

MEMORANDUM FOR Commander, Tulsa District

SUBJECT: Tenkiller Ferry Lake, Illinois River, Oklahoma Master Plan Update (June 2015)

1. Enclosed subject Master Plan is submitted for review and approval in accordance with ER/EP 1130-2-550.
2. Point-of-contact in Operations Division for this request is Steve Nolen, 918-669-7660.



EARL GROVES  
Chief, Operations Division

Encl

Approved: \_\_\_\_\_



Disapproved: \_\_\_\_\_



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

# MASTER PLAN

## Tenkiller Ferry Lake Illinois River, Oklahoma



**US Army Corps  
of Engineers®**  
Tulsa District

**June 2015**

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**TENKILLER FERRY LAKE MASTER PLAN  
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## **CHAPTER 1 - INTRODUCTION**

### **1.1. PROJECT AUTHORIZATION**

Tenkiller Ferry Lake was authorized by the Flood Control Act approved June 28, 1938. Installation of power features were authorized by the River and Harbor Act approved July 24, 1946; Project Document Committee No. 1, 75th Congress, 1st Session, HD 758, 79th Congress, 2d Session. The originally-authorized purposes of the lake included flood control and hydroelectric power generation.

### **1.2. PROJECT PURPOSE**

Tenkiller Ferry Lake is a feature of the project for comprehensive development of the Arkansas River and tributaries for flood risk management, hydroelectric power, water supply, natural resource management, and recreation. Additionally, hydroelectric generation provides regulated flows from Tenkiller Ferry Reservoir into the McClellan-Kerr Arkansas River Navigation System (MKARNS).

### **1.3. PURPOSE AND SCOPE OF MASTER PLAN**

This report proposes land classifications necessary to develop and conserve existing project lands to realize the optimal potential of the project. This plan incorporates conservation, enhancement, development, operation, management, and public interest use of all project lands, waters, forests, and other resources throughout the life of the project, and includes plans showing the most desirable and feasible locations and types to meet these goals. Emphasis has been placed on a balanced approach to public access, camping, shoreline use, water based recreation, and conservation. Adequate facilities and land-based requirements are proposed to insure all desired recreational opportunities are achieved and assure compliance with applicable environmental regulations, laws and policies. This plan also proposes proper utilization of natural resources and recreational facilities in regards to available funding while at the same time preserving the biological, scenic, scientific and wildlife resources, plus protecting and enhancing the primary project purposes and benefits. The plan is presented with recreational enhancement funded by the Government limited to existing public use areas rather than acquisition and development of new ones.

### **1.4. DESCRIPTION OF PROJECT AND WATERSHED**

Major construction of dam was started in June 1947. The spillway, outlet works, and tunnels were completed in 1951, and embankment closure occurred in May 1952. Impoundment of the power pool began in July 1952. The project was completed for full flood control operation in July 1953. Installation of the two hydropower units was completed in December 1953 and power generation was initiated. Work on the repair and extension of the spillway apron was initiated in July 1960 and completed in August 1961.

The dam structure is a rolled, impervious and semi-pervious earth-filled dam approximately 3,000 feet long with a maximum height of 197 feet above the streambed elevation 480.20 feet. Oklahoma State Highway 100 extends across the top of the dam. An

earth-filled dike approximately 1,350 feet long is located between the right end of the dam and the spillway.

The spillway and outlet works include a concrete-gravity spillway, located in a narrow ridge comprising the right abutment of the dam about 800 feet west of the axis of the dam, with a total width of 590 feet. Spillway capacity is 290,400 cubic feet per second (cfs) at maximum pool (elevation 672.2') with flow controlled by ten 50- by 25-foot tainter gates. A flood control outlet extending through the narrow ridge comprising the right abutment consists of a 19-foot conduit. Capacity of the conduit is 23,300 cfs at the top of the flood control pool. Flow through the conduit is controlled by two 9- by 19-foot tractor-type service gates installed at the upstream end of the conduit and operated by individual electric hoists located on the operating floor of the gate tower structure. A 19-foot-diameter penstock is provided through the narrow ridge comprising the right abutment to the powerhouse.

In fiscal year 2003, Phase 1 of a dam safety project was begun at the lake. Phase 2 began in fiscal year 2004 and was completed in fiscal year 2006. The dam safety project consists of an auxiliary spillway with five 50-foot wide by 35-foot high tainter gates constructed near the right abutment of the embankment. Auxiliary spillway capacity is 248,300 cfs at maximum pool elevation of 674.5 feet. The auxiliary spillway structure is similar to the existing spillway. In addition, a new Highway 100 bridge was built to carry traffic across the upstream approach channel for the new spillway. On November 29, 2006, a ribbon cutting ceremony was held marking the completion of the spillway project.

Tenkiller Ferry Lake straddles two ecoregions: the upper one-third portion of the lake is situated in the Dissected Springfield Plateau-Elk River Hills ecoregion of the Ozark Highlands in the Springfield Plateau physiographic region; the lower two-thirds portion of the lake is situated in the Lower Boston Mountains ecoregion of the Boston Mountains in the Ozark Mountains physiographic province.

The Dissected Springfield Plateau-Elk River Hills ecoregion is characterized by moderately to highly dissected and hilly, with narrow ridgetops separated by steep V-shaped valleys. Karst features are common. Spring seeps are common along streams and contribute to stream flow during the normally dry periods of summer and fall. As such, most streams are perennial.

The Lower Boston Mountains ecoregion is characterized by rounded high hills and benches. In drier summer months, streams typically contain little to no flow, however water still moves through the landscape in interstitial spaces between pools. Stream substrates are mostly rocky and consist of gravel, cobbles, and boulders. In larger water bodies, some organic material or mud substrates may occur.

Natural vegetation in these areas generally consists of species in the oak-hickory forest association and includes species of blackjack oak, post oak, scarlet oak, and black hickory in the drier upland areas. Species that are generally found along stream banks and in floodplains typically consist of bottomland forests and include species of pecan, oak, maple,

birch, sycamore, cottonwood, elms, and willow. Common understory species include woody species of sumac, hawthorn, wild plum, and rough leaved dogwood. Herbaceous species include bluestems, sedges, panic grass, and broomsedge.

### 1.5. PRIOR DESIGN MEMORANDA

<u>Memo #</u>	<u>Title</u>	<u>Date Submitted</u>	<u>Date</u>
1B(C1)	Public Use and Access Facilities	Jun 1961	Sep 1961
	Master Plan for Tenkiller Ferry Reservoir, Illinois River		Oct 1953
1C	Master Plan for Tenkiller Ferry Dam and Reservoir (Update)	Oct 1962	Mar 1964
1C	Master Plan for Tenkiller Ferry Dam and Reservoir (Update)		Aug 1978
2	Tenkiller Ferry Lake, Illinois River, Oklahoma: Design Memoranda No. 2, auxiliary spillway and existing spillway modifications		2006

### 1.6. PERTINENT PROJECT INFORMATION

Table 1.1 provides pertinent information regarding existing reservoir storage capacity.

Table 1.1. Tenkiller Ferry Lake and Dam Pertinent Data.

<b>Feature</b>	<b>Elevation<sup>*</sup> (feet)</b>	<b>Area (acres)</b>	<b>Capacity (acre-feet)</b>	<b>Equivalent Runoff<sup>(1)</sup> (inches)</b>
Top of Dam	677.2	-	-	-
Top of Gates & Flood Control Pool	667.0	20,800	1,230,800	14.33
Flood Control Storage	632.0-667.0	-	576,700	6.72
Spillway Crest	642.0	14,700	791,900	9.22
Top of Conservation Pool	632.0	12,900	654,100 <sup>(2)</sup>	7.62
Conservation Storage	594.5-632.0	-	371,000	4.32
Top of Inactive Pool	594.5	-	283,100	3.30

(1) From a 1,610-square-mile drainage area above the dam.

(2) Includes 25,400 acre-feet for water supply, 345,600 acre-feet for power drawdown storage, and 283,100 acre-feet of dead storage.

\* Water elevation measurement is based on the National Geodetic Vertical Datum (NGVD). All elevations presented within the Master Plan referenced the NGVD.

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## **CHAPTER 2 - PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT**

### **2.1. DESCRIPTION OF RESERVOIR**

Tenkiller Ferry Dam and Reservoir is a unit of a system of river improvement works in the Arkansas and Lower Mississippi River Basins. The project was initially authorized for Flood control by the Flood Control Act of 1938, and was later authorized for generation and hydroelectric power by the Harbor Act of 1946. Authorized project purposes include flood control and hydroelectric power.

Construction was completed in 1953 at an approximate cost of \$23 million. The Tenkiller Ferry Lake powerhouse contains two 20,000-kilowatt hydroelectric generators, and produces commercial electric power which is valued at approximately \$8.6 million a year. Currently there are six Class A and two Class C campgrounds and several day use parks operated by USACE with numerous other facilities operated by State, private entities and local governments that have approximately 2.5 to 3 million visitors annually.

Tenkiller Ferry Lake has 654,100 acre-feet of storage that is utilized for water supply and generation of hydroelectric power. An acre-foot of water is equivalent to one foot of water spread over one acre of land. The conservation pool, with top at elevation 632.00 feet above sea level, is fully allocated. Allocation of storage in Tenkiller Ferry Lake includes 25,400 acre-feet for water supply, 345,600 acre-feet for power drawdown storage, and 283,100 feet of dead storage. The conservation pool covers an area of 12,900 acres. The flood control pool, with top at elevation 667.00 feet, will have an additional capacity of 576,700 acre-feet, making a total capacity of 1,230,800 acre-feet, and will cover a total area of 20,800 acres. This flood-control pool will be kept empty except during flood periods. Then the water in excess of channel capacity of Illinois River below the dam will be stored in the flood control pool until such time as it can be released without causing floods downstream from the project. The entire flood control storage of the lake can be expected to be utilized once every 10 years.

### **2.2. HYDROLOGY AND GROUNDWATER**

Tenkiller Ferry Dam is located on the Illinois River at river mile 12.8 and the watershed comprises 1,610 square-miles above the dam. The reservoir has the Illinois River, as its major tributary. Major tributaries include the Barren Fork. Minor tributaries include Caney Creek, Dry Creek, Elk Creek, Sixshooter Creek, Terrapin Branch, Chicken Creek, Snake Creek, Cato Creek, Pine Creek, Parkhill Creek, Pettit Creek, Sisemore Creek, Burnt Cabin Creek, Dogwood Creek, Salt Creek, and Lender Branch. Groundwater basins within the Tenkiller Ferry Lake regions include the Northeastern Oklahoma Minor Groundwater Basin (NOMGB) and the Boone Aquifer in all, or portions of, Adair, Cherokee, Craig, Delaware, Mayes, Ottawa, and Sequoyah Counties, Oklahoma.

The NOMGB is comprised of Pennsylvanian and late Mississippian deposits that occur as shale, siltstone, coal, thin limestones, and widely separated sandstone units. Average

formation thickness is estimated to be 250 feet with an average saturated thickness of approximately 200 feet. The formations have very little primary porosity and their ability to store and transmit water is limited. Bedding plane openings are the principal avenues for water entry and movement and water also moves through fractures and joints. Recharge entering the basin is derived mainly from precipitation falling on the outcrop.

The Boone aquifer is overlain by younger Mississippian and Pennsylvanian formations along the western and southern edges of the basin. The formation consists of alternating sequences of low-permeability shale and low-permeability to permeable limestone, sandstone, and coal. Formation thickness is ranges from zero to greater than 400 feet. The average saturated thickness is approximately 200 feet. The formations have very little primary porosity and their ability to store and transmit water is limited. Recharge to the Boone aquifer is almost entirely from infiltration of precipitation in areas were the Boone Formation crops out. Bedding plane openings, fractures, and joints are the principal avenues for water recharge.

### **2.3. SEDIMENTATION AND SHORELINE EROSION**

The lake inflow carries a minimal amount of sediment because of the stony soils upstream of the project. Sedimentation and shoreline erosion have not contributed substantially to volume losses in the reservoir and no measures of sediment have been made since impoundment.

### **2.4. WATER QUALITY**

In general, Tenkiller Ferry Lake is classified as eutrophic based on Trophic State Index (TSI) index values calculated by the Oklahoma Water Resources Board (OWRB) in 2012. Elevated nutrient (nitrogen and phosphorus) concentrations, elevated levels of chlorophyll a, and increasing incidence of nuisance algal blooms support this classification. The lake is listed in the State of Oklahoma Water Quality Standards (WQS) as a nutrient limited water (NLW) indicating the Aesthetics beneficial use is considered threatened by nutrients until additional studies can be conducted to confirm the non-support status of the reservoir. The 2012 303(d) List of Impaired Waters reports Tenkiller Ferry Lake does not support designated beneficial uses in the following categories: 1) Fish and Wildlife Propagation owing to turbidity values exceeding the WQS numeric criteria; 2) Public and Private Water Supply owing to chlorophyll a values exceeding WQS numeric criteria; and, 3) Aesthetics owing to elevated nutrient concentrations resulting in the NLW classification in the WQS.

Overall, water quality in Tenkiller Ferry Lake can be characterized as good. Recorded pH values range from 6.56 to 9.02 standard units (less than 1% of recorded values exceed WQS numeric criteria) and fluctuate seasonally with algal activity. Surface total nitrogen values range from 0.40 milligrams per liter (mg/l) to 3.43 mg/l and surface total phosphorus values range from 0.005 mg/l to 0.097 mg/l and the ratio of nitrogen to phosphorus in the reservoir indicates the nutrient most limited for biological growth and primary production is phosphorus. Specific conductance values range from 177 micro Siemens per centimeter ( $\mu\text{S}/\text{cm}$ ) to 278  $\mu\text{S}/\text{cm}$  indicating low concentrations of ionized salts. Fecal coliform counts

are generally below WQS, however occasional exceedances have been reported historically resulting in the temporary closure of swimming beaches.

The frequency and duration of harmful algae blooms (HABs) and nuisance algae blooms have increased in Tenkiller Ferry Lake since 2000. The majority of nuisance and harmful algae blooms have been cyanobacteria blooms, however occasional dinoflagellate blooms; are reported in isolated coves of the lake. Recorded cyanobacterial bloom cell densities frequently exceed established World Health Organization public health guidelines for primary body contact for low ( $> 20,000$  cells/ml cyanobacteria) and moderate ( $> 100,000$  cells/ml cyanobacteria) risk of adverse health effects. Additionally, the hepatotoxin (liver toxin) microcystin has regularly been detected in Tenkiller Ferry Lake at concentrations ranging from non-detect to 0.252 micrograms per liter (ug/l), and below the WHO recreation guidelines of 20 ug/l.

## **2.5. TOPOGRAPHY, GEOLOGY, AND SOILS**

Tenkiller Ferry Lake straddles two ecoregions: the upper one-third portion of the lake is situated in the Dissected Springfield Plateau-Elk River Hills ecoregion of the Ozark Highlands in the Springfield Plateau physiographic region; the lower two-thirds portion of the lake is situated in the Lower Boston Mountains ecoregion of the Boston Mountains in the Ozark Mountains physiographic province.

The Dissected Springfield Plateau-Elk River Hills ecoregion is characterized by moderately to highly dissected and hilly, with narrow ridgetops separated by steep V-shaped valleys. Karst features are common. Spring seeps are common along streams and contribute to stream flow during the normally dry periods of summer and fall. As such, most streams are perennial.

The Lower Boston Mountains ecoregion is characterized by rounded high hills and benches. In drier summer months, streams typically little to no flow, but water still moves through the landscape in interstitial spaces between pools. Stream substrates are mostly rocky and consist of gravel, cobbles, and boulders. In larger water bodies, some organic material or mud substrates may occur.

The terrain is rugged with elevations varying from about 475 to 1,700 feet. The highest ridges and peaks are capped with sandstone and shales of Pennsylvanian age. The deeply eroded valleys are cut into the underlying Mississippian limestone and Ordovician dolomite. The soils of this region have a high infiltration rate. The soils of this area vary widely in fertility, structure, and use. The majority of the soils are stony in texture and well drained. To the north of the project, the Illinois River and its principal tributaries flow through heavily wooded deeply dissected hillsides surround by low and gently rolling fields. Natural cover consists of hardwood forests with grasses in the medium to open forest canopy areas. Pine tree forests can be found in the rolling hill areas.

The average elevation of the tablelands is about 1,250 feet. The valley slopes are steep and rocky, and most of the area is covered with a light growth of timber and underbrush. The

average fall of the Illinois River is about 8 feet per mile, varying from approximately 20 feet per mile in the upper reaches to approximately 3 feet per mile in the lower reaches. The valley averages one-half mile in width, while the river channel varies in width from 200 to 600 feet. The riverbanks average 10 feet in height. The principal tributaries are the Muddy Fork, Osage Creek, Flint Creek, Barren Fork, and Caney Creek. All of these tributaries enter the Illinois River above Tenkiller Ferry Dam, with the Barren Fork being the largest.

Soils within the valley are comprised mostly of alluvially deposited sandy and silty loams formed from the decomposition of local sandstones and shales. These soils generally consist of very deep, moderately drained, and rapidly permeable upland soils that formed in sandy Pleistocene sediments. The type and range sites of these soils are described in the following paragraphs.

1. Claypan prairie is on areas of nearly level to moderately sloping soils on uplands and consists of Okemah silty clay loam, 1 to 3 percent slopes. Soils in the group are 2 percent Mayes and 2 percent Parsons.
2. Heavy Bottomland is on areas that are often overflowed and consists of Osage clay, 0 to 1 percent slopes. The soils are deep clay and consist of 95 percent Osage soil.
3. Loamy Bottomland is on bottomlands. The soils are deep and loamy and are comprised of Elsay very gravelly loam, 0 to 3 percent slopes, consisting of Healing and Razort soils; Osage clay, 0 to 1 percent slopes, consisting of Verdigris soil; Cleora fine sandy loam, 0 to 2 percent slopes, consisting of Cleora soil; and Mason silt loam, 0 to 1 percent slopes, consisting of 90 percent Mason, 5 percent Speer, 3 percent Cleora, and 2 percent Cupco soils.
4. Loamy Prairie is on uplands. The soils are nearly level to moderately steep and are on convex slopes of low ridges and on the side slopes of moderately steep ridges in broad valleys. The soils are comprised of Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Eram soil; Newtonia silt loam, 1 to 5 percent slopes, consisting of Newtonia, Dennis, Okemah, and Britwater soils; Okemah silty clay loam, 1 to 3 percent slopes, consisting of Okemah and Dennis soils; and Shidler stony silty clay loam, 10 to 25 percent slopes, consisting of Lula and Catoosa soils.
5. Very shallow is in areas of nearly level to gently sloping, very shallow soils. The surface layer is 6 to 10 inches deep over limestone. The soils are comprised of the Shidler-Rock outcrop complex, 2 to 50 percent slopes, and Shidler stony silty clay loam, 10 to 25 percent slopes. Soils are primarily comprised of Shidler soils and are extremely rocky.
6. Eroded Claypan Prairie is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are

comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of 88 percent Apperson, 8 percent Okemah, 3 percent Dennis, 1 percent Shidler soils.

