both 1989 and 1990. The oxygenated epilimnion therefore composed a larger fraction of the water column than previously. The metalimnion was made more resistant to heating by the enhanced thermal inertia of the epilimnion, but retained its proclivity to cool and reoxygenate quickly during epilimnetic mixing caused by cool fronts and precipitation. Mortality events did not occur in 1989 or 1990.

No floodwater discharges were necessary in 1991, but hydropower releases evacuated hypolimnetic waters and thereby maximized the relative volume of the epilimnion. Nevertheless, metalimnetic temperatures exceeded the tolerance of adult striped bass in 1991 and a die-off ensued. This resulted from a combination of environmental factors including low inflows, high air temperatures, low reservoir elevations, and an absence of significant summer cool fronts or precipitation.

The probability of mortality-inducing limnological conditions in Keystone Reservoir was reduced but not eliminated by implementation of the revised floodwater discharge procedure. Discerning the annual probability of mortality-inducing weather conditions at Keystone Reservoir is tenuous, but it is likely that the conditions experienced in 1991 will recur. We therefore recommend evaluation and implementation of active reservoir manipulation strategies, such as localized artificial destratification, to create an oxygenated thermal refuge for adult striped bass in Keystone Reservoir during summer.

Morrow, Robert SWF

From: Nolen, Stephen L SWT
Sent: Monday, March 28, 2016 11:47 AM
To: Morrow, Robert SWF
Cc: Irwin, Eric J SWF; Miller, Travis W SWT
Subject: FW: [EXTERNAL] Fwd: keystone master plan

Rob:

Keystone MP comment received via email.

sln

-----Original Message-----
From: Nolen, Stephen L SWT
Sent: Monday, March 28, 2016 11:46 AM
To: Hensley, John W <John.W.Hensley@usace.army.mil>
Subject: RE: [EXTERNAL] Fwd: keystone master plan

Thanks -- got it.

Steve

-----Original Message-----
From: Hensley, John W
Sent: Monday, March 28, 2016 11:40 AM
To: Nolen, Stephen L SWT <Stephen.L.Nolen@usace.army.mil>
Subject: RE: [EXTERNAL] Fwd: keystone master plan

My goal is to make available to Washington Irving, Appalachia Bay and surrounding community an ice and filtered water machine. This would be the best location with the least amount of inconvenience for all of the locations. This would require a lease of about 2 acres, and to my understanding a structure like this cannot be on low density recreation but is allowed to be on high density recreation area once all approved. Thanks again for the consideration

-----Original Message-----
From: Nolen, Stephen L SWT
Sent: Monday, March 28, 2016 10:44 AM
To: Hensley, John W <John.W.Hensley@usace.army.mil>
Subject: RE: [EXTERNAL] Fwd: keystone master plan

Mr. Hensley:

Thank you for your comment. Do you have a particular goal, objective, or rationale for this proposed reclassification that the lake office and master plan team could consider in evaluating this request? Any additional information you could provide would be helpful. Thanks again.

Steve Nolen

-----Original Message-----

From: Hensley, John W
Sent: Monday, March 28, 2016 10:35 AM
To: Nolen, Stephen L SWT <Stephen.L.Nolen@usace.army.mil>
Subject: FW: [EXTERNAL] Fwd: keystone master plan

I would like to see the strip of Corps land between the flood water level and private land, North of hwy 412/64 and east of Bears Glenn Rd. exit. on Keystone Lake classification changed from low density recreation to high density recreation area. Thank you for this consideration.

Department of Energy
Southwestern Power Administration
One West Third Street
Tulsa, Oklahoma 74103-3502

April 1, 2016

Stephen L. Nolen
Chief, Natural Resources and Recreation Branch
Operations Division
U.S. Army Corps of Engineers, Tulsa District
1645 S. 101st East Avenue
Tulsa, OK 74128

Dear Mr. Nolen,

Thank you for the opportunity to comment on the update of the Keystone Lake Master Plan (Master Plan) and the accompanying draft Environmental Assessment (EA). As the Federal agency responsible for scheduling and marketing the hydroelectric power and energy from the Keystone project, Southwestern Power Administration (Southwestern) has comments regarding the update to the Master Plan and the EA.

First and foremost, any updates made to the Master Plan should not negatively impact hydroelectric power operations at the Keystone project. Hydroelectric power is one of the original Congressionally authorized purposes of the project, and Southwestern applies a portion of the revenues collected each year to paying off the U.S. taxpayers' original investment and ongoing reinvesment, plus interest, as well as annual operation and maintenance costs, for the Keystone hydroelectric power plant and for an allotted portion of the joint-use infrastructure and project facilities. Therefore, other project uses should not receive additional benefits to the detriment of hydroelectric power.