7. Eroded Loamy Prairie is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of Okemah and Dennis soils.
8. Eroded Very Shallow is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of thin Shidler soil.
9. Smooth chert savannah is on cherty uplands on the more gently sloping ridges and footslopes in the Ozark Highlands. The soils are comprised of Clarksville very gravelly silt loam, 5 to 20 percent slopes, consisting of Britwater and Nixa soils; Clarksville very gravelly silt loam, 20 to 50 percent slopes, consisting of Britwater and Nixa soils; Tonti gravelly silt loam, 1 to 3 percent slopes, consisting of Captina and Britwater soils; Newtonia silt loam, 3 to 5 percent slopes, consisting of Britwater soil; Healing silt loam, 0 to 1 percent slopes, consisting of Britwater soil; Razort gravelly loam, 0 to 3 percent slopes, consisting of Britwater soil; Stigler silt loam, 0 to 1 percent slopes, consisting of Stigler and Captina soils; Sallisaw loam, 1 to 3 percent slopes, consisting of Sallisaw soil; and Sallisaw loam, 3 to 5 percent slopes, consisting of Sallisaw soil.
10. Loamy Savannah is in areas of nearly level to gently sloping, rolling, deep soils on uplands. The soils are comprised of Shermore loam, 1 to 3 percent slopes, consisting of Stigler soil; Stigler-Wrightsville complex, 0 to 1 percent slopes, consisting of Stigler and Vian soils; and Linker-Hector complex, 3 to 5 percent slopes, comprised of Stigler soil.
11. Sandy Savannah is in areas of nearly level to steep, sandy soils on uplands. The soils are comprised of Hector fine sandy loam, 3 to 5 percent slopes, consisting of Hector and Linker soils; Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Enders, Linker, and Eram soils; Rock outcrop-Hector complex, 40 to 100 percent slopes, consisting of Linker soil; and Shermore loam, 1 to 3 percent slopes, consisting of Shermore and Linker soils.
12. Savannah breaks is in steep and very steep, rocky areas that have large sandstones on or near the surface. Large amounts of bare rock on the surface restrict forage production. The soils are comprised of Rock outcrop-Hector

complex, 40 to 100 percent slopes, consisting of Hector soil and Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Endsaw soil.

13. Shallow savannah is in areas or fugged topography on low, mountainous ridges. The soil is comprised of Hector fine sandy loam, 3 to 5 percent slopes, consisting of Hector soil; Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Hector soil; and Linker fine sandy loam, 3 to 5 percent slopes, consisting of Hector soil.

## **2.6. RESOURCE ANALYSIS**

### **2.6.1. Fish and Wildlife Resources**

Tenkiller Ferry Lake provides habitat for an abundance of various wildlife and fisheries located both in the lake proper and in the tailwater area.

The lake provides fishing opportunities for the boater and bank angler. Cooperative efforts between the USACE and the Oklahoma Department of Wildlife Conservation (ODWC) have improved fishing success rates with installation of fish habitat and maintenance of access areas throughout the project. Common sport fish species present in Tenkiller Ferry Lake include largemouth bass, spotted bass, smallmouth bass, white crappie, black crappie, white bass, and channel catfish. Other species include a variety of smaller sunfish, minnows, darters, and shad. Additional angler opportunities exist in the tail water trout fishery. This fishery is managed by the ODWC as a put-and-take fishery through active annual stocking of rainbow and brown trout. Other species present in the lake tailwaters include crappie, bass, sunfish, flathead catfish, and channel catfish.

USACE licenses 2590.125 acres of land to the ODWC for the purposes of wildlife management. The majority of which comprises the Tenkiller Wildlife Management Area (WMA) in Cherokee and Sequoyah Counties. The Tenkiller WMA is a mixture of upland areas and riparian habitat associated with Tenkiller Ferry Lake and is managed for both game and non-game species. Game species of interest within the Tenkiller WMA include bear, white-tailed deer, turkey, quail, rabbit, squirrel, dove, coyote, bobcat, gray fox, raccoon, skunk, mink and opossum. Non-game species of interest within the Tenkiller WMA include bald eagles and other raptors, migratory shore birds, and various song birds. The ODWC submits a five year management plan to USACE for review and approval on an annual basis. In addition to the areas leased to the ODWC, several units managed by USACE also provide excellent game and non-game habitat. USACE managed units are approximately 5,165 acres. These areas are also popular with both hunters and individuals wishing to observe wildlife in their natural habitat. Species that are located in these areas includes: white-tailed deer, squirrel, cottontail rabbit, raccoon, turkey, quail (limited), dove, eagles, waterfowl, and various song birds.

### **2.6.2. Vegetative Resources**

The vegetative resources of the Tenkiller Ferry Lake project were classified using information derived from the National Vegetation Classification System. Level 1

Environmental Inventory GIS data was used to download and analyze this data and the results are displayed in Table 2.1.

### 2.6.3. Threatened and Endangered Species

Table 2.2 lists the federally listed threatened and endangered species thought to occur on Tenkiller Ferry Lake fee lands.

### 2.6.4. Invasive Species

Table 2.3 lists the important invasive species that occur on Tenkiller Ferry Lake fee lands. Data were retrieved from the FY2014 Project Site Invasive Species Records in reported in OMBIL.

Table 2.1. Vegetative Resources of the Tenkiller Ferry Project.

<b>Division</b>	<b>Order</b>	<b>Class</b>	<b>Sub-Class</b>	<b>Acreage</b>
DEVELOPED/OTHER LANDCOVER*	Agricultural	Crop	Warm season	168
DEVELOPED/OTHER LANDCOVER*	Agricultural	Improved/introduced pasture	Warm season	1,317
DEVELOPED/OTHER LANDCOVER*	Urban	Residential/industrial	Non-Vegetated	616
DEVELOPED/OTHER LANDCOVER**	Water	Lake Reservoir	Non-Vegetated	12,900
DEVELOPED/OTHER LANDCOVER*	Water	Pond	Non-Vegetated	652
FOREST*	Mainly deciduous forest	Cold deciduous broad-leaved forest with evergreen needle-leaved trees	Oak-hickory and pine forest	294
FOREST*	Mainly deciduous forest	Cold deciduous broad-leaved forest with evergreen needle-leaved trees	Oak cedar forests	238
FOREST*	Mainly deciduous forest	Cold deciduous forest without evergreen needle-leaved treest	Eastern crosstimbers	843
FOREST*	Mainly deciduous forest	Cold deciduous forest without evergreen needle-leaved treest	White oak-hickory forest	10,683
FOREST*	Mainly deciduous forest	Cold-deciduous alluvial forest	East central bottomland forest	45

\* Based on the most recent GIS information.

\*\* Based on fee land allocation at top of conservation pool.

2.6.5. Ecological Setting

Tenkiller Ferry Lake lies within two ecoregions. The upper one-third portion of the lake is situated in the Dissected Springfield Plateau-Elk River Hills ecoregion of the Ozark Highlands in the Springfield Plateau physiographic region. The lower two-thirds portion of the lake is situated in the Lower Boston Mountains ecoregion of the Boston Mountains in the Ozark Mountains physiographic province.

The Dissected Springfield Plateau-Elk River Hills ecoregion is characterized by moderately to highly dissected and hilly, with narrow ridgetops separated by steep V-shaped valleys. Karst features are common. Spring seeps are common along streams and contribute to stream flow during the normally dry periods of summer and fall. As such, most streams are perennial.

Table 2.2. Federally Listed Species of the Tenkiller Ferry Project.

<b>Species</b>	<b>FED/State List</b>	<b>Inventoried Occurrence</b>	<b>Biological Opinion Issued</b>	<b>Final Recovery Requirements</b>	<b>Recovery Actions Designated</b>
Beetle, American burying	FED	Rare	Y	N	N
Plover, piping	FED	Potential	N	N	N
Tern, least	FED	Rare	Y	N	N
Knot, Red	FED	Uncommon	N	N	N
Mucket, Neosho	FED		N	N	N
Rabbitsfoot	FED		N	N	N
Bat, Gray	FED		N	N	N
Bat, Indiana	FED		N	N	N
Bat, northern long-eared	FED (proposed)		N	N	N
Bat, Ozark Big-eared	FED		N	N	N

Table 2.3. Invasive Species Documented to be Present on the Tenkiller Ferry Project.

<b>Species Common Name</b>	<b>Type of Occurrence</b>	<b>Acreage Impacted</b>
Grass carp	Minor	50
Eurasian collared dove	Significant Major	10,000
European starling	Minor	10,000
Autumn olive	Minor	1,000
Johnson grass	Minor	5,000
Purple star thistle	Minor	1,000
Eastern red cedar	Significant Major	10,000
Sericea lespedeza	Minor	100
Tall fescue	Minor	1,000

The Lower Boston Mountains ecoregion is characterized by rounded high hills and benches. In drier summer months, streams typically little to no flow, but water still moves through the landscape in interstitial spaces between pools. Stream substrates are mostly rocky and consist of gravel, cobbles, and boulders. In larger water bodies, some organic material or mud substrates may occur. Natural vegetation in these areas generally consists of species in the oak–hickory forest association and includes species of blackjack oak, post oak, scarlet oak, and black hickory in the drier upland areas. Species that are generally found along stream banks and in floodplains typically consist of bottomland forests and include species of pecan, oak, maple, birch, sycamore, cottonwood, elms, and willow. Common understory species include woody species of sumac, hawthorn, wild plum, and rough leaved dogwood. Herbaceous species include bluestems, sedges, panic grass, and broomsedge.

#### 2.6.6. Wetlands

Table 2.4 lists the acreages of various types of wetlands present at Tenkiller Ferry Lake. Wetland classifications presented are derived from the U.S. Fish and Wildlife Service (USFWS) Trust Resource List generated using the Information, Planning, and Conservation System decision support system available at <http://ecos.fws.gov/ipac/>.

Table 2.4. Wetland Resources Present on the Tenkiller Ferry Project.

<b>System</b>	<b>NWI Code</b>	<b>Sub-System</b>	<b>Class</b>	<b>Subclass</b>	<b>Water Regime</b>	<b>Class Acres</b>
Palustrine	PEM1C	NO SUB-SYSTEM	Emergent	Persistent	Seasonally Flooded	20.1
Palustrine	PEM1A	NO SUB-SYSTEM	Emergent	Persistent	Temporary Flooded	22.4
Palustrine	PEM1/USCh	NO SUB-SYSTEM	Emergent/Unconsolidated Shore	Persistent	Seasonally Flooded	18.5
Palustrine	PEM1Ch	NO SUB-SYSTEM	Emergent	Persistent	Seasonally Flooded	6.0
Palustrine	PEM1Fh	NO SUB-SYSTEM	Emergent	Persistent	Semi-permanently Flooded	4.1
Palustrine	PFO1Ah	NO SUB-SYSTEM	Forested	Broad-Leaved Deciduous	Temporary Flooded	5.3
Palustrine	PSS1/EM1C	NO SUB-SYSTEM	Scrub-shrub/ Emergent	Broad-Leaved Deciduous/ Persistent	Seasonally Flooded	13.8
Palustrine	PSS1Ah	NO SUB-SYSTEM	Scrub-shrub	Broad-Leaved Deciduous	Temporary Flooded	2.6
Palustrine	PSS1/EM1A	NO SUB-SYSTEM	Scrub-shrub/ Emergent	Broad-Leaved Deciduous/ Persistent	Temporary Flooded	8.0

Table 2.4 continued. Wetland Resources Present on the Tenkiller Ferry Project.

<b>System</b>	<b>NWI Code</b>	<b>Sub-System</b>	<b>Class</b>	<b>Subclass</b>	<b>Water Regime</b>	<b>Class Acres</b>
Palustrine	PFO1Ch	NO SUB-SYSTEM	Forested	Broad-Leaved Deciduous	Seasonally Flooded	8.9
Palustrine	PFO1/USCh	NO SUB-SYSTEM	Forested/Unconsolidated Shore	Broad-Leaved Deciduous	Seasonally Flooded	7.1
Palustrine	PFO5F	NO SUB-SYSTEM	Forested	Dead	Semi-permanently Flooded	8.4
Palustrine	PFO1/EM1A	NO SUB-SYSTEM	Forested/Emergent	Broad-Leaved Deciduous/Persistent	Temporary Flooded	63.2
Palustrine	PSS1A	NO SUB-SYSTEM	Scrub-shrub	Broad-Leaved Deciduous	Temporary Flooded	15.6
Palustrine	PFO1C	NO SUB-SYSTEM	Forested	Broad-Leaved Deciduous	Seasonally Flooded	103.2
Palustrine	PFO1A	NO SUB-SYSTEM	Forested	Broad-Leaved Deciduous	Temporary Flooded	807.5
Palustrine	PUBHx	NO SUB-SYSTEM	Unconsolidated Bottom	NO SUBCLASS	Permanently Flooded	32.4
Palustrine	PUBH	NO SUB-SYSTEM	Unconsolidated Bottom	NO SUBCLASS	Permanently Flooded	10.4
Palustrine	PUBHh	NO SUB-SYSTEM	Unconsolidated Bottom	NO SUBCLASS	Permanently Flooded	12.0
Lacustrine	L1UBHh	Limnetic	Unconsolidated Bottom	NO SUBCLASS	Permanently Flooded	11,765.3
Lacustrine	L2USCh	Littoral	Unconsolidated Bottom	NO SUBCLASS	Seasonally Flooded	787.6
Lacustrine	L2UBFh	Littoral	Unconsolidated Bottom	NO SUBCLASS	Semi-permanently Flooded	561.4
Riverine	R4SBC	Intermittent	Streambed	NO SUBCLASS	Seasonally Flooded	75.6
Riverine	R2UBH	Lower Perennial	Unconsolidated Bottom	NO SUBCLASS	Permanently Flooded	379.6
Riverine	R2USC	Lower Perennial	Unconsolidated Shore	NO SUBCLASS	Seasonally Flooded	35.1

## **2.7. CULTURAL RESOURCES**

### **2.7.1. Historic and Archaeological Features**

#### **A. History**

Tenkiller Ferry Lake is located in a region that once was the Cherokee Nation (one of the Five Civilized Tribes relocated to Indian Territory during the 1800s). Among the early settlers of the area were: John Ross, Principal Chief of the Cherokee Nation; George M. Murrell, who operated a steam mill on the east side of the Barren Fork near present-day Welling; Mark Bean and Reuben Sanders, who operated a salt works in the early 1800s; and Samuel Mackey, who started another salt works in 1828. Another early day settler was Samuel Newton, who with his wife Mary established a mission in 1830.

Historical sites in the vicinity of the project are: the City of Tahlequah, which is the oldest incorporated town in Oklahoma; the Cherokee Agency, located three miles northwest of Tahlequah; Cherokee National Capitol, which was erected in 1867 by the Tribal Council and served as the Capitol Building until 1907 (now the Cherokee County Courthouse); Bacone College, established at Tahlequah in 1880 and moved to the City of Muskogee in 1882 (originally known as Indian University, it is still active); Jane Ross Miegs house, a home built over a century ago for the daughter of John Ross; the Murrell Home, which is four miles south of Tahlequah on State Highway 82 and one mile east; Park Hill (District), center of cultural, political, and economic life of the Cherokee Nation from 1836 to 1900, now overshadowed by the City of Tahlequah; and Riley's Chapel, a Methodist Mission established in 1844, located two miles southeast of Tahlequah.

#### **B. Archaeology**

Archaeological sites representative of the Paleo-Indian, Archaic, Woodland, Caddoan/Mississippian, Protohistoric (Contact), and Historic Periods are known in the larger vicinity of Tenkiller Ferry Reservoir in northeastern Oklahoma. This culture-historical sequence falls generally within the overall sequence that has been established for eastern Oklahoma. Many archaeological sites in this area have undisturbed, deeply-buried deposits; many are comprised of multi-component prehistoric and/or historic occupations. Several cultural resources investigations, including archaeological survey and excavation, were conducted incident to and post-construction of Tenkiller Ferry Reservoir. 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 (OAS). Ultimately, as a major river flowing out of the western Ozarks, the entire Illinois River Valley can be classified as an area of high sensitivity for the location of cultural resources.

### **2.7.2. Cultural History Sequence**

The following regional chronology is adopted in this Master Plan.

#### **A. Paleo-Indian 12,000 to 8500 BP**

- B. Archaic 8500 to 2000 BP
- C. Woodland 2000 to 1200 BP (AD 1 to 800)
- D. Caddoan/Mississippian AD 800 to 1500
- E. Protohistoric (Contact) AD 1500 to 1825
- F. Historic AD 1825 to present

To aid in comparing divergent cultures and sequences in eastern Oklahoma, the following general adaptation types are used to characterize prehistoric cultural traditions.

#### A. Paleo-Indian

Specialized, large-game hunting by small bands of hunter-gatherers was the adaptation type associated with this period. Signature stone tools are unnotched projectile points of fluted or lanceolate type, often found in contexts where mammoth or bison remains also occur. Structural remains are poorly understood, the probable result of a mobile lifestyle and the use of perishable construction materials. Three main complexes identified within this period are Clovis, Folsom, and Late Paleo-Indian (e.g., Dalton). The extent of the Paleo-Indian period was approximately 12,000 BP to 8,500 BP.

#### B. Archaic

Plant foraging was an important subsistence strategy of hunter gatherer groups in this period and was associated with increased seasonal variability of resources during the mid-Holocene Hypsithermal period. Repeated occupation of sites and features such as rock-lined hearths and roasting pits, and grinding tools reflect intensive plant processing and the cyclical exploitation of resources. Bison were hunted on a smaller scale than previously, with greater reliance on small mammals, mussels and fish. Stone tools were often thermally cured, and included distinctive stemmed and notched projectile points. 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.

#### C. Woodland

Archaeologists in Oklahoma associate the use of ceramics in describing Woodland cultural components. Incipient horticulture was the adaptation type associated with this period, marked by the introduction of cultigens in eastern Oklahoma. Evidence for semi-permanent villages, increased reliance on wild and domestic plants, widespread use of ceramics and elaborate burials reflect the more sedentary lifestyle of Woodland cultures. Small game remained essential in subsistence. Tool assemblages are distinguished by small, corner-notched projectile points, which suggest invention of the bow and arrow.

#### D. Caddoan/Mississippian

Agriculture, supplemented by hunting and gathering, was the adaptation type associated with village societies. Agricultural tools were recognized in artifact assemblages, along with triangular arrowpoints for hunting and pottery types that in eastern Oklahoma serve to denote this period as the Caddoan/Mississippian. Village cultures are often identified in lowland terraces of waterways where agriculture was viable. Some archaeological sites

from this time period have mounds associated, suggesting that those sites have some larger ceremonial or social function. Some mounds contain primary or secondary burials, but a few represent mounds on which a structure was located. Mounds such as these likely had a very specific role in the ceremonial lives of the region's inhabitants.

#### E. Protohistoric (Contact)

This period was defined by transitory contacts of European explorers in the eastern woodlands and central plains, substantiated by little or no historical documentation. Lifeways were subsumed under the Plains Village adaptation type, which is the Plains adaptation largely contemporaneous with Caddoan/Mississippian villages. 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 south-central Kansas. Great Bend manifestations likely represent the proto-Wichita villages encountered by Francisco Coronado in 1541. Slightly later Proto-Wichita sites from the early 1700's have been identified in Kay County, north-central Oklahoma, and closer to the Tenkiller Ferry Reservoir area in Tulsa County, Oklahoma. These early 1700's Proto-Wichita sites are evidence of French influence on the southern Plains, as artifact assemblages from these sites contain metal musket parts from French firearms, glass trade beads (French), and European gunflints.

#### F. Historic

The Reservation Period (1825-1900) was marked by the displacement and resettling of Native American tribes throughout the greater Oklahoma region. The Cherokee Nation was created in northeastern Oklahoma in 1828, soon thereafter incorporating the Quapaw and Seneca tribes. After the Civil War, the area was further divided into reserves for the Peoria, Ottawa, Wyandotte and others. From 1838 to 1871 the Neosho Agency held jurisdiction over all tribes but the Cherokee. Between the 1830s and 1850s Anglo-Americans legally occupied tribal lands to operate mission schools, trading posts, ferries, mills and blacksmith shops. The period 1850-1900 was marked by increasing Anglo-American land speculation and enhanced military supply lines through the study region that connected Fort Gibson, Fort Scott and Fort Leavenworth during the Civil War. Pioneer settlement of homesteads and towns began in earnest in southeastern Kansas during the 1860s following the removal of Native American tribes to Oklahoma. This trend was somewhat delayed in northeastern Oklahoma where the Cherokee Nation maintained a loose hold on sovereignty. By the 1890s, however, towns such as Miami and Ottawa in northeastern Oklahoma were firmly rooted.

## 2.8. DEMOGRAPHICS

### 2.8.1. Population

The total population for the zone of interest is 223,109, as shown in Table 2.5. About 32% of the population is in Muskogee County, 22% in Cherokee County, 19% in Delaware County, 18% in Sequoyia County and 9% in Adair County. The population in the zone of interest makes up approximately 6% of the total population of Oklahoma. From 2013 to 2065, the population in the zone of interest is expected to increase to 339,032, an annual growth rate of 0.8% per year. By comparison, the population of Oklahoma is projected to increase at a rate

of 0.6% per year. The distribution of the population among gender is approximately 49% male and 51% female in all geographical areas, as shown in Table 2.6.

Table 2.5. 2013 Population Estimates and 2065 Projections.

<b>Geographical Area</b>	<b>2013 Population Estimate</b>	<b>2065 Projection</b>
Oklahoma	3,850,568	5,280,026
Adair County	22,194	32,391
Cherokee County	48,017	79,204
Delaware County	41,377	74,060
Muskogee County	70,303	85,457
Sequoia County	41,218	67,920
<b>Zone of Interest Total</b>	<b>223,109</b>	<b>339,032</b>

Source: U.S. Bureau of the Census, American Fact Finder (2013 Estimate)  
Oklahoma State Data Center (2065 Projections)

Table 2.6. 2013 Population Estimate by Gender.

<b>Geographical Area</b>	<b>Male</b>	<b>Female</b>
Oklahoma	49.5%	50.5%
Adair County	50.0	50.0
Cherokee County	49.3	50.7
Delaware County	49.3	50.7
Muskogee County	48.9	51.1
Sequoia County	49.3	50.7
<b>Zone of Interest Total</b>	<b>49.2</b>	<b>50.8</b>

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

Table 2.7 shows the population by age group. The distribution by age group is similar among the counties, zone of interest and the state overall. The largest age group is the 45 to 54, with 14% of the total population for each geographic area. Approximately 36-38% of the total population for each area is between 25 and 54 years of age.

Population by race and Hispanic Origin is displayed in Table 2.8. For the zone of interest, 57% of the population is White, 20% American Indian or Native Alaskan, 13% two or more races, 5% Hispanic, and 4% Black. The remainder of the races makes up less than 1% each. By comparison, for the state, 68% of the population is White, 9% Hispanic, 7% each for Black, American Indian/Native Alaskan, and two or more races, 2% Asian, with the remaining less than 1% each.

### 2.8.2. Education and Employment

In the zone of interest, for 36% of the population 25 years old and older the highest level of education attained is a high school diploma or equivalent. Twenty-four percent have some college, but no degree, 12% have a Bachelor's degree, 11% 9-12 years but with no diploma, 7% have an Associate degree, 6% have a graduate or professional degree and 5%

have less than nine years of education. The distribution is very similar to the state overall. For Oklahoma, 32% has a high school diploma or equivalent, 24% has some college, but no degree, 16% has a Bachelor's degree, 9% 9-12 years of school but no diploma, 8% have a graduate or professional degree, 7% have an Associate degree, and 5% less than nine years of schooling. Table 2.9 shows the population over 25 years of age by highest level of educational attainment for each of the geographical areas.

Employment by sector is presented in Table 2.10. In the zone of interest, approximately 19% of the workforce is employed in the Health Care and Social Assistance Sector, followed by 13% in Public Administration, 12% in Retail Trade, 11% in Educational Services, 10% in Manufacturing, and 8% in Accommodation and Food Services. Similarly, the largest employment sector in the state was also Health Care and Social Assistance, with 14% of the total employment. The second largest employment sector in the state is Retail Trade with 11%, followed by Educational Services and Manufacturing and Accommodations & Food Services, each with 9%, Public Administration with 7%, and Administrative and Support with 6%. While manufacturing has importance in both the zone of interest and state, it is evident the economies are driven by service sector employment.

As shown in Table 2.11, the unemployment rate is slightly higher in the zone of interest, at 5.6%, than the state overall, with 4.4%. The difference is driven by a significantly higher unemployment rate in Sequoyia County, at 7.2 % and a moderately higher rate in Adair and Muskogee Counties with just over 5%. Cherokee and Delaware Counties have unemployment rates closer to the state rate.

Table 2.7. 2013 Population Estimate by Age Group.

Area	Age Group												
	<5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 34	35 to 44	45 to 54	55 to 59	60 to 64	65 to 74	75 to 84	85 and over
Oklahoma	264,159	262,213	256,213	260,843	277,306	512,819	464,680	513,248	243,245	208,692	292,159	165,856	63,599
Adair County	1,540	1,701	1,840	1,690	1,314	2,700	2,874	3,090	1,392	1,283	1,805	957	241
Cherokee County	3,240	3,134	3,028	3,983	4,782	5,751	5,272	6,007	3,027	2,637	3,927	1,968	732
Delaware County	2,155	2,698	2,549	2,660	2,052	4,008	4,465	5,762	3,011	3,287	5,406	2,694	647
Muskogee County	4,985	4,573	5,039	4,716	4,699	8,938	8,563	9,687	4,406	4,494	5,797	3,389	1,371
Sequoia County	2,548	2,844	3,212	2,900	2,332	4,777	5,457	6,011	2,829	2,409	3,883	1,958	674
Zone of Interest	14,468	14,950	15,668	15,949	15,179	26,174	26,631	30,557	14,665	14,110	20,818	10,966	3,665

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

Table 2.8. 2013 Population Estimate by Race/Hispanic Origin.

Area	Race / Hispanic Origin							
	White	Black	American Indian or Native Alaskan	Asian	Native Hawaiian or Other Pacific Islander	Other Race	Two or more	Hispanic
Oklahoma	2,582,335	269,717	255,929	66,720	4,208	2,854	258,840	345,139
Adair County	9,453	80	8,102	144	3	13	3,383	1,249
Cherokee County	23,699	547	13,304	304	59	51	6,489	3,035
Delaware County	27,151	108	8,831	513	22	3	3,488	1,278
Muskogee County	40,984	7,766	9,610	411	11	23	8,050	3,802
Sequoya County	27,200	787	4,965	257	0	6	7,133	1,486
Zone of Interest	128,487	9,288	44,812	1,629	95	96	28,543	10,850

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

Table 2.9. 2013 Population Estimate by Highest Level of Educational Attainment, Population 25 Years of Age and Older.

Area	Highest Educational Attainment							
	Population 25 Over	<9 Years	9 to 12 Years, No Diploma	High School	Some College No Degree	Associate Degree	Bachelor Degree	Graduate or Professional Degree
Oklahoma	2,464,298	113,560	221,671	782,753	595,862	171,995	387,885	190,572
Adair County	29,280	1,102	3,382	11,447	6,791	1,838	3,184	1,536
Cherokee County	29,321	1,437	2,931	8,607	7,529	1,633	4,405	2,779
Delaware County	29,280	1,102	3,382	11,447	6,791	1,838	3,184	1,536
Muskogee County	46,645	2,171	4,879	15,361	11,902	3,982	5,867	2,483
Sequoya County	27,998	1,652	3,579	11,385	5,702	1,949	2,561	1,170
Zone of Interest	162,524	7,464	18,153	58,247	38,715	11,240	19,201	9,504

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

Table 2.10. 2013 Annual Average Employment by Sector.

<b>Sector</b>	<b>Oklahoma</b>	<b>Adair County</b>	<b>Cherokee County</b>	<b>Delaware County</b>	<b>Muskogee County</b>	<b>Sequoyah County</b>	<b>Zone of Interest</b>
Agriculture, Forestry, Fishing, and Hunting	10,284	99	641	42	94	71	947
Mining	59,551	ND	41	ND	65	77	183
Utilities	16,561	76	238	53	380	106	853
Construction	79,148	67	330	434	1,423	240	2,495
Manufacture	138,198	1,543	186	777	3,792	127	6,424
Wholesale Trade	62,171	68	ND	118	862	80	1,128
Retail Trade	177,903	500	1,659	1,268	3,154	1,336	7,918
Transportation and Warehousing	51,901	53	61	120	899	244	1,377
Information	23,704	23	72	64	339	73	569
Finance and Insurance	55,645	123	311	272	681	281	1,668
Real Estate and Rental and Leasing	22,890	13	203	58	386	42	702
Professional, Scientific and Technical Services	68,853	49	168	147	481	312	1,155
Management of Companies and Enterprises	16,590	ND	ND	ND	52	ND	52
Administrative and Support and Waste Management and Remediation Services	99,720	33	121	226	1,257	227	1,864
Educational Services	143,973	758	2,102	971	2,439	1,204	7,474
Health Care and Social Assistance	210,892	591	2,463	1,314	5,424	2,585	12,377
Arts, Entertainment and Recreation	34,998	ND	416	1,058	1,553	568	3,595
Accommodation and Food Services	139,481	285	1,186	880	2,372	820	5,544
Other Services (except Public Administration)	36,221	85	316	230	555	139	1,325
Public Administration	112,276	279	4,089	462	3,284	488	8,601
<b>TOTAL</b>	<b>1,560,960</b>	<b>4,647</b>	<b>15,206</b>	<b>8,510</b>	<b>29,491</b>	<b>9,062</b>	<b>66,916</b>

Source: Oklahoma Employment Security Commission, , citing Quarterly Census of Employment and Wages Program, Bureau of Labor Statistics

ND = Not disclosed for confidentiality purposes

Table 2.11. Labor Force, Employment and Unemployment Rates, November 2014.

<b>Area</b>	<b>Civilian Labor Force</b>	<b>Number Employed</b>	<b>Number Unemployed</b>	<b>Unemployment Rate</b>
Oklahoma	1,796,308	1,717,345	78,963	4.4
Adair County	9,506	8,983	523	5.5
Cherokee County	22,841	21,865	976	4.3
Delaware County	18,759	17,862	897	4.8
Muskogee County	30,625	28,963	1,662	5.4
Sequoia County	16,242	15,078	1,164	7.2
Zone of Interest	97,973	92,751	5,222	5.6

Source: Oklahoma Employment Security Commission

### 2.8.3. Households and Income

There are approximately 84,000 households in the zone of interest with an average household size of 2.61 persons. For the state, there are 1.4 million households, with an average size of 2.55 persons per household, as shown in Table 2.12.

Table 2.12. 2013 Households and Household Size.

<b>Area</b>	<b>Number of Households</b>	<b>Average Household Size</b>
Oklahoma	1,444,081	2.55
Adair County	8,046	2.76
Cherokee County	16,875	2.68
Delaware County	16,589	2.47
Muskogee County	26,802	2.51
Sequoia County	15,624	2.65
Zone of Interest	83,936	2.61

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

As shown in Table 2.13, the zone of interest is slightly poorer than the state overall. In the zone of interest, the median household income is almost \$36,000, compared to the state median household income of \$45,000. Within the zone of interest, the median household incomes are similar, with Muskogee County having the highest (\$39,000) and Adair County the lowest (\$33,000). Similarly, the zone of interest has a lower per capita income (\$19,000) compared to the state (\$24,000). Within the zone of interest, Delaware County has the highest per capita income (\$21,000) and as with median income, Adair has the lowest per capita income (\$15,000).

Table 2.13. Median and Per Capita Income, 2012.

<b>Area</b>	<b>Median Household Income</b>	<b>Per Capita Income</b>
Oklahoma	\$45,339	\$24,208
Adair County	32,556	15,116
Cherokee County	37,260	18,582
Delaware County	36,588	21,109
Muskogee County	38,502	19,868
Sequoia County	35,742	18,131
Zone of Interest	N/A	19,028

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

## **2.9. RECREATION FACILITIES, ACTIVITIES, AND NEEDS**

### **2.9.1. Zones of Influence**

The primary area of economic influence encompasses portions southeastern Sequoyah, Muskogee, Cherokee, Wagoner, Mayes, Delaware, and Adair Counties with additional economic influence from within a 100 mile radius of the lake. This seven-county region has been utilized as the basis in summarizing the visitation characteristics of Tenkiller Ferry Lake.

### **2.9.2. Visitation Profile**

The majority of visitors to Tenkiller Ferry Lake come from within a 100 mile radius of the lake area. Tenkiller Ferry Lake visitors are a diverse group ranging from campers who utilize the campgrounds around the lake, full time and part time residents of the private housing developments that border the lake, hunters who utilize the Wildlife Management Areas around the lake, day users who picnic in the city, state and federally operated parks, marina customers and many other user groups. The peak visitation months on Tenkiller Ferry Lake are April through September when 82 percent of the visits occur. July is the highest visitation month and accounts for 17 to 21 percent of the annual total. Approximately 83 percent of visits to recreation areas occur in USACE managed recreation areas. Dispersed recreation visits exceed those that occur in recreation areas.

### **2.9.3. Recreation Analysis**

Recreational use at Tenkiller Ferry Lake continues to evolve. While visitation in recreational areas remains strong, facilities installed in outgranted areas indicate that there is demand for recreational opportunities not offered in traditional USACE managed parks. Annual visitation trends recorded the USACE Operation and Maintenance Business Information Link (OMBIL) is presented in Table 2.14. The most recent available data from OMBIL for monthly visitation is FY2012. In FY 2012, there were

3,829,616 visitations. In 2012, June was recorded to be the month of highest visitation with 757,851 visitations. The majority of visitation occurs within the traditional recreation season of April-September with 3,420,736 visitations reported, representing 89.32% of total visitation to Tenkiller Ferry Project in FY 2012. Monthly visitation in FY 2012 is presented in Table 2.15. There is not a great demand for private boat dock permits and the maximum number of permits available for private docks has been issued. Requests for vegetative modification permits are limited and little to no growth in permit related workload is anticipated. Blue Green algae blooms, which have occurred lake wide since 2011, are fueled by nutrient loading, adequate light availability, and hot dry weather. Continued algal blooms have the potential to make some portions of Tenkiller Ferry Lake undesirable for water related recreation.

Table 2.14. Annual attendance from FY 2003 through FY 2012.

<b>Year</b>	<b>Visitation</b>
2003	2,890,538
2004	3,668,258
2005	3,507,524
2006	3,612,692
2007	3,795,268
2008	3,849,234
2009	4,001,268
2010	4,084,731
2011	3,384,097
2012	3,829,616

#### 2.9.4. Recreation Carrying Capacity

The recreation carrying capacity of a lake is the amount of development, use, and activity any lake and associated recreational lands can sustain without being permanently adversely impacted. No recreation carrying capacity studies have been conducted at Tenkiller Ferry Project. Presently, lake staff manage recreation areas using historic visitation data combined with best professional judgment to address recreation areas considered to be overcrowded, overused, underused, or well balanced. Lake staff will continue to identify possible causes and effects of overcrowding and overuse and apply appropriate best management practices including: site management, regulating visitor behavior, and modifying visitor behavior.

#### **2.10. REAL ESTATE**

The acquisition policy for purchasing lands for Tenkiller Ferry Lake were: (a) fee area encompassing elevation 670.0 feet, which is the flood control pool plus three feet of freeboard and (b) the upper guide line for flowage easement encompasses the flood of record, assumed to fall on a filled flood control pool (elevation 667.0 ft.) with freeboard of 3 feet added to the envelope curve in the flat pool (to elevation 670.0 ft.) for possible operation for induced surcharge, accompanied by wave action and shoreline erosion.

Table 2.15. Project Site Visits\*, by Recreation Area, for Tenkiller Ferry Project (FY 2012).

Project Site Area(USACE)	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sep 2012
ANG CLUB BOAT RAMP - 30138												
BARNACLE BILL'S - 110187	6535	3651	2539	2500	2488	2512	4191	11624	18406	18056	12964	12627
BLACKGUM LANDING - 203228	1220	253	136	129	139	255	1005	3276	4135	3687	2013	0
BURNT CABIN - 110189	5611	3241	1578	1466	1547	1712	3053	10345	15304	14924	8871	9461
BURNT CABIN BOAT RAMP - 30144												
CAMP FRED DARBY - 203912	0	0	0	0	0	0	0	0	0	0	0	0
CANEY RIDGE - 110190	4366	3056	2289	2264	2620	2969	5443	11528	16052	15358	7937	7722
CANEY RIDGE BOAT RAMP - 30143												
CARLISLE COVE - 2077251	5795	3681	1570	1504	1858	2251	4530	12692	20280	10187	6319	6520
CARTERS LANDING - 202678	3879	2062	1126	1031	1125	1573	3134	11911	17521	12827	5643	6779
CATO CREEK LANDING - 203431	5781	2935	1520	1361	1705	2321	3845	8992	12923	11558	9592	9731
CHEROKEE LANDING STATE PARK - 203409	4087	1878	1028	1381	1429	4936	3880	15974	18092	14706	8195	7599
CHICKEN CREEK - 518050013	13795	6540	5105	4958	4962	5224	8679	40215	54656	50096	29242	31566
CHICKEN CREEK SOUTH - 30142												
COOKSON BEND - 518050011	7093	3971	2848	2453	2486	2593	5140	22865	31830	31193	15031	15155
COOKSON BEND MARINA - 30141												
ELK CREEK LANDING - 518050009	6271	2604	1740	1599	1605	1859	4776	14777	22376	19914	10121	10390
ELK CREEK MARINA - 30140												
ETTA BEND BOAT RAMP - 30134												
HORESHOE BEND - 202698	1239	1069	196	192	332	934	2544	3873	4300	3964	1662	1797
METHODIST BOYS RANCH - 203609												

\* Sites without visitation data reported do have traffic/visitation counters.

Table 2.15 continued. Project site visits\*, by recreation area, for Tenkiller Ferry Project (FY 2012).