Moreover, it is important to note that the Master Plan is not intended to address water level management at Keystone Lake. However, lake users should be made aware in the Master Plan update that lake levels will fluctuate depending on a variety of factors, including rainfall (or lack thereof), flood control operations, water supply withdrawals, and power demand. Prior to the construction of additional facilities in or around Keystone Lake, developers should continue to be informed of these routine and sometimes significant fluctuations.

Additionally, when designating lands for project operations, please keep in mind that future major rehabilitation projects at the Keystone hydroelectric power plant may require an increase in the footprint of the Keystone powerhouse and switchyard facilities. A sufficient buffer around the current powerhouse and switchyard should be included as project operations land to allow for potential expansion.

Finally, technical comments are as follows (note that paragraphs are numbered from the beginning of the referenced section or sub-section):

1. Page 1-3, Section 1.4 Description of Project and Watershed, fourth paragraph, last sentence. Suggest updating the conservation pool capacity to the 2008 survey value and providing the incremental capacity for elevation 706 to 723 feet, as the sentence implies, rather than stating the total storage at elevation 723 feet.
2. Page 1-3, Section 1.6 Pertinent Project Information, Table 1.1. Suggest updating the table with 2008 survey values and removing note about sediment reserve.
3. Page 2-1, Section 2.2 Hydrology and Groundwater, second paragraph, first sentence. Suggest updating capacity and area data with 2008 survey values.
4. Page 6-2, Section 6.4 Powerhouse and Hydropower, third paragraph. Suggest updating the conservation pool capacity with 2008 survey values.
5. Page 6-2, Section 6.4 Powerhouse and Hydropower, Table 6.1 Power Data. Suggest removing Table 6.1 due to errors and lack of relevance.
6. Appendix A, Land Classification, Managing Agencies, Recreation, and Seaplane Restriction Maps, Land Classification Maps. Please include the map for Land Classification (Sheet 09).
7. Draft Environmental Assessment (EA), Page 2, Section 1.1 Project Location and Setting, fourth paragraph, last sentence. Suggest updating the conservation pool capacity with 2008 survey values and providing incremental capacity for elevation 706 to 723 feet as the sentence implies, rather than stating the total storage at elevation 723 feet.
8. Draft EA, Page 12, Section 3.2.1 Hydrology and Groundwater, second paragraph, first sentence. Suggest updating capacity and area data with 2008 survey values.

Southwestern appreciates the opportunity to provide input for the Master Plan update. If you have any questions or comments, please contact Tyler Gipson at (918) 595-6685 or Tyler.Gipson@swpa.gov.

Sincerely,

Ashley E Cooke

FOR Fritha Ohlson
Director
Division of Resources and Rates

cc:
Nicki Fuller
Executive Director
Southwestern Power Resources Association

Sherry Ethell

From: Nolen, Stephen L SWT <Stephen.L.Nolen@usace.army.mil>
Sent: Tuesday, April 05, 2016 6:07 AM
To: Morrow, Robert SWF
Cc: Irwin, Eric J SWF; Miller, Travis W SWT
Subject: FW: Environmental Assessment
Attachments: FactSheet-GeneralConstructionProjects.pdf

-----Original Message-----
From: Roberts, Jon [mailto:Jon.Roberts@deq.ok.gov]
Sent: Tuesday, April 05, 2016 7:03 AM
To: Nolen, Stephen L SWT <Stephen.L.Nolen@usace.army.mil>
Subject: [EXTERNAL] Environmental Assessment

Dear Mr. Nolen:

In response to your request, we have completed an environmental review of air, land and water records for the projects listed below. Attached is a list of environmental recommendations that you should consider as you complete your projects.

Projects

Letter dated March 1, 2016 - Keystone Lake Master Plan Revision

If you have any questions or need clarification, please contact me.