Project Site Area(USACE)	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sep 2012
MONGOLD'S BOAT RAMP - 30139												
OVERLOOK - 203400	8771	1665	1609	1599	2198	3329	5608	13686	13950	13190	6819	6673
PETTIT BAY - 518050005	7434	3990	3118	2520	2809	3891	7177	26623	33952	32808	18203	18944
PETTIT BAY MARINA - 30145												
PSA_TENKILLER FERRY LAKE - 018050	86620	43155	28998	26700	29009	36783	69978	226230	306232	273805	154474	492951
SIXSHOOTER - 110194	5355	2844	1328	923	1115	1190	2916	11179	15393	14540	6951	7895
SIZEMORE LANDING - 202354	4044	2544	1196	1108	1210	1356	3205	5605	10940	11241	6471	8827
SNAKE CREEK - 518050014	9500	4554	3636	3384	3491	4283	8054	32619	43811	38635	21156	22670
SNAKE CREEK MARINA - 30137												
STANDING ROCK - 202750	913	209	126	116	137	263	602	1977	3249	2477	1271	1563
STRAYHORN LANDING - 518050002	9221	4647	3520	3397	3407	3927	7462	21258	29775	30631	19461	20035
STRAYHORN LANDING MARINA - 30136												
S.W. OSU TENKELLER ADVENTURE PROGRAM - 203640	0	0	0	0	0	0	0	0	0	0	0	0
TENKILLER HARBOR BOAT RAMP - 30135												
TENKILLER STATE PARK - 203248	6497	4192	4980	3604	4865	6553	8419	28947	58005	24815	13904	15727
TROUT STREAM - 203943	2884	2684	1688	1478	1684	2979	5222	9137	6669	5084	3483	3667
<b>Sum:</b>	<b>206911</b>	<b>105425</b>	<b>71874</b>	<b>65667</b>	<b>72221</b>	<b>93693</b>	<b>168863</b>	<b>545333</b>	<b>757851</b>	<b>653696</b>	<b>369783</b>	<b>718299</b>

\* Sites without visitation data reported do have traffic/visitation counters.

## 2.11. PERTINENT PUBLIC LAWS

The following public laws are applicable to Tenkiller Ferry Lake.

- a. 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.
- b. 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".
- c. 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.
- d. 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.
- e. Public Law 78-534, Flood Control Act of 1944, as amended. – Section 4 of the act as last amended in 1962 by Section 207 of Public Law 87-874 authorizes the USACE to construct, maintain, and operate public parks and recreational facilities in reservoir areas and to grant leases and licenses for lands, including facilities, preferably to Federal, State or local governmental agencies. Section 5 of the act authorized the Southwestern Power Administration to market and deliver the electricity generated at Tenkiller Ferry Lake.
- f. 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.
- g. 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.

- h. 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.
- i. 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.
- j. 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.
- k. 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.
- l. 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.
- m. 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.
- n. 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 OCE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.
- o. 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.

- p. 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.
- q. 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.
- r. 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.
- s. Public Law 91-190, National Environmental Policy Act of 1969 (NEPA). – NEPA declared it a national policy to encourage productive and enjoyable harmony between man and his environment, and for other purposes. Specifically, it declared a “continuing policy of the Federal Government... to use all practicable means and measures...to foster and promote the general welfare, to create conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.” Section 102 authorized and directed that, to the fullest extent possible, the policies, regulations and public law of the United States shall be interpreted and administered in accordance with the policies of the Act.
- t. 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.
- u. 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 the USACE of Engineers from collecting entrance fees to projects.

- v. 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."
- w. 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.
- x. 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.
- y. 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.
- z. 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 plan installations.
- aa. 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.
- bb. 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.
- cc. 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.

- dd. 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.
- ee. 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.
- ff. 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 objects, and the freedom to worship through ceremonials and traditional rites.
- gg. 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.
- hh. 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.
- ii. Public Law 98-63, Supplemental Appropriations Act of 1983. This Act authorized the Corps of Engineers Volunteer Program. The United States Army Chief of Engineers may accept the services of volunteers and provide for their incidental expenses to carry out any activity of the Army Corps of Engineers, except policymaking or law or regulatory enforcement.
- jj. 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.
- kk. Public Law 101-601, Native American Graves Protection and Repatriation Act. This Act provides for the protection of Native American and Native Hawaiian cultural items. It establishes a process for the authorized removal of human remains, funerary,

sacred, and other objects of cultural patrimony from sites located on land owned or controlled by the Federal government. This Act requires Federal agencies and Federally assisted museums to return specified Native American cultural items to the Federally recognized Indian tribes or Native Hawaiian groups with which they are associated. Notification of all inadvertent discoveries of such items covered by the Act is reported to the appropriate affiliated descendant or tribe in order of precedence as set by the Act.

- II. Public Law 110-114, Water Resources Development Act of 2007, Section 3134. – This act requires lakes within the State of Oklahoma under Corps of Engineers jurisdiction research methods for demonstration projects to benefit and enhance recreation.

## **2.12. EXECUTIVE ORDERS AND CIRCULARS**

The following Executive Orders and Circulars are applicable to Tenkiller Ferry Lake.

- a. Executive Order 11593, 13 May 1971, Protection and Enhancement of the Cultural Environment. This Presidential Order mandates that all Executive Branch agencies, bureaus, and offices: (1) compile an inventory of the cultural resources – archeological, architectural, and historical structures, sites, and districts – for which they are trustee; (2) nominate all eligible Government properties to the National Register of Historic Places; (3) preserve and protect their cultural resources; and (4) insure that agency activities contribute to the preservation and protection of non-federally owned cultural resources. The deadline for Federal agency compliance with Executive Order 11593 was 1 July 1973.
- b. Executive Order 11752, 17 December 1973, Prevention, Control, and Abatement of Environmental Pollution at Federal Facilities. The purpose of this order is to assure that the Federal Government, in the design, construction, management, operation, and maintenance of its facilities, shall provide leadership in the nationwide effort to protect and enhance the quality of air, water, and land resources through compliance with applicable standards for the prevention, control, and abatement of environmental pollution. Section 4 listed the requirements for federal facility design, construction, management, operation, and maintenance.
- c. Executive Order 11988, 24 May 1977, Floodplain Management. This order outlines the responsibilities of Federal agencies in the role of floodplain management. Each agency shall evaluate the potential effects of actions on floodplains and should not undertake actions that directly or indirectly induce growth in the floodplain, unless there is no practical alternative. Agency regulations and operating procedures for licenses and permits should include provisions for evaluation and consideration of flood hazards. Construction of structures and facilities on floodplains must incorporate flood proofing and other accepted flood protection measures. Agencies shall attach appropriate use restrictions to property proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties.

- d. Executive Order 11990, 24 May 1977, Protection of Wetlands. This order directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands.
- e. Executive Order 12898, 11 February 1994, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal agencies shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.
- f. Executive Order 12962, 7 June 1995, Recreational Fisheries. This order mandates that Federal agencies, to the extent permitted by law and where practicable, improve the quality, function, and sustainable productivity and distribution of aquatic resources for increased recreational fishing opportunities.
- g. Executive Order 13007, 24 May 1996, Indian Sacred Sites. This Executive Order requires that agencies avoid damage to Indian sacred sites on Federal land, and avoid blocking access to such sites for traditional religious practitioners.
- h. Executive Order 13045, 21 April 1997, Protection of Children from Environmental Health Risks and Safety Risks. This order mandates that Federal agencies, to the extent permitted by law and appropriate and consistent with the agency's mission, make it a priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities and standards address disproportionate risks to children that result from environmental health risks or safety risks.
- i. Executive Order 13112, 3 February 1999, Invasive Species. The purpose of this order mandates that each Federal agency whose actions may affect the status of invasive species shall identify the actions, use relevant programs and authorities to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, monitor invasive species populations, provide for restoration of native species and habitat conditions in ecosystems that have been invaded, conduct research on invasive species, and promote public education on invasive species. Federal agencies are further mandated not to authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species. The order also establishes an Invasive Species Council and outlines the duties of the Council. USACE responded with a Policy Memorandum on 2 June 2009, which implements USACE Invasive Species Policy. The policy memorandum establishes a consistent, nationwide policy that will be applied to all Civil Works projects and programs. Specifically for Operations, the memorandum states that "Operating projects will include strategies for invasive species management in their project Operations and Maintenance responsibilities." The strategies are to be coordinated with other Federal, State, and local agencies. The National Invasive Species Management Plan, developed by the National Invasive Species Council,

serves as a blueprint for USACE action on both aquatic and terrestrial invasive species.

- j. Executive Order 13186, 10 January 2001, Protection of Migratory Birds. This order requires that each Federal agency taking actions that have, or are likely to have, a measureable negative effect on migratory bird populations develop and implement a Memorandum of Understanding with the Fish and Wildlife Service that shall promote the conservation of migratory bird populations.
- k. Executive Order 13474, 26 September 2008, Recreational Fisheries. This order amends Executive Order 12962.
- l. Executive Order 13514, 5 October 2009, Federal Leadership in Environmental, Energy, and Economic Performance. This order requires Federal agencies to establish an integrated strategy to meet greenhouse gas emission goals established by this Executive Order.
- m. Executive Order 13693, 19 March 2015, Planning for Federal Sustainability in the Next Decade. This order revokes Executive Order 13423, 24 January 2007; Executive Order 13514, 5 October 2009; Presidential Memorandum of 2 December 2011, Section 1 of Presidential Memorandum of 21 February 2012; Presidential Memorandum of 5 December 2013; and Presidential Memorandum of 24 May 2011. This order requires federal agencies to maintain Federal leadership in sustainability and greenhouse gas emission reductions, promote building energy conservation, efficiency, and management by reducing agency building energy intensity, increase total amount of building electric energy and thermal energy from renewable electric energy and alternative energy, improve water use efficiency and management, and improve agency fleet and vehicle efficiency to reduce per-mile greenhouse gas emissions.

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## CHAPTER 3 - RESOURCE OBJECTIVES

### 3.1. RESOURCE OBJECTIVES

Resource considerations at Tenkiller Ferry Lake exist primarily due to user demands on the project. Multiple user types have interests in the project lands, recreation facilities, and waters, and such demands regularly create conflicts. USACE is also obligated to manage these resources for the overall interest of the public and not just for a select group of individuals. It is the responsibility of the project and the agency to attempt to provide an environmentally sound balance of these demands. Impacts on the environment will be assessed during the decision making process prior to any change to management plans or strategies. The following objectives are the priorities for consideration when determining management goals and development activities.

1. To increase the value of all project lands and waters for recreation, fisheries, and wildlife.
2. Manage the existing natural resources and recreation facilities in compliance with all pertinent laws, regulations and policies.
3. Develop and manage the area for maximum enjoyment of the recreating public.
4. Protect and preserve the existing native wildlife species and improve wildlife habitat for now and in the future.
5. Protect and preserve the existing shoreline from erosion and overuse through natural resource management and cooperation with adjacent landowners.
6. Inform the public, through programs and personal contacts, about the project and resource management purposes and objectives.
7. Integrate fish and wildlife management practices with other natural resource management practices while working closely with state and local natural resource agencies.
8. Identify safety hazards or unsafe conditions; correct infractions and implement safety standards in accordance with EM 385-1-1.
9. Avoid the appearance of private exclusive use in areas zoned for limited development in the Tenkiller Ferry Lake Shoreline Management Plan (SMP).
10. Encourage non-consumptive use of project lands.

Implementation of these objectives is based upon time, manpower, and budget. The objectives provided in this chapter are established to provide high levels of stewardship to USACE managed lands and resources while still providing a high level of public service.

These objectives will be pursued through the use of a variety of mechanisms such as: Assistance from volunteer efforts, hired labor, contract labor, permit conditions, remediation, and special lease conditions. It is the intention of Tenkiller Ferry Project to provide a realistic approach to the management of all resources.

The Natural resource elements within the identified objectives come in several different categories of work at Tenkiller Ferry Lake. They can be broken into fisheries, game, non-game, and shoreline use. Management objectives for these categories are dependent on the individual resource, location, and lead agency.

A. Shoreline Management. The Tenkiller Ferry Lake shoreline management program is one of the primary work burdens for the staff. The objective for this program is to manage public lands in accordance with the Tenkiller Ferry Lake SMP. The purpose of this document is to manage activities considered as private use on public lands without allowing degradation to natural resources or creating the appearance of private exclusive use. Reference the Tenkiller Ferry Lake SMP for descriptions of authorized activities within this program.

B. Wildlife and Fisheries Management. Wildlife and fisheries are managed cooperatively between the ODWC and USACE. USACE currently licenses 2,590 acres of land to ODWC. This area comprises the Tenkiller Wildlife Management Area. USACE also currently licenses 0.125 acres to ODWC for placement and operation of a Supersaturated Dissolved Oxygen System (SDOX) to support the ODWC management goals and objectives associated with the tailwater trout fishery. ODWC's primary objective in these areas is to manage game species with the understanding those actions benefit both game and non-game species. These areas will continue being managed by this agency under their license.

ODWC is also the primary agency responsible for performing fisheries management. ODWC objectives for fisheries are to continue to monitor current populations, insure the populations are healthy and stable, and reduce the number of spotted bass in the reservoir. ODWC does annual sampling and data analysis to assure fisheries populations stay within an acceptable range. They also make adjustments in creel and size limits as necessary to keep existing populations healthy. ODWC can also supplement fish populations with their hatchery program.

USACE is not directly involved with management within the ODWC areas of responsibility. However, USACE has determined that ODWC's objectives compliment goals for fish and wildlife management and should remain as the primary objectives for these locations. Another USACE objective for ODWC areas of responsibility will be to continue providing support when resources are available. USACE often provides support with assistance in the placement of fish structures, archeological reviews for proposals involving soil disturbance, and assistance with GIS mapping.

In addition to the ODWC licensed areas, USACE has several additional management units established 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 will be centered on both game and non-game species and can be found in the Operational Management Plan (OMP).

C. Recreation. 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 master 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: USACE, State of Oklahoma, county and city governments, and private/commercial concessionaires. Land-based recreation objective will be to continue providing service and rehabilitate existing parks to a "Justified Level of Service".

Water-based outdoor recreation includes opportunities, activities, areas and facilities that occur on water managed by USACE. These activities include; fishing, boating, swimming, scuba diving, operating seaplanes, kayaking, etc. Unlike land-based recreation the majority of water-based 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. This program will involve looking at recreation carrying capacity vs. current use patterns, zoning requirements for no-wake or restricted areas, and areas to remain open for public recreation. 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.

D. Oklahoma State Comprehensive Recreation Plan. 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 will see an increase in resource user groups that have historically represented ethnic and racial minorities. 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.

E. Project-Wide Resource Objectives. The purpose of the USACE Master Plan is to establish the guidelines for sustainable stewardship of natural and recreational resources managed directly and indirectly on USACE fee lands. 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.

Resource objectives are attainable goals for development, conservation, and management of natural, cultural, and manmade resources at a project. They are guidelines for obtaining maximum public benefits while minimizing adverse impacts to 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 project-wide resource objectives for Tenkiller Ferry Lake, not in priority order, are listed below:

1. To give priority to the preservation and improvement of wild land values in public use planning, design, development, and management activities.
2. To preserve and protect important paleontological, archeological, ecological, and esthetic resources.
3. To manage habitat for threatened and endangered species and to support a diversity of fish and wildlife, and recreation use.
4. To 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.
5. To manage and develop project lands to accommodate ongoing and sometimes significant fluctuations in lake elevations with minimal impacts.
6. To 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.
7. To manage identified recreations lands in ways that enhance benefits to wildlife.

8. To provide access by Tribal members to any cultural resources, sacred sites, or other Traditional Cultural Properties.
9. To preserve and protect cultural resources sites in compliance with existing federal statutes and regulations.
10. To expand public outreach and education about the history of the area, project resources, and the USACE's role in developing and managing these resources.
11. To foster stewardship by minimizing encroachments and other non-allowed uses.
12. To develop and manage lands in cooperation and coordination with other management agencies and appropriate entities in the private sector.
13. To maintain and manage project lands and waters to support regional management programs.

Execution of resource objectives at a large multi-purpose project such as Tenkiller Ferry Lake is difficult. It 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 and economical groups. Access will be in the form of offering hunting, fishing, camping, bird watching, boating, and other various lake related recreational opportunity locations.

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

### 4.1. LAND ALLOCATION

Land allocation is identified as the congressionally authorized purpose for which the project lands were purchased. There are four categories of allocation identified as Operations, Recreation, Fish and Wildlife, and Mitigation. There was a total of 30,493 acres of land purchased for the creation of Tenkiller Ferry Lake.

- 4.1.1. Operations. These are lands acquired specifically to meet the requirements of the congressionally authorized purpose of constructing and operating the project (i.e., flood control, hydroelectric power generation). There were 30,493 acres purchased for this purpose which comprises 100 percent of the project.
- 4.1.2. Recreation. These would be lands that were purchased specifically for the purpose of development for recreation. There were no lands purchased specifically to meet this purpose and allow development for recreational facilities. Authorization allowing development of recreational facilities was included in subsequent legislation and is presented in Section 2.10.
- 4.1.3. Fish and Wildlife. These would be lands that were purchased specifically for the purpose of managing or protecting fish and wildlife. There were no lands congressionally authorized for the purpose of Fish and Wildlife.
- 4.1.4. Mitigation. These would be lands purchased for the specific intention of offsetting the losses associated with the creation of the project. There were no lands congressionally authorized for the purpose of Mitigation.

A map showing the Land Allocation for Tenkiller Ferry Lake is presented in the Index to Drawings Appendix A.

### 4.2. LAND CLASSIFICATION

Land Classification indicates the primary use for which project lands area managed. There are five categories of classification identified as: Project Operations, High Density Recreation, Mitigation, Environmentally Sensitive Areas, and Multiple Resource Managed Lands. Maps showing the various land classification can be found in Appendix A (Drawing TEN15MP-OC-01 through TEN15-OC-17). Table 4.1 lists the acreage associated with each category of land classification at Tenkiller Ferry Lake.

- 4.2.1. Project Operations. This category includes the lands required for the dam, spillway, hydropower plant, project office, and maintenance yards. There are 335 acres 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, and concession areas. There are 3,462 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 congressionally authorized.
- 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 777 acres classified for environmentally sensitive areas to manage and protect cultural resources identified as eligible for the National Register of Historic Places.
- 4.2.5. Multiple Resource Managed Lands. This classification is for the predominate use of an area with the understanding that other compatible uses can occur within the area. This classification is divided into four subcategories identified as: Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. There are 12,826 acres of lands that are under this classification. The following identifies the amount contained in each subcategory of this classification.
- a. Low Density Recreation. These are lands with minimal development or infrastructure that support passive public use (e.g., fishing, hunting, wildlife viewing, shoreline use, hiking, etc...). They were lands purchased for project operations and classified for low density recreation. The intention of these classified lands is to assure available lands for low density recreation between areas classified as recreation intensive use and wildlife management. There are 4,913 acres under this classification at Tenkiller Ferry Lake.
  - b. Wildlife Management. These lands designated for the management of Fish and Wildlife resources. They were lands purchased for project operations and classified for the purpose of wildlife management. There are 7,755 acres under this classification at Tenkiller Ferry Lake.
  - c. Vegetative Management. These are lands designated for stewardship of forest, prairie, and other native vegetative cover. There is no acreage under this classification at Tenkiller Ferry Lake.
  - d. 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 158 acres under this classification at Tenkiller Ferry Lake.

4.2.6. Water Surface. The project does have a surface water management program for 3 items. Item 1 includes the area around the dam which has been identified for no boat entry. There is an area below and above the dam that is buoyed off and in which no boat entry is allowed. This is for both project operations and public safety. Item 2 includes restrictions at Pine Cove at Crappie Point located within Tenkiller State Park and relates to restricting public access to cliffs and bluffs to deter cliff diving and promote public safety. Item 3 includes sea plane takeoff and landing restrictions within 2,000 feet of dam structure, bridges, and recreation areas.

Table 4.1. Land Classifications at Tenkiller Ferry Lake.

CLASSIFICATION	ACRES
Project Operations	335
High Density Recreation	3,462
Environmentally Sensitive Areas	777
Multiple Resource Managed Lands	4,913
Low Density Recreation	
Multiple Resource Managed Lands	7,755
Wildlife Management	
Multiple Resource Managed Lands	0
Vegetative Management	
Multiple Resource Managed Lands	158
Future/Inactive Recreation Areas	

The remainder 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 navigational direction. This buoy system is managed by USACE with close coordination with the Oklahoma Department of Public Safety.

### 4.3. PROJECT EASEMENT LANDS

These are lands on which easement interests are held but not fee title ownership. These are typically composed of three different classification indentified as Operations Easement, Flowage Easement, and Conservation Easement. There are 268 acres of easement lands at Tenkiller Ferry Lake.

4.3.1. Operations Easement. These would be easements the Corps of Engineers purchased for the purpose of project operations. There are 140 acres of operation easements at Tenkiller Ferry Lake.

4.3.2. Flowage Easement. These are easements purchased by the Corps of Engineers giving the right to temporarily flood private land during flood risk management operations. There are 129 acres of flowage easement lands located at Tenkiller Ferry Lake.

4.3.3. Conservation Easement. These are easements purchased by the Corps of Engineers for the purpose of protecting wildlife, fisheries, recreation, vegetation, archeological, threatened and endangered species, or other environmental benefits. There are no conservation easements at Tenkiller Ferry Lake.

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## CHAPTER 5 - RESOURCE PLAN

### 5.1. CLASSIFICATION AND JUSTIFICATION

This chapter describes the management plans for each area of classification within the MP. The classifications which exist at Tenkiller Ferry Lake are; Project Operations, High Density Recreation, Low Density Recreation, Wildlife Management, and Environmentally Sensitive. The management plans identified are in broad terms of how these project lands will be managed. A more descriptive plan for managing these lands can be found in the Tenkiller Ferry Lake OMP.

#### A. Project Operations

This land is classified for security reasons pertaining to project operations. This would be land associated with the dam and related facilities. There are 335 acres of lands under this classification which are managed by the USACE. The management plan for this area is to continue providing physical security necessary to insure continued operations of the dam, hydropower plant, and related facilities. This means that public access must be restricted in hazardous locations, near the dam and spillway, and within the hydropower plant. Authorization for the public to moor private floating facilities and/or the modification of land form and vegetation are not permitted within this area. The goal for these classified lands is to continue operating as done historically in order to insure project operations.

#### B. High Density Recreation

There are numerous areas around Tenkiller Ferry Lake that are designated as High Density Recreation in previous master plans. Description of High Density recreation is provided in two separate areas. First are areas classified for high density recreation but leased to another agency/entity for management and operation. Second would be those high density areas which USACE still manages and operates.

There are several areas currently classified as high density recreation which are leased to other organizations for operation and management. These areas include the lands and waters leased to two state parks and recreation facilities. USACE does not provide any maintenance within any of these locations but there are times when support is provided to the managing agency. USACE has to provide review of requests and make sure they are in accordance with applicable laws and regulations for the proposed activity within an area zoned high density recreation. The areas currently leased to other agencies and individuals can be found in Table 5.1. The goal for these areas is to work with USACE partners to assure recreation areas are being managed in accordance with resource objectives identified in Chapter 3.

Table 5.1. Recreation Area Managing Agency.

<b>Park</b>	<b>Number of Acres</b>	<b>Land Classified for Recreation</b>	<b>Managing Agency</b>
Barnacle Bills Marina	59	Yes	Barnacle Bills Marina
Burnt Cabin Marina	65	Yes	Burnt Cabin Marina
Caney Ridge Marina	40	Yes	Caney Ridge Marina
Cookson Bend Marina	32	Yes	Cookson Bend Marina
Cherokee Landing State Park	136	Yes	State of Oklahoma
Elk Creek Marina	28	Yes	Elk Creek Marina
Pettit Bay Marina	27	Yes	Pettit Bay Marina
N.S.U. Riverhawk Camp	261	Yes	Northeastern State University
Sixshooter Marina	29	Yes	Sixshooter Marina
Snake Creek Marina	32	Yes	Snake Creek Marina
Strayhorn Landing Marina	70	Yes	Strayhorn Landing Marina
Tenkiller State Park	565	Yes	State of Oklahoma

USACE still operates and manages numerous areas designated as high density recreation. These areas vary from locations that were classified recreation areas that were developed but have since been turned into access points and locations where developed recreational areas are still managed and maintained for high density use. Table 5.2 shows the areas currently managed by USACE. Drawings showing existing parks and facilities managed by USACE are located in Appendix A (TEN15MP-OR-01 through TEN15MP-OR-13).

Table 5.2. Management Goal for Designated Public Use Areas.

<b>Park</b>	<b>Number of Acres</b>	<b>Land Classified for Recreation</b>	<b>Management Goal</b>
Blackgum Landing	22	Yes	Access Point
Carlisle Cove	107	Yes	Access Point
Carters Landing	22	Yes	Maintained Facility
Chicken Creek	81	Yes	Maintained Facility
Chicken Creek South	43	Yes	Maintained Facility
Cookson Bend	108	Yes	Maintained Facility
Elk Creek Landing	174	Yes	Maintained Facility
Etta Bend	19	Yes	Access Point
Horseshoe Bend	143	Yes	Access Point
Overlook	24	Yes	Access Point
Pettit Bay	94	Yes	Maintained Facility
Sizemore Landing	98	Yes	Maintained Facility
Snake Creek	206	Yes	Maintained Facility
Standing Rock	93	Yes	Maintained Facility
Strayhorn Landing	78	Yes	Maintained Facility
Trout Stream	63	Yes	Access Point

The areas identified as Access Point under the management goal are locations that were constructed in the early years of the lake's development. These locations were projected to have need for recreational facilities based on projected use. Time revealed that recreational use did not develop for these locations and/or funding to provide services was insufficient. Therefore, over a several year period USACE opted to change some maintained facilities into Access Points. This allowed these areas to stay open for public use but services such as park cleaning, refuse collection, and mowing were no longer provided. Also, any maintenance needs such as improvements or betterments were ceased. The only maintenance performed is the minimal amount necessary to allow safe use of the facilities. Management goal for these areas is to keep them open for public use while meeting the resource objectives identified in Chapter 3.

The areas shown as maintained facilities under the management goals are parks that were constructed and managed for high density use. These areas still provide services such as water, electric, mowing, refuse collection, cleaning, and maintenance/improvements. The plan is to provide a justified level of service by updating camp sites to accommodate larger camping units with 50-amp electrical service, restrooms to a sufficient standard to service the public, and water available for camper hook-up while at campsite. With minor exceptions, all operations and maintenance activities are performed by the USACE employees, contractors, volunteers, and other various methods. The ultimate goal of this program is to insure the safety of visitors and to provide a wide range of opportunities for outdoor recreational enjoyment while concurrently meeting the resource objectives in Chapter 3. Users and their activities vary greatly at Tenkiller Ferry Lake and satisfying these demands will be a constant challenge. Routine visitor use surveys will be conducted to identify user desires and preferences. Future management strategies will shift to accommodate the demands indicated in these visitor use surveys.

#### C. Environmentally Sensitive Area

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the ESA, 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. There are four areas at Tenkiller Ferry Lake that fit this description. These areas total 777 acres on USACE land purchased for the construction of Etta Bend Public Recreation Area southeast and north northwest of existing road and boat ramp improvements, on USACE land purchased for the construction of Carters Landing south of primary access road into the Public Use Area, and on USACE land purchased for recreation, above the top of conservation pool elevation of 632.00 feet, along the north bank of the Barren Fork River, a tributary to the Illinois River. The management goal for these areas is to ensure conservation and preservation in compliance with the NHPA.

D. Multiple Resource Management Lands. These are areas where predominate use is that of the classification. However, there are other compatible uses which may occur on these

lands without impacting the predominant use. These lands can be divided into four sub-categories for the purposes of this master plan. These categories are; Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. The following is a description of each sub-categories resource objectives, acreages, and description of use.

1. Low Density Recreation. These are lands with minimal development or infrastructure that support passive public use. There are 4,913 acres zoned Low Density Recreation which the allowable use within these lands can be categorized as either shoreline use (private floating structures/vegetative modification) or low density recreation.

Portions of the Low Density Recreation lands are areas where USACE has determined that Limited Development can occur under a Shoreline Use Permit. These permits can authorize construction of private floating facilities on the lake as well as vegetative modification on fee owned land. Shoreline use is the major portion of work effort at Tenkiller Ferry Lake when it comes to natural resources management. These activities may be authorized in designated areas consistent with approved use allocations specified in the Tenkiller Ferry Lake SMP. The intention of the SMP is to protect natural resources while still providing limited private use activities. The issuance of a private shoreline use permit does not convey any real estate or personal property rights or exclusive use rights to the permit holder.

The current status of shoreline management at Tenkiller Ferry Lake is there are approximately 281 permits issued for boat docks and approximately 20 active permits for vegetation modification related activities. It is anticipated this number will increase in future years due to the increase of development from the adjacent private property around the lake. Consult the Tenkiller Ferry Lake SMP for specific information on how shoreline use is managed.

The intention for these lands is to assure they are being managed in accordance with the objectives identified in Chapter 3, and the requirements in CFR, Title 36, Section 327.30. Tenkiller Ferry Lake staff will monitor permitted shoreline use in these areas to accomplish this task. Staff will assure the appearance of private exclusive use is not occurring and that USACE resource objectives are being met. The threshold for areas available for permitted private docks and vegetation modification is very nearly saturated; USACE will notify the public why additional shoreline use permits cannot be issued within that area as appropriate.

2. Wildlife Management: These are lands designated for the management of wildlife resources. Wildlife management is conducted by USACE and the State of Oklahoma. There are currently 2590.125 acres of land licensed to the ODWC. These areas are primarily located in the Tenkiller Wildlife Management Area and powerhouse equipment yard. ODWC's primary strategy in these areas is to manage game species with the understanding those actions benefit both game and non-game species. The resource plan for ODWC licensed land coincides with the objectives USACE desires to see on land classified as

wildlife management. Therefore the plan for these areas is to continue allowing ODWC to implement their management plan.

A special note about USACE involvement within ODWC licensed land is USACE is not directly involved with the work effort within these areas. However, USACE often provides support to ODWC when time and resources are available. Support often comes in assistance with creation of habitat, archeological reviews, identifying boundary line, and assistance with GIS mapping. USACE will continue to let ODWC be the lead agency when it comes to management of wildlife at these locations.

In addition to the ODWC licensed areas, USACE has property directly managed within several units for the purpose of wildlife management. These areas are managed with the intentions of providing public hunting opportunities for both big and small game. A level one environmental inventory has been conducted for Tenkiller Ferry Lake, which is a GIS based measurement of existing wetlands, soils, and vegetative types. The next step is to perform a level two environmental inventory to continue cataloging existing natural resources. This survey is more labor intensive and requires actual field surveillance by staff to identify resources that need to be cataloged. These inventories will identify sensitive natural resources and their location as well as help develop management plans to enhance these natural resources. The management plans will include common wildlife management practices such as: planting of food plots, fencing, cattle grazing for vegetation control, and the use of special restrictions to manage wildlife populations.

Non-game wildlife is something that is also managed by USACE. The species of focus within this area of consideration are animals listed as a threatened or endangered species under the ESA. These species (Table 2.2) will continue to receive attention to assure they are managed in accordance to their habitat needs and parameters identified in a biological opinion. Other non-game programs such as song bird nest box construction and installation of bat boxes are often performed on an intermittent basis. The plan is to continue providing effort to these initiatives in order to provide some form of management for non-game species.

The goal for the areas leased to ODWC is to continue working with USACE partners to assure wildlife management is being conducted so that it benefits both game and non-game species. Those lands managed directly by USACE will continue being managed in a fashion to enhance the existing environment and benefit both game and non-game wildlife. A priority will be given to accomplishing the objectives identified in Chapter 3.

3. Vegetative Management. These are lands that have vegetative types considered to be sensitive and needing special classification to ensure success. A good example of these types of vegetation would be forested wetlands and Cross Timber forests. No lands are currently identified at Tenkiller Ferry Lake for vegetative management purposes.

4. Future/Inactive Recreation Areas. These are areas that were classified for recreation but were never developed. There are nine (9) islands totaling 158 acres occurring

within the lake south of the highway 82 bridge. These areas are classified for High Density Recreation and have been previously leased to the State of Oklahoma. The current lease with the State of Oklahoma excludes these islands, however the State of Oklahoma would be interested in leasing these areas in the future if their inclusion is deemed economically justifiable. Therefore, they should remain as a potential recreational development location. In the interim it should be managed for wildlife and low density public recreation and allow activities such as, hunting, hiking, or wildlife observation.

E. Water Surface. This is in reference to water surface management needs which the project utilizes to ensure project operations. There are two types of water surface zoning utilized at Tenkiller Ferry Lake. First would be an area that is prohibited for boat traffic. This area is located around the dam and is delineated with buoy lines. There are prohibited entry locations on both the upstream and downstream side of the dam in accordance with ER 1130-2-520. The purpose of this restriction is to limit public access to ensure the security of the structure and public safety. The second type of water surface zoning is for public safety related to cliff jumping and cliff diving. There are two locations at Tenkiller State Park where access to water and shoreline is prohibited for public safety. The goal for this zoning is to continue managing it to provide the optimal recreational experience for the user while still providing high levels of public safety.

## **5.2. SPECIAL CONSIDERATIONS**

There is an abundance of cultural resources located around and within Tenkiller Ferry 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 negative impact must be coordinated with the appropriate state or tribal entity before authorization of work is granted. In addition, the recently developed Historic Property Management Plan (HPMP) must be implemented for managing cultural resources.

There are several endangered species that have a home range within the Tenkiller Ferry Lake area. Therefore, any work conducted on this project has to be in accordance to the ESA. The methodology to assure all work is done in compliance with ESA is to review the proposed action for impacts, conduct a field survey to ascertain if the species or suitable habitat is present, and if species or suitable habitat are present, follow the requirements of the ESA.

Shoreline management at Tenkiller Ferry Lake is an integral part of the project. Therefore, it is a management topic that must be identified to help lay the ground work to assure compliance of the regulations. 36 CFR Section 32.30(d)(1) states:

“It is the policy of the Chief of Engineers to protect and manage shorelines of all Civil Works water resource development projects under USACE jurisdiction in a manner which will promote the safe and healthful use of these shorelines by the public while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions will be to achieve a

balance between permitted private uses and resource protection for general public use. Public pedestrian access to and exit from these shorelines shall be preserved. For projects or portions of projects where Federal real estate interest is limited to easement title only, management actions will be appropriate within the limits of the estate acquired. “

Generally, Tenkiller Ferry Lake has been historically managed to achieve the results required in the above policy statement. The intention is to continue managing in this fashion to achieve a balance between public desires for shoreline use and environmental sustainability. Through the recent analysis conducted it has become apparent that some changes need to occur to the SMP to assure compliance with this policy statement in the future.

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## **CHAPTER 6 - SPECIAL TOPICS/ISSUES/CONSIDERATIONS**

### **6.1. COMPETING INTERESTS ON THE NATURAL RESOURCES**

Tenkiller Ferry Lake is a medium sized multi-purpose project with numerous authorized purposes. The authorized purposes have municipal and industrial users which 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. Due to these interests, competing desires on the natural resources develop. It is very difficult to balance these interests so the customer can benefit while insuring there are no adverse impacts. It is the intention of this document to outline a plan, which when executed, provides customer service and appropriate natural resource management.

### **6.2. AMERICAN BURYING BEETLE**

The American burying beetle (ABB) can be found at Tenkiller Ferry 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. Excavating soils, clearing vegetation, and constructing access roads involve displacement of soils that could uncover ABBs. Uncovered ABBs could be exposed to predation, adverse environmental conditions, or crushed by equipment. 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.

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

While the action of revising a Master Plan is not likely to jeopardize the continued existence of the ABB, and is not likely to destroy or adversely modify critical habitat, it is possible that lake management in accordance with the proposed action could result in incidental take of ABBs.

Since incidental take may occur, the USACE will have a section 10 permitted biologist conduct presence/absence surveys using established survey procedures. These surveys must be performed during the ABB active season and are valid until the beginning of the active season in the following year. Also, if soil disturbance has not commenced by the beginning of the active season in the following year, another survey will be conducted.

If a survey for a project site is positive for the ABB the following best management practices would be implemented:

1. Project footprint will be minimized to the greatest extent practicable.
2. Equipment will utilize existing roads and all equipment will use the same path to minimize disturbance.
3. Habitat will not be altered until necessary for the project construction equipment access points to dredge disposal sites will be minimized to the greatest extent practicable.
4. Project sites will be canvassed and any carcasses that may be present will be removed. Searches for carcasses must be initiated at least two weeks prior to project-related soil disturbance and conducted once a week until soil disturbance begins.
5. The minimum amount of lighting necessary to meet the objectives of the project will be used. If night time work is required, lighting will be down shielded.
6. Vegetation will be established in areas not permanently impacted that were disturbed during project construction as soon as possible following construction. This will be accomplished with an appropriate mix of plant species native to the project site. Plants listed as invasive by the U.S. Department of Agriculture or the state of Oklahoma should be avoided.
7. At least an area equal to the suitable habitat impacted by the project actions (impacts of existing flood pools excluded) will be replaced through improved management or restoration of habitat suitable for ABBs. The USACE will prepare an ABB habitat plan outlining proposed habitat improvements and the improved or restored habitat must be in a location approved by the Service. Management and monitoring of these improved habitat areas must be incorporated to maintain these areas and such actions will be included in an annual report to the Service.

### **6.3. WATER QUALITY**

Existing water quality is summarized in Section 2.4.

Water quality at Tenkiller Ferry Lake is dependent upon many factors. The location and watershed are two primary factors which contribute to general water quality. Tenkiller Ferry Dam is located on the Illinois River at river mile 12.8 in Sequoyah County, Oklahoma.

The reservoir area lies in northern portions of Sequoyah and southern portions of Cherokee Counties in Oklahoma. The watershed extends from northwestern Arkansas to northeastern Oklahoma and encompasses 1,069,530 acres with 576,030 acres located in Oklahoma and the remainder located in Arkansas. The Illinois River is classified as a state scenic river from the Lake Frances Dam to the confluence of the Illinois River with the Barren Fork, approximately 70 river miles. An additional 35 river miles of the Barren Fork and 12 river miles of Flint Creek are classified as scenic rivers upstream of their confluence with the Illinois River.

A number of water quality surveys have been conducted within the Tenkiller Ferry Lake watershed since 1999 by the USEPA, Oklahoma Conservation Commission (OCC), Oklahoma Water Resources Board (OWRB), United States Geological Survey (USGS), Oklahoma Department of Environmental Quality (ODEQ), and USACE. Additional Joint River Studies have been conducted by the States of Arkansas and Oklahoma. Several segments of the Illinois River, including Tenkiller Ferry Lake, are listed in the most recent 303(d) listing of waters identified by the State of Oklahoma as not meeting WQS for designated beneficial uses. Tenkiller Ferry Lake is currently identified by the State of Oklahoma as a “Nutrient Limited Water”, indicating that nutrient enrichment of the lake (i.e., eutrophication) is considered to adversely impacting the Public-Private Water Supply beneficial use. Osage Creek, Muddy Fork, and Spring Creek tributaries of the Illinois River in Arkansas are listed in the most recent 303(d) listing of impaired waters in Arkansas. No Total Maximum Daily Load (TMDL) has been established for the Illinois River or Tenkiller Ferry Lake, however the USEPA has initiated the collection of existing water quality data for TMDL development (75 FR 2860).

More recent water quality impacts related to excessive nutrients (e.g., nitrogen, phosphorous) within the watershed is the now regular occurrence of cyanobacteria (blue-green algae) blooms throughout the lake since 2011. The primary sources of nitrogen and phosphorous in the lake are runoff from fertilized agricultural lands, septic systems, NPDES permitted waste water treatment discharges, and run off from fertilized lawns. Additional sources of nitrogen and phosphorus are internal loadings from organic matter containing nitrogen and phosphorous present in the lake water and sediment.

Tenkiller Ferry Lake is typical of many of the reservoirs in Oklahoma and surrounding states that were constructed in the 20<sup>th</sup> century. As a reservoir ages, water quality declines can be attributed to many factors, individually and collectively. Factors which generally contribute to declining water quality in aging reservoirs includes sedimentation, increased human habitation within the vicinity of the lake, changing land management practices within the watershed, increase urbanization and associated urban runoff, and increased reliance on allocated water supply. Recreation is one use that has already been adversely impacted by cyanobacteria blooms, low dissolved oxygen water, and increasing reliance on water supply by stakeholders with water supply contracts. Adverse impacts to the local economy due to water quality and quantity issues have been an increasing matter of local, state, and regional concern throughout the contiguous United States in recent years.

Water quality and quantity concerns and future anticipated TMDL implementation by state and federal agencies will affect the selection and implementation of management plans throughout the watershed. Addressing water quality and quantity concerns in conjunction with TMDL implementation could allow Tenkiller Ferry Lake to meet all authorized purposes into the future.

#### **6.4. INVASIVE SPECIES**

The extent of invasive species currently documented to be present at the Tenkiller Ferry Lake project is presented in Table 2.3.

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, Eurasian watermilfoil, hydrilla, purple loosestrife, salvinia, and water hyacinth. Due to its proximity to the McClellan Kerr Arkansas River Navigation System, Tenkiller Ferry 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 Tenkiller Ferry 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 are common in water garden 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 interfere 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 Tenkiller Ferry Project lands include Japanese honeysuckle, Chinese lespedeza, Japanese climbing fern, kudzu, and autumn olive.

While zebra mussels have not been documented in Tenkiller Ferry Lake, population levels in surrounding lakes within the Arkansas River Basin have quickly risen to levels that are impacting raw water intakes for water supply and internal piping within structures and associated infrastructure. At present these impacts are mainly in the form of increased maintenance costs due to having to remove the mussels. While zebra mussels have yet to spread to the lake, their spread is inevitable. Grass carp have been found in Tenkiller Ferry Lake but population levels remain low. Several invasive terrestrial species are known to

occur on Tenkiller Ferry Project lands as presented in Table 2.3. Those species plant and animal species of greatest concern are the Eurasian collard dove and eastern red cedar.

Several native species pose problems for Tenkiller Ferry Lake and its surrounding lands. The most problematic of these are the Eastern Red Cedar, which is becoming widespread on project lands due to fire suppression, and various species of blue green algae. The spread of eastern red cedar reduces biodiversity and limits food supplies for various animal species by crowding out other plants that produce food. Wide spread blooms of cyanobacteria are the result of nutrient loading, drought, and excessively hot summers that have occurred regularly since 2011. Various species of cyanobacteria are capable of producing toxins which have the capability of causing illness and death in humans and animals. The presence of blooms and the associated publicity has impacted visitation at the lake.

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## CHAPTER 7 - PUBLIC AND AGENCY COORDINATION

### 7.1. PUBLIC AND AGENCY COORDINATION

The USACE began planning to revise the Tenkiller Ferry Lake Master Plan (MP) in spring 2014. The objectives for a MP revision were 1) update land classifications to reflect changes in USACE land management policies since 1995 and 2) to update the Project MP to reflect new agency requirements for MP documents in accordance with ER 1130-2-550, Change 7, 30 Jan 13 and EP 1130-2-550, Change 5, 30 Jan 13.

The first action was a scheduled public scoping meeting providing an avenue for public and agency stakeholders to ask questions and provide comments. This public scoping meeting was held on April 17, 2014 in Gore, OK. The Tulsa District placed commercial paid advertisements in the *Muskogee Phoenix*, *Sequoyah County Times*, *Vian-Tenkiller News*, *The Paper (Mayes County)*, *Pryor Daily News*, *Wagoner Tribune*, *Tahlequah Daily Press*, and *Tulsa World* on multiple dates during the two weeks prior to the public scoping meeting.

USACE employees hosted the workshop, which was conducted in a semi-structured manner. 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 NEPA 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 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; and
- Submitting a comment and mailing it in on letterhead or choice of paper.

One (1) comment was received following the April 17, 2014 public scoping meeting, interest groups, partner agencies, other government agencies, and businesses. In total, 25 persons, including USACE personnel, attended this public scoping meeting. The one

comment received by the USACE was general in nature and addressed the desire to work collaboratively on land management activities.

The draft MP revision and draft EA were released for Public and Agency review and comment on April 29, 2015. Comment period closed on May 29, 2015. Two (2) comments were received during this review and comment period and are included in Appendix C of the final EA.

## CHAPTER 8 - SUMMARY OF RECOMMENDATIONS

### 8.1. SUMMARY OVERVIEW

The following are the recommendation for the course of action necessary to manage Tenkiller Ferry’s current and future issues. The belief is actions taken today can ensure the future health and longevity of Tenkiller Ferry Lake while still allowing continued use and development. The factors considered cover a broad spectrum of public use, environmental, socioeconomic, and workload. The final MP for Tenkiller Ferry Lake will continue to provide for and enhance recreational opportunities for the public, improve the environmental quality, and create a management philosophy more conducive to existing staff levels at the Tenkiller Ferry Project.

### 8.2. RECLASSIFICATION OF LAND ALLOCATION

A public notice was developed as part of the initial process for revising the Tenkiller Ferry Project MP. The public notice requested the public to provide proposals for the revision of the MP. During this process there were no proposals received. Reclassification proposals assessed during this process were formulated by Tenkiller Ferry Lake Project staff and Tulsa District Office staff assigned to the Project Delivery Team (PDT). Reclassification proposals are presented in Table 8.1.

Table 8.1. Fee Land Reclassification Proposals Evaluated.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 1	Reclassify all allocated lands above the conservation pool elevation, 632.00 feet, High Density Recreation	NO – does not align with SMP. Would not allow for permitted private docks. Does not meet natural resource management policy goals and objectives of USACE.
Reclassification Proposal 2	Reclassify all allocated lands above the conservation pool elevation, 632.00 feet, Wildlife Management	NO – does not align with SMP. Would not allow for permitted private docks. Does not meet recreation management and recreation policy goals and objectives of USACE.
Reclassification Proposal 3	Reclassify all allocated lands above Hwy 82 Wildlife Management	NO – does not align with SMP below Hwy 82. Would not allow permitted private docks in areas where they are currently permitted. Only partially meets natural resource and recreation policy goals and objectives of USACE.

Table 8.1 continued. Fee Land Reclassification Proposals Evaluated.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 4	Reclassify 24 acres in Strayhorn Cove from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassification Proposal 5	Reclassify 46 acres on the south shore of Lender Branch Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassification Proposal 6	Reclassify 98 acres in the vicinity east of Barnacle Bill’s Marina from Low Density Recreation to High Density Recreation	YES – aligns with SMP and currently permitted private docks.
Reclassification Proposal 7	Reclassify 424 acres in the vicinity of Sisemore Cove from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassification Proposal 8	Reclassify 125 acres in the vicinity of Pettit Creek Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassification Proposal 9	Reclassify 81 acres in the vicinity of Pettit Creek Cove/Pettit Bay Recreation Area from High Density Recreation to Wildlife Management	YES – geography not suitable for High Density Recreation.
Reclassification Proposal 10	Reclassify 4 acres in the vicinity of S. Bayside Lane from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassification Proposal 11	Reclassify 77 acres extending east from Pettit Bay PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassification Proposal 12	Reclassify 60 acres in the S. Boathouse Lane vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.

Table 8.1 continued. Fee Land Reclassification Proposals Evaluated.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 13	Reclassify 118 acres on peninsula across from Standing Rock Landing PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassification Proposal 14	Reclassify 75 acres in the P-21 road vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassification Proposal 15	Reclassify 24 acres in the vicinity of the tree nursery above Hwy 82 from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassification Proposal 16	Reclassify 140 acres from in vicinity of the tree nursery above Hwy 82 from Low Density Recreation to Wildlife Management	YES – shoreline is not suitable for low density recreation.
Reclassification Proposal 17	Reclassify 164 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassification Proposal 18	Reclassify 190 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassification Proposal 19	Reclassify 88 acres in T16N, S18 and S19 from Low Density Recreation to Environmentally Sensitive Area	YES – Provide maximum protection for historically significant areas.
Reclassification Proposal 20	Reclassify 335 acres in T15N, S5 and S6 from Low Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.

Table 8.1 continued. Fee Land Reclassification Proposals Evaluated.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 21	Reclassify 638 acres along Caney Creek, Dry Creek and east bank of Illinois River from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassification Proposal 22	Reclassify 182 acres along Elk creek cove from High Density Recreation to Wildlife Management	YES – shoreline not suitable for high density recreation.
Reclassification Proposal 23	Reclassify 77 acres in Standing Rock area from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassification Proposal 24	Classify 140 acres currently unclassified lands adjacent to cottage site disposal to Low Density Recreation	YES – area is suitable for low density recreation and is currently used for low density recreation.
Reclassification Proposal 25	Reclassify 83 acres in Carlile Cove from High Density Recreation to Low Density Recreation	YES – area not suitable for high density recreation. Permitted private boat docks and aligns with SMP.
Reclassification Proposal 26	Reclassify 54 acres in south of Carlile Cove from High Density Recreation to Wildlife Management	YES – area not suitable for low density recreation and aligns with aesthetic classification in SMP.
Reclassification Proposal 27	Classify 22 acres currently not classified north of Chicken Creek Point PUA as Low Density Recreation.	YES – area is suitable for low density recreation.
Reclassification Proposal 28	Reclassify 8 acres north of Woodhaven Drive from High Density Recreation to Low Density Recreation	YES – aligns with SMP.
Reclassification Proposal 29	Reclassify 371 acres in Snake Creek Cove from High Density Recreation to Low Density Recreation	YES – aligns with SMP.

Table 8.1 continued. Fee Land Reclassification Proposals Evaluated.

PROPOSAL	DESCRIPTION	RESPONSE
Reclassification Proposal 30	Reclassify 30 acres from Wildlife Management to Project Operations	YES – necessary for auxiliary spillway.
Reclassification Proposal 31	Reclassify 5 acres on north side of Hwy 100 from High Density Recreation to Project Operations	YES – currently used for project related stockpiles.
Reclassification Proposal 32	Reclassify 145 acres in the Overlook area from High Density Recreation to Low Density Recreation	YES – Not suitable for high density recreation.

### 8.3. AMERICAN BURYING BEETLE

The ABB is identified as a federally endangered species with a possible distribution on Tenkiller Ferry Project fee lands. Under Section 7 of the Endangered Species Act, the Tulsa Districts assesses operation and maintenance impacts to the ABB under a Biological Opinion (BO) from the USFWS. This BO allows for incidental take for flood control activities within the reservoir. Impacts to the ABB on lands held in fee title above the top of the flood control pool (667.0 feet) requires consultation with the USFWS to ensure compliance with current ABB guidance. It is recommended the Tenkiller Ferry Project staff continue to ensure all project and outgrant related earth disturbing activities are conducted in a manner that ensures compliance with all applicable laws, policy, and guidance and minimize to the extent practicable adverse impacts to the ABB at Tenkiller Ferry Lake.

### 8.4. SHORELINE MANAGEMENT

Shoreline management workload is a component of project staff duties at Tenkiller Ferry Lake and is one of the primary work burdens for staff associated with private dock permitting and shoreline management activities. While shoreline management activities comprise a large amount of staff effort, shoreline management workload is currently stable with no appreciable growth anticipated in future years. Currently, the maximum numbers of allowable private dock and vegetation modification permits have been issued and activities associated with permits are limited to permit renewals.

USACE is mandated through Executive Order 13693 to reduce greenhouse gas emissions. The use of alternative energy is the preferred alternative for any future permit requests. This power could be provided in the form of wind turbine or solar and can be authorized with a Shoreline Use Permit. USACE recognizes that local utilities and individual permittees have increasing options available to provide energy produced by renewable energy resources and infrastructure necessary to provide power to private dock could closely resemble the infrastructure associated with conventional fossil fuel generated electricity. The inclusion of permit requirements to include renewable energy resources to power private docks would allow USACE to meet the policy goals and objectives for reducing reliance on fossil fuels and reduce manpower required for process or issuance of a license. If the

applicant can validate that it is unfeasible to use alternative power on site, they can provide documentation from the local electrical utility that electricity being purchased is being produce via renewable energy alternatives. If the applicant can validate that it is unfeasible to use and or acquire electricity from renewable resources they can request authorization of a conventional electric line to power the private dock.

Changes to land use classification incorporated into this MP revision better align with the existing 1996 SMP, however it is recommended this SMP be updated as soon as practicable following completion of this MP revision.

### **8.5. RECREATION**

USACE maintains and operates numerous recreation areas at Tenkiller Ferry Lake. The recommendation is to continue to provide the service to which the public has grown accustomed. This service is increasing in cost every year and has grown to become a substantial part of the operating budget. USACE should continue to strive in developing innovative and cost efficient methods to conduct business. Should budget constraints not allow for continued service then the recommendation is to either reduce services or campground availability or a combination of both in order to cut costs.

Funds spent on recreational improvements are very limited but are, at times, authorized and appropriated by Congress. When these funds are appropriated and available there should be a priority system for improvement projects within recreational areas. At present, USACE has not conducted a recreation carrying capacity study of Tenkiller Ferry Lake. It is recommended the Tulsa District prioritize recreation carrying capacity studies to be undertaken at projects with recently completed MP updates and that these studies include land-water interface recreation data and surveys, water-based recreation data and surveys, land-based recreation data and surveys, and dispersed-use recreation surveys. Survey results would then be available to assist the lake managers improve water based recreation management and water safety outreach and prioritize recreational areas for improvement projects and or partnership opportunities.

### **8.6. ENCROACHMENTS**

Encroachments have been an occasional issue for Tenkiller Ferry Lake. Encroachments occur for multiple reasons including areas with narrow land boundaries in some portions of the project, a lack of adequate fencing in place along the project boundary, and boundary monuments not visible and or located prior to initiation of the activities resulting in an encroachment. The unfortunate consequence results in occurrences when construction encroaches onto Government property held in fee title or flowage easement. The resolution is to have all encroachments removed or authorized by a real estate instrument. It is recommended that an encroachment policy be created which strives to have all encroachments removed unless determined to be justifiably on Government property and can be authorized with a Real Estate instrument.

### **8.7. PARTNERSHIPS**

The USACE has embraced the use of partnerships to provide services to the public which cannot be provided by the Government. This typically entails a second party that has resources with which to develop an area for a more enhanced recreational experience beyond what the USACE can provide. These opportunities, when available and if they provide a better opportunity for the public without negative effects to the lake, should be researched to determine if they are in compliance with applicable USACE regulation, policy, and guidance. If such a determination is positive, it is recommended that agreements be formalized with the new partner and the development be allowed to occur.

### **8.8. CULTURAL RESOURCES**

Cultural resources are abundant in the Tenkiller Ferry Lake area. Cultural resources are managed by USACE in accordance with a Historic Property Management Plan (HPMP). The HPMP is a five year plan developed to assist the government in management these historic and cultural properties and is prepared in compliance with applicable federal laws, regulations, and guidance. Currently there is no Historic Property Management Plan for Tenkiller Ferry project. It is recommended the Tulsa District complete a HPMP for Tenkiller Ferry Project and incorporate HPMP components into the Operational Management Plan (OMP) for the Project.

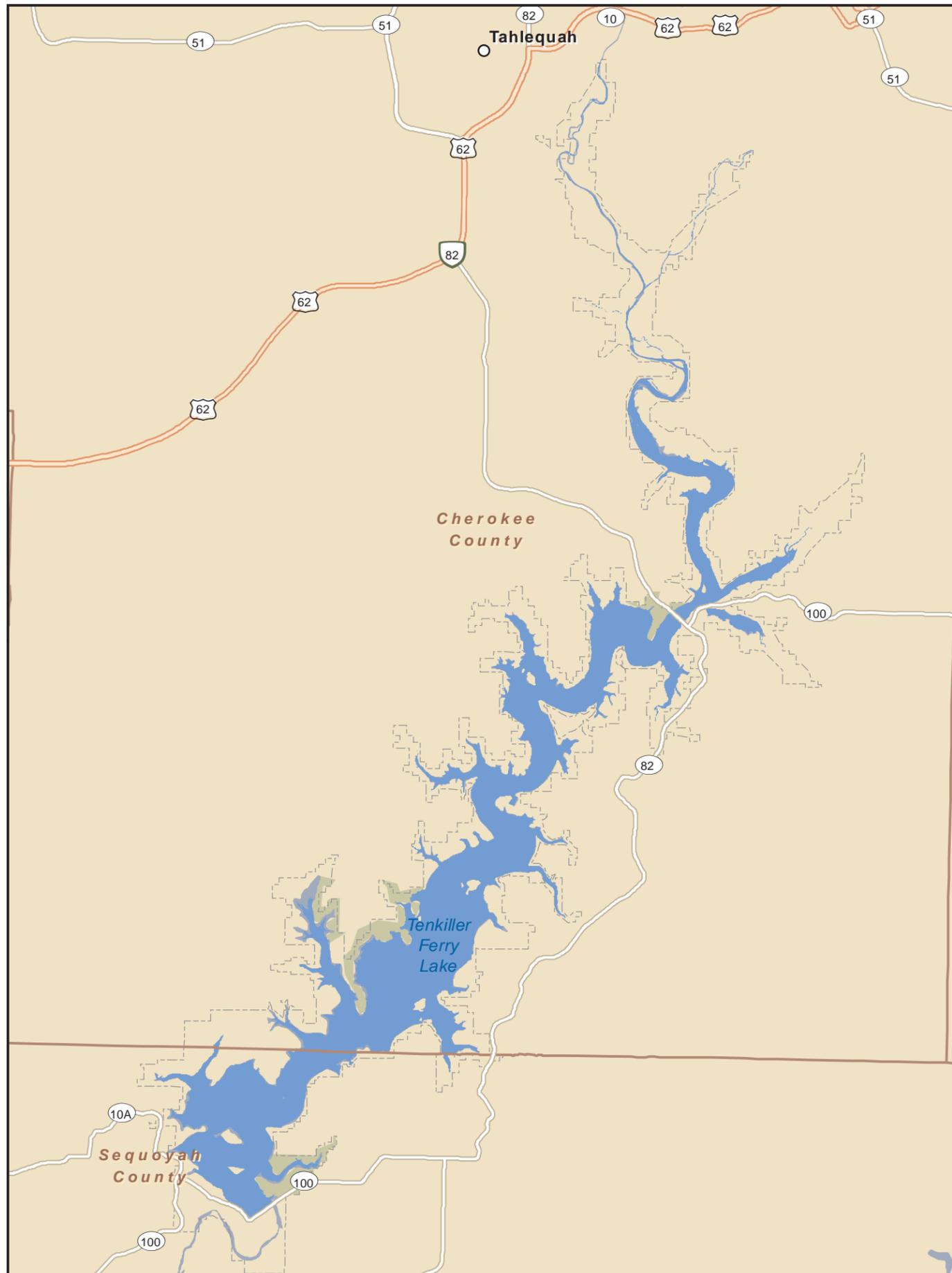
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**APPENDIX A - LAND CLASSIFICATION AND RECREATION AREA  
DRAWINGS**



## INDEX TO DRAWINGS

### GENERAL

DRAWING NO.	TITLE
TEN15MP-OI-00	PROJECT LOCATION & INDEX TO PLATES
TEN15MP-OP-01	SEAPLANE GUIDE

### LAND CLASSIFICATION

DRAWING NO.	TITLE
TEN15MP-OC-01	LAND CLASSIFICATION (SHEET 01)
TEN15MP-OC-02	LAND CLASSIFICATION (SHEET 02)
TEN15MP-OC-03	LAND CLASSIFICATION (SHEET 03)
TEN15MP-OC-04	LAND CLASSIFICATION (SHEET 04)
TEN15MP-OC-05	LAND CLASSIFICATION (SHEET 05)
TEN15MP-OC-06	LAND CLASSIFICATION (SHEET 06)
TEN15MP-OC-07	LAND CLASSIFICATION (SHEET 07)
TEN15MP-OC-08	LAND CLASSIFICATION (SHEET 08)
TEN15MP-OC-09	LAND CLASSIFICATION (SHEET 09)
TEN15MP-OC-10	LAND CLASSIFICATION (SHEET 10)
TEN15MP-OC-11	LAND CLASSIFICATION (SHEET 11)
TEN15MP-OC-12	LAND CLASSIFICATION (SHEET 12)
TEN15MP-OC-13	LAND CLASSIFICATION (SHEET 13)
TEN15MP-OC-14	LAND CLASSIFICATION (SHEET 14)
TEN15MP-OC-15	LAND CLASSIFICATION (SHEET 15)
TEN15MP-OC-16	LAND CLASSIFICATION (SHEET 16)
TEN15MP-OC-17	LAND CLASSIFICATION (SHEET 17)

### RECREATION AREAS

DRAWING NO.	TITLE
TEN15MP-OR-01	HORSESHOE BEND
TEN15MP-OR-02	CARTERS LANDING
TEN15MP-OR-03	PETTIT BAY
TEN15MP-OR-04	ELK CREEK LANDING
TEN15MP-OR-05	STANDING ROCK LANDING
TEN15MP-OR-06	SIZEMORE LANDING
TEN15MP-OR-07	COOKSON BEND
TEN15MP-OR-08	CHICKEN CREEK POINT
TEN15MP-OR-09	SNAKE CREEK COVE
TEN15MP-OR-10	BLACKGUM LANDING
TEN15MP-OR-11	STRAYHORN LANDING
TEN15MP-OR-12	OVERLOOK
TEN15MP-OR-13	TROUT STREAM

**DISCLAIMER:**  
 All US Army Corps of Engineers GIS data, information, and maps are provided "as is" without warranty or any representation of accuracy, timeliness or completeness. This information is provided as a visual representation only and considered a generalized spatial representation that is subject to revisions and is not to be used as a legal or official representation of legal boundaries. The data displayed is not a survey-quality product and the end user assumes the risk of utilizing it. The burden for determining accuracy, completeness, timeliness, merchantability, and fitness for or the appropriateness for use rests solely on the requester.

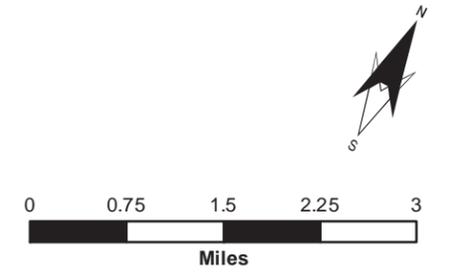
	U. S. Army Corps of Engineers Tulsa District
<small>TENKILLER FERRY DAM AND RESERVOIR</small>	<small>ILLINOIS RIVER, OKLAHOMA</small>
<b>TENKILLER FERRY LAKE</b>	
<b>TENKILLER MASTER PLAN UPDATE</b>	
<b>PROJECT LOCATION &amp; INDEX</b>	
<small>DATE:</small> APRIL 2015	<small>PLATE NO.</small> TEN15MP-OI-00



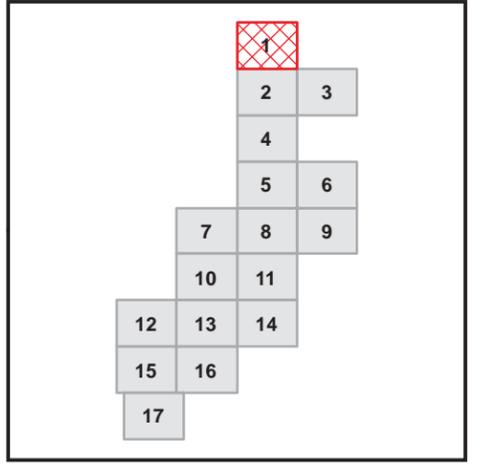
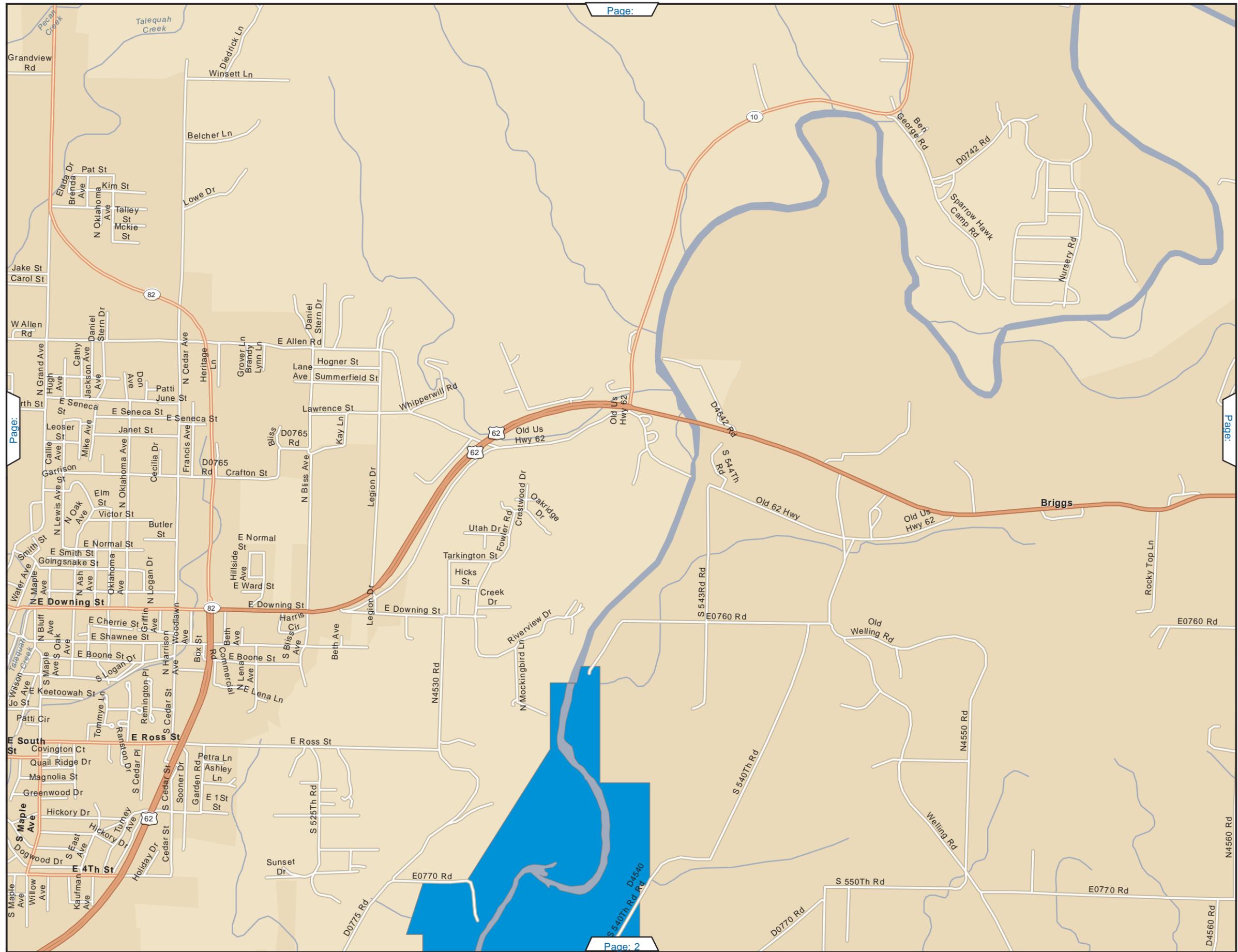
Operation of a seaplane at Corps projects is at the risk of the plane's owner, operator, and/or passenger(s).

Restricted Zone

**NOTE:**  
TAKEOFF AND LANDING  
PROHIBITED WITHIN 2,000'  
OF DAM STRUCTURE, BRIDGES,  
AND RECREATION AREAS.

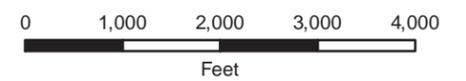


	U. S. Army Corps of Engineers Tulsa District
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA	
TENKILLER FERRY LAKE TENKILLER MASTER PLAN UPDATE SEA PLANE GUIDE	
DATE:	PLATE NO.
APRIL 2015	TEN15MP-OP-01



### Land Classification

- Project Operations
- High Density Recreation
- Low Density Recreation
- Wildlife Management
- Environmentally Sensitive



U. S. Army Corps of Engineers  
Tulsa District

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

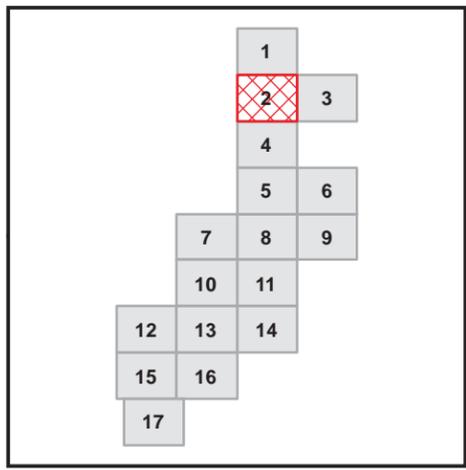
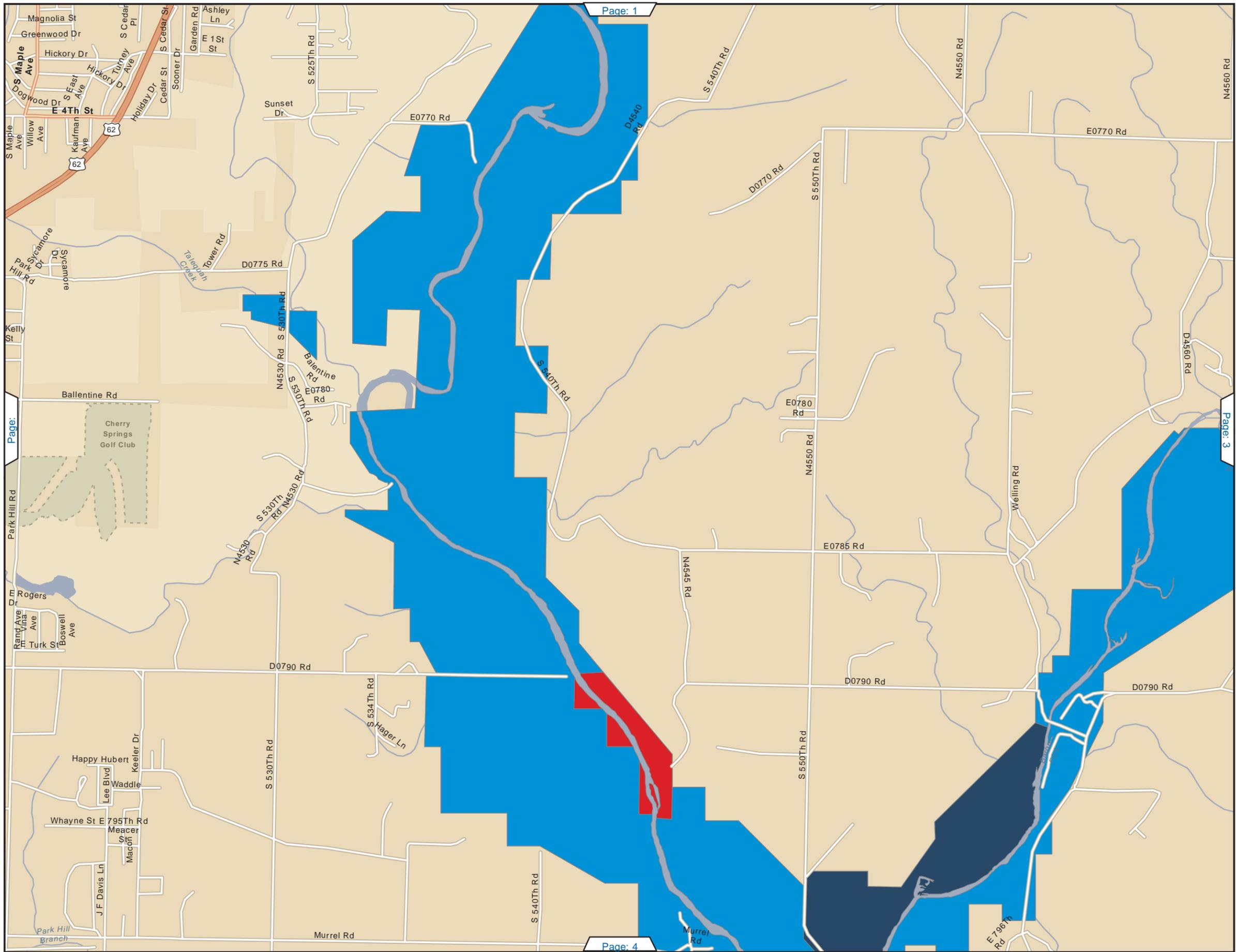
TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

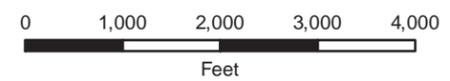
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### Land Classification

- Project Operations
- High Density Recreation
- Low Density Recreation
- Wildlife Management
- Environmentally Sensitive



U. S. Army Corps of Engineers  
Tulsa District

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

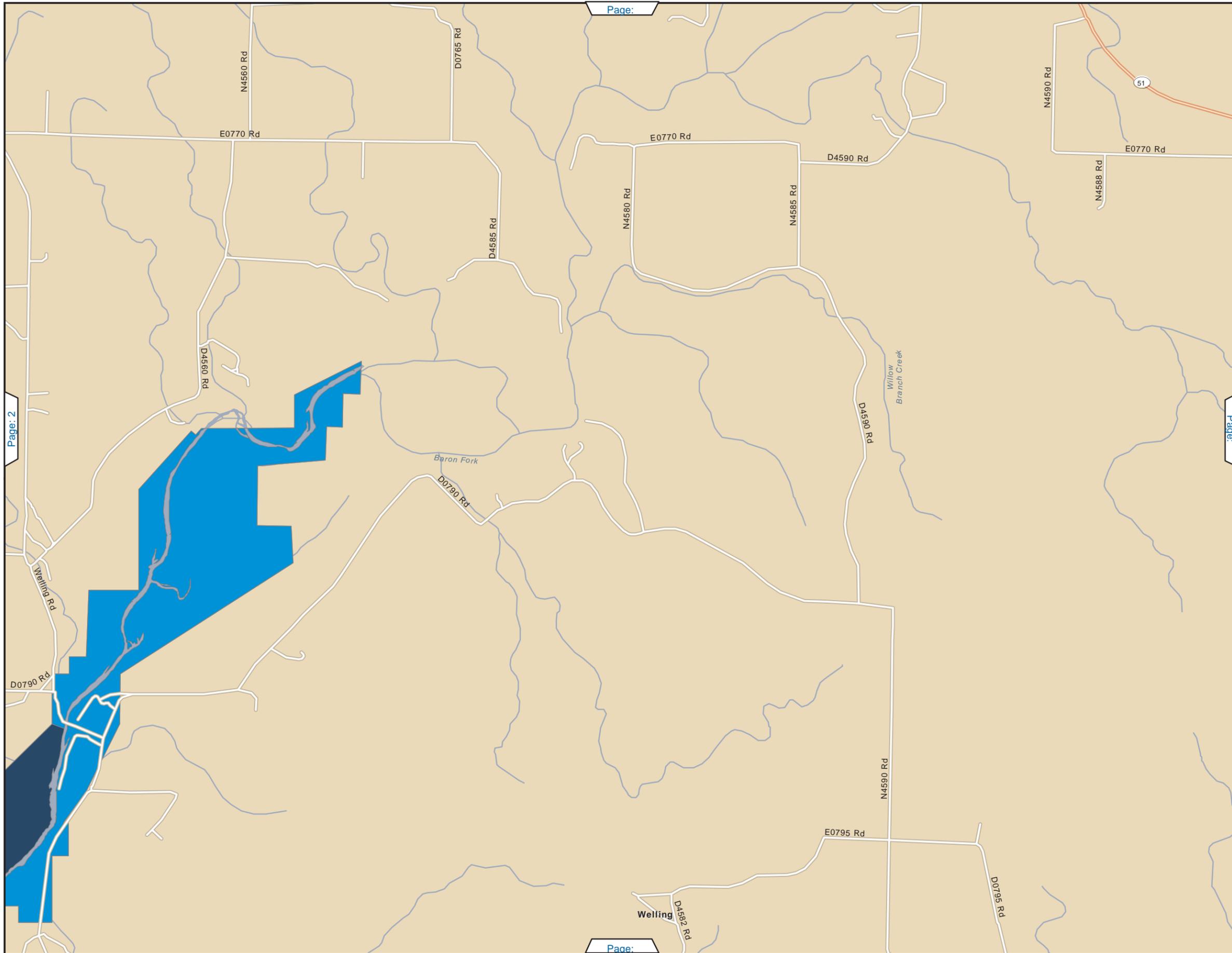
TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

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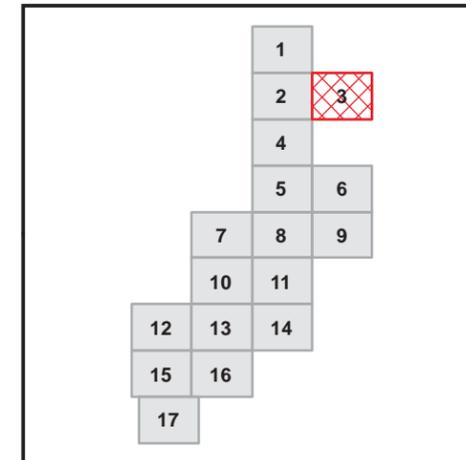
DATE: APRIL 2015	PLATE NO. TEN15MP-OC-02
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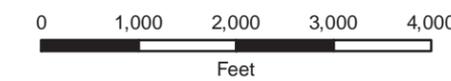
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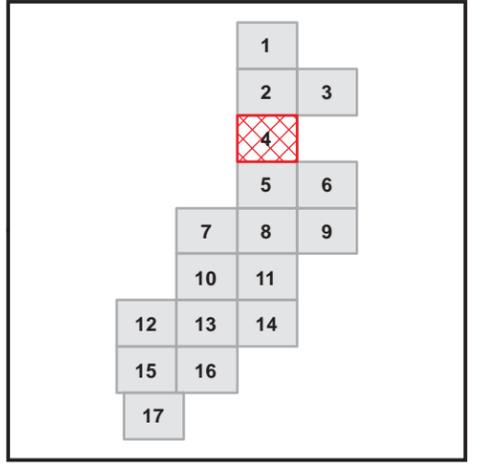
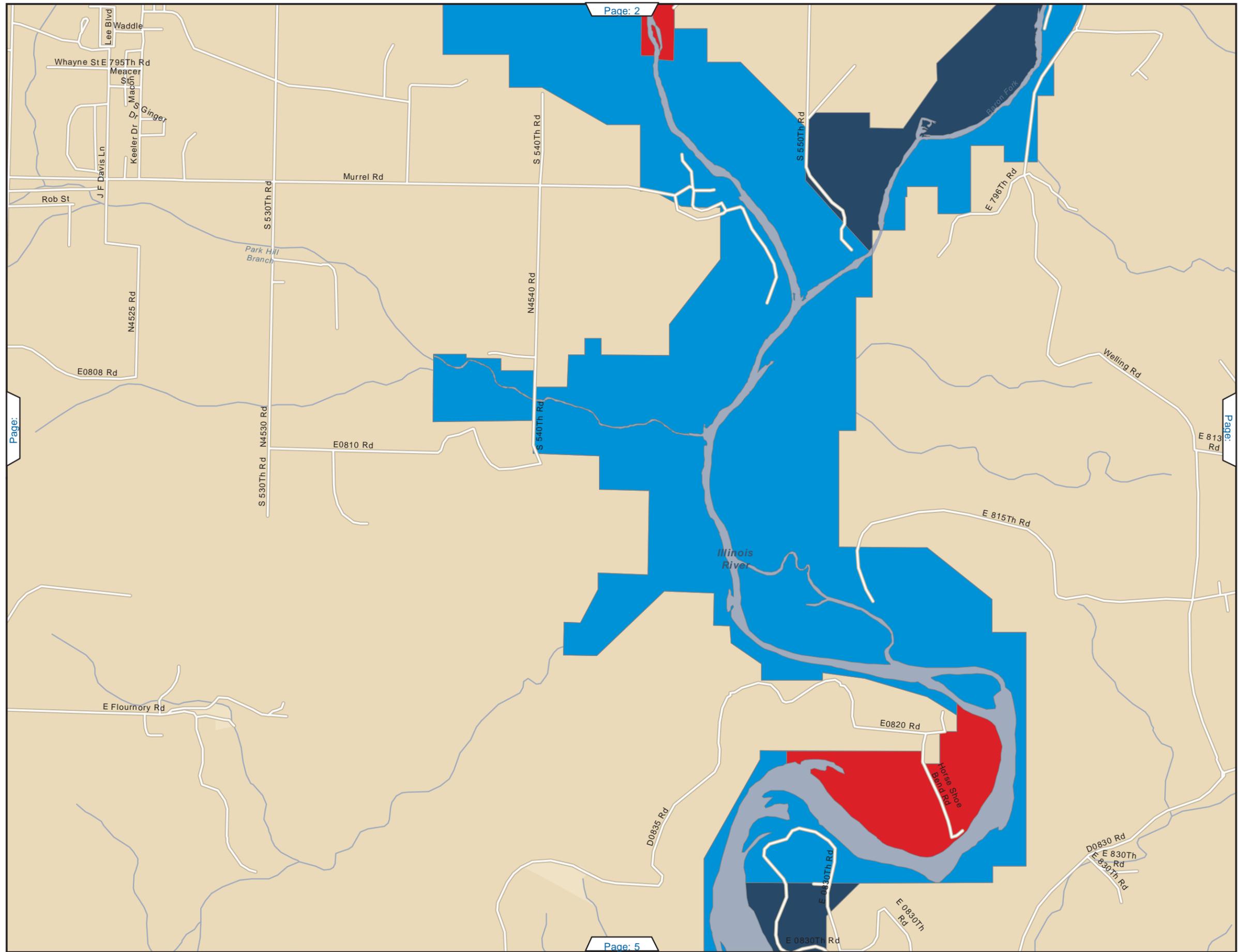


### Land Classification

- Project Operations
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- Wildlife Management
- Environmentally Sensitive

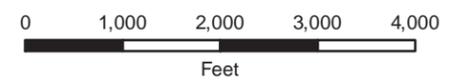


	<p>U. S. Army Corps of Engineers Tulsa District</p>
<p>TENKILLER FERRY DAM AND RESERVOIR      ILLINOIS RIVER, OKLAHOMA</p>	
<p><b>TENKILLER FERRY LAKE</b></p> <p>TENKILLER MASTER PLAN UPDATE</p> <p>LAND CLASSIFICATION</p>	
DATE:	PLATE NO.
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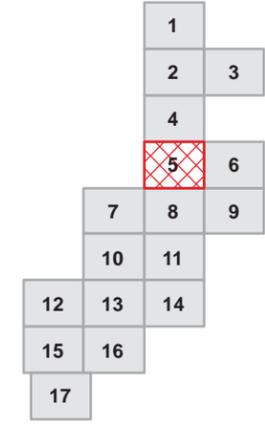
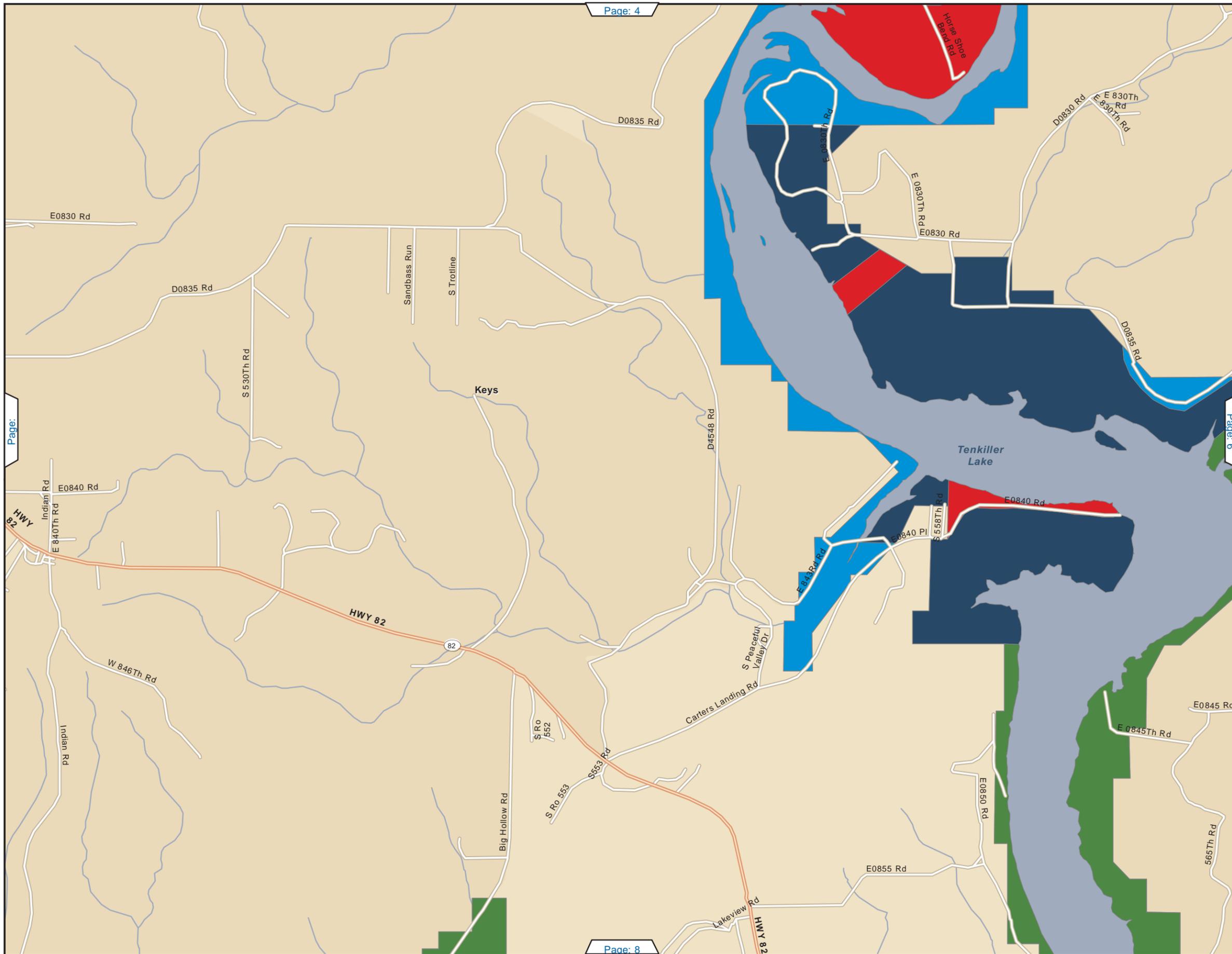


### Land Classification

- Project Operations
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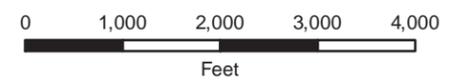


<b>U. S. Army Corps of Engineers</b> Tulsa District	
TENKILLER FERRY DAM AND RESERVOIR <span style="float: right;">ILLINOIS RIVER, OKLAHOMA</span>	
<b>TENKILLER FERRY LAKE</b>	
<b>TENKILLER MASTER PLAN UPDATE</b>	
<b>LAND CLASSIFICATION</b>	
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### Land Classification

- Project Operations
- High Density Recreation
- Low Density Recreation
- Wildlife Management
- Environmentally Sensitive



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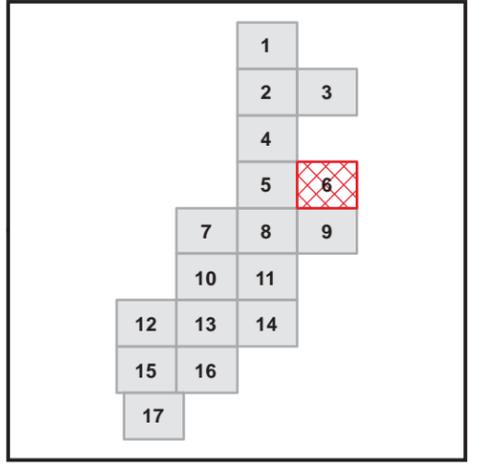
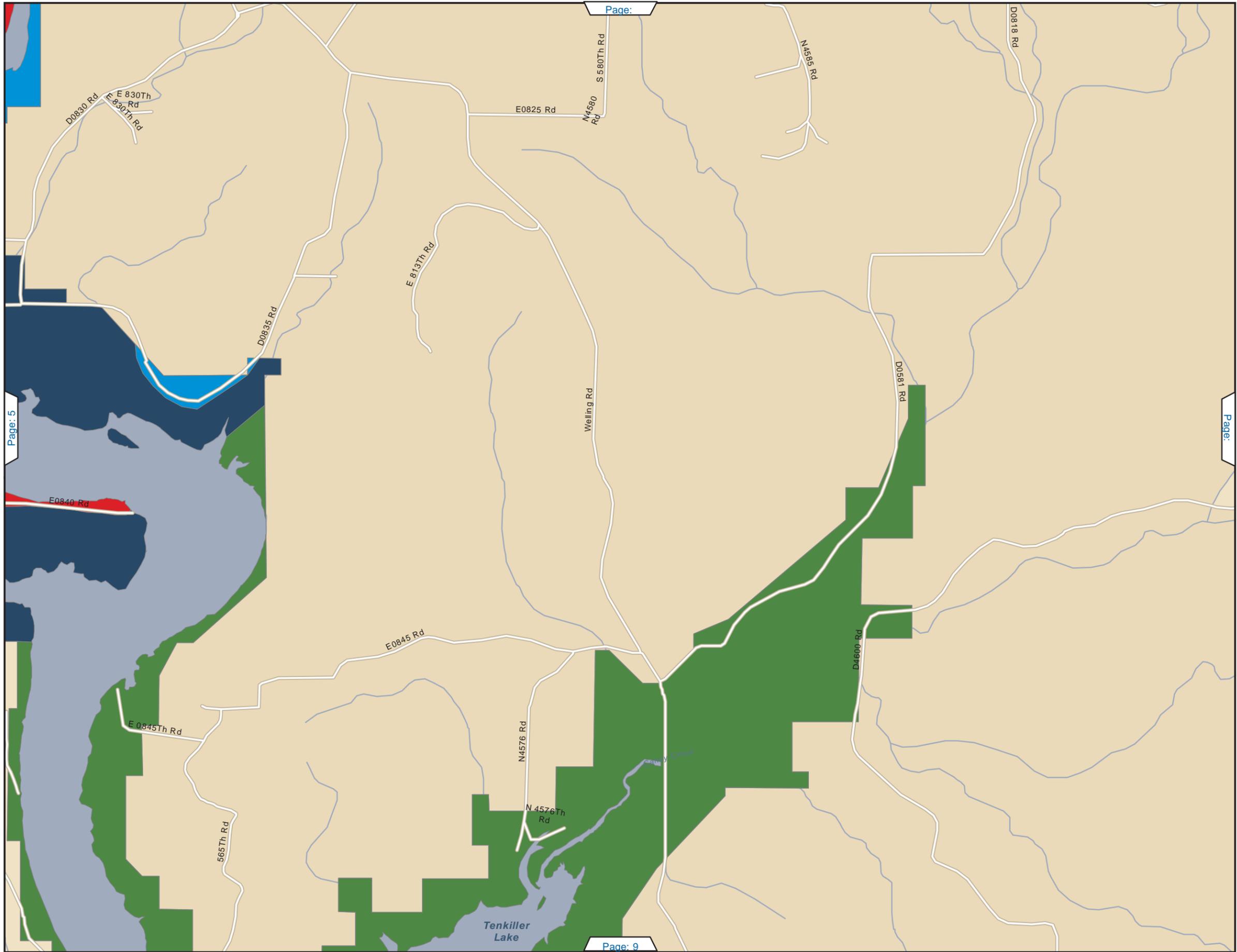
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**  
TENKILLER MASTER PLAN UPDATE  
LAND CLASSIFICATION

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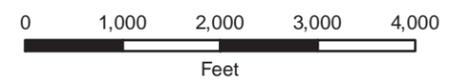
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### Land Classification

- Project Operations
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- Low Density Recreation
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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

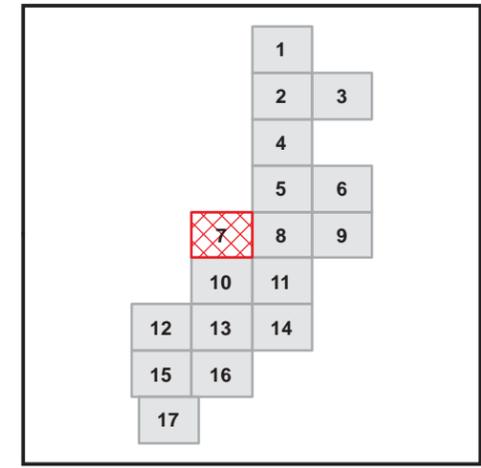
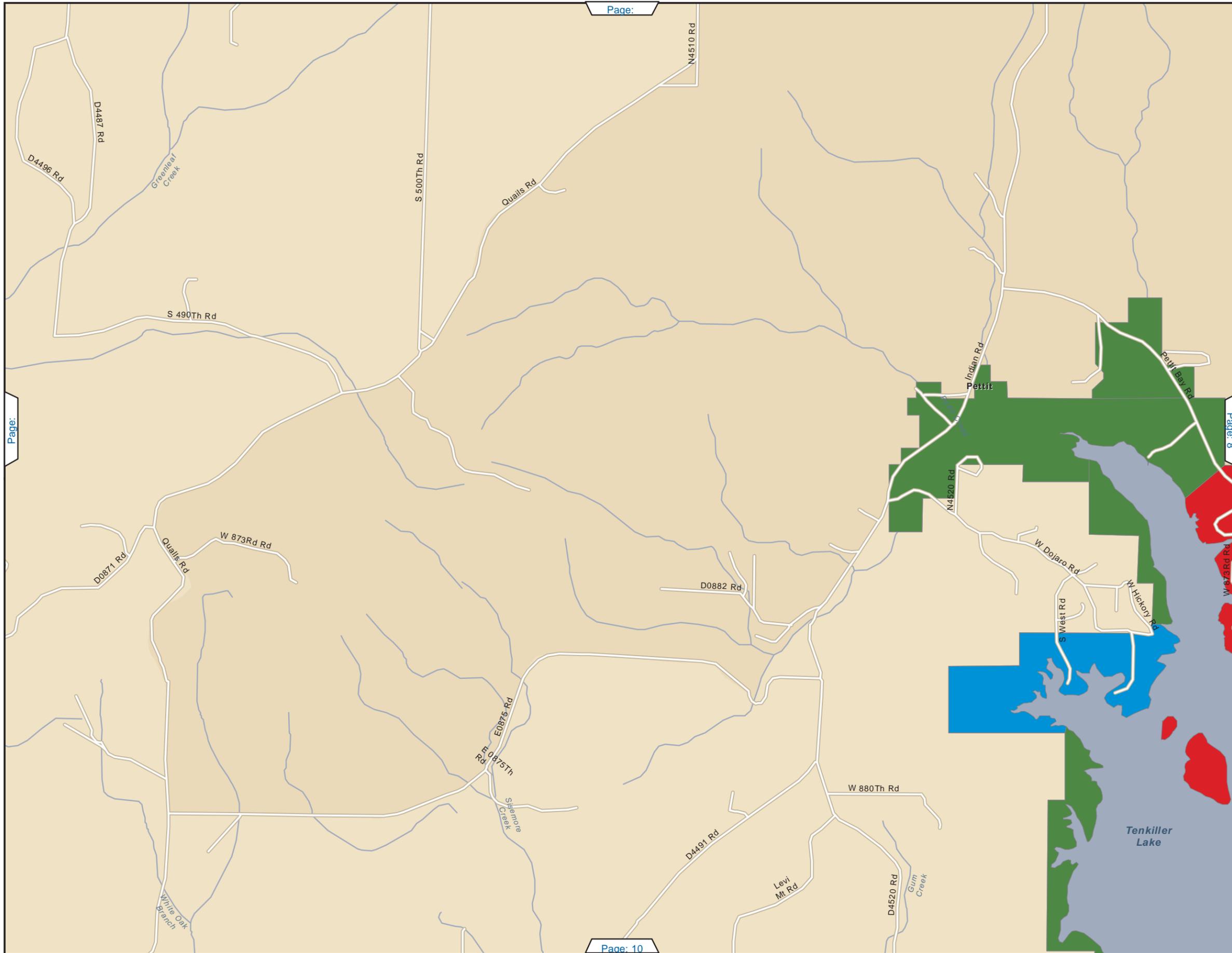
TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

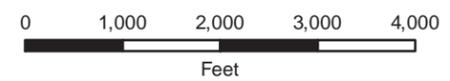
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DATE: APRIL 2015	PLATE NO. TEN15MP-OC-06
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### Land Classification

- Project Operations
- High Density Recreation
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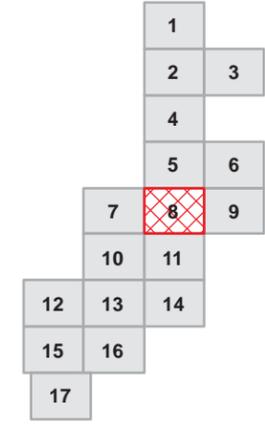