Regards,

_____

Jon A. Roberts, Senior Manager

Office of External Affairs

Oklahoma Department of Environmental Quality

P. O. Box 1677

707 N. Robinson Ave.

Oklahoma City, OK 73101-1677

Ph: (405) 702-7111; Fax: (405) 702-7101

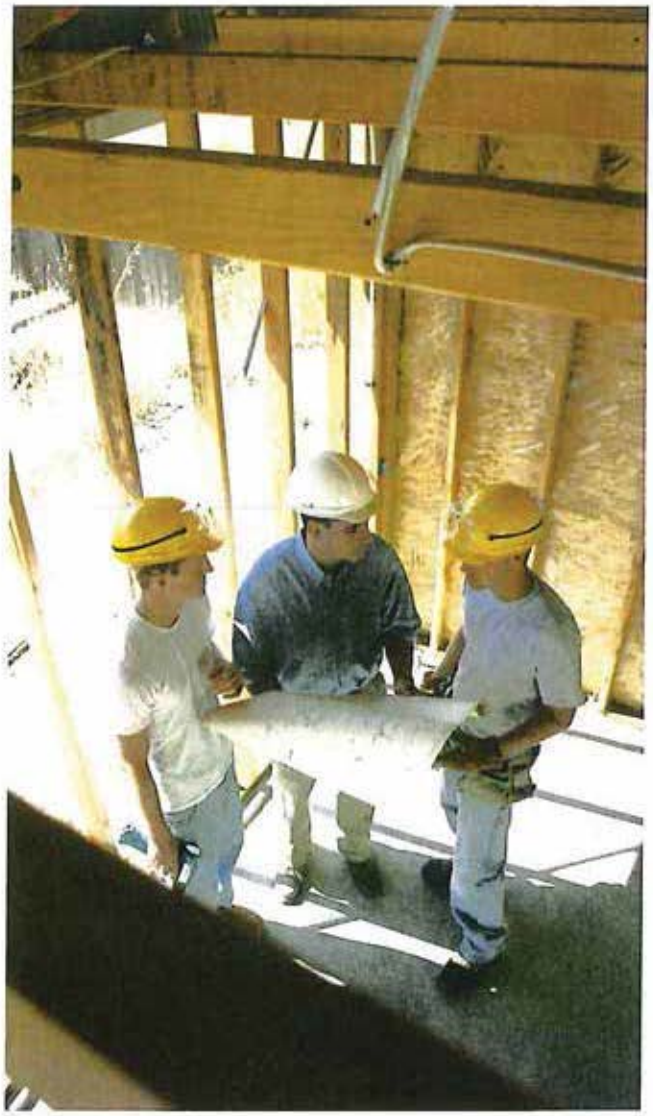
Blockedhttp://www.deq.state.ok.us/OEA/index.html

October 2010

AIR, LAND & WATER

Recommendations for General Construction/Improvement Projects

During the environmental review process for general construction/improvement projects, the following recommendations are offered to assist in ensuring environmental compliance throughout the project.



- Any project which includes the removal or installation of water and/or sewer lines shall conform to all relevant local and/or state plumbing codes.
- Any project which includes the removal of paint shall conform to all relevant lead-based paint regulations.
- Any project which includes the handling and/or removal of asbestos shall conform to all relevant asbestos regulations.
- During any construction, demolition, and/or rehabilitation reasonable precautions should be taken to protect air quality by minimizing fugitive dust emissions.
- If construction, demolition, and/or rehabilitation will disturb more than one acre of land, a determination should be made as to whether an Oklahoma Pollutant Discharge Elimination System (OPDES) permit for storm water is required during the construction phase.
- Any solid or hazardous waste from the site shall be recycled and/or disposed of in accordance with all relevant solid waste and/or RCRA regulations.

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

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APPENDIX D - ACRONYMS

KEYSTONE DAM AND RESERVOIR
ACRONYMS/ABBREVIATIONS

ABB	American Burying Beetle
ARA	Archaeological Research Associates
BO	Biological Opinion
BUMP	Beneficial Use Monitoring Program
CAP	Climate Action Plan
cfs	Cubic Feet per Second
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Areas
FONSI	Findings of No Significant Impact
GSI	Geographical Information Systems
HDR	High Density Recreation
ILT	Interior Least Tern
Kw	Kilowatts
MKARNS	McClellan-Kerr Arkansas River Navigation System
mls	Mean Sea Level
MP	Master Plan
MRML	Multiple Resource Management Lands
MSA	Metropolitan Statistical Area
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	National Resource Conservation Service
NTU	Nephelometric Turbidity Unit
OAS	Oklahoma Archeological Survey
OCWCS	Oklahoma Comprehensive Wildlife Conservation Strategy
ODPT	Oklahoma Department of Parks and Tourism
ODWC	Oklahoma Department of Wildlife Conservation pg 2.12
OMBIL	Operations and Maintenance Business Information Link
OMP	Operation Management Plan
OU	University of Oklahoma
OWRB	Oklahoma Water Resources Board

ppm	Parts per Million
PTD	Project Development Team
RPEC	Regional Planning and Environmental Center
RV	Recreational Vehicle
SCORP	State Comprehensive Recreation Plan
SHPO	State Historic Preservation Act
SMP	Shoreline Management Plan
SWD	Southwest Division
TSI	Trophic State Index
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WWAC	Warm Water Aquatic Community
WMA	Wildlife Management Area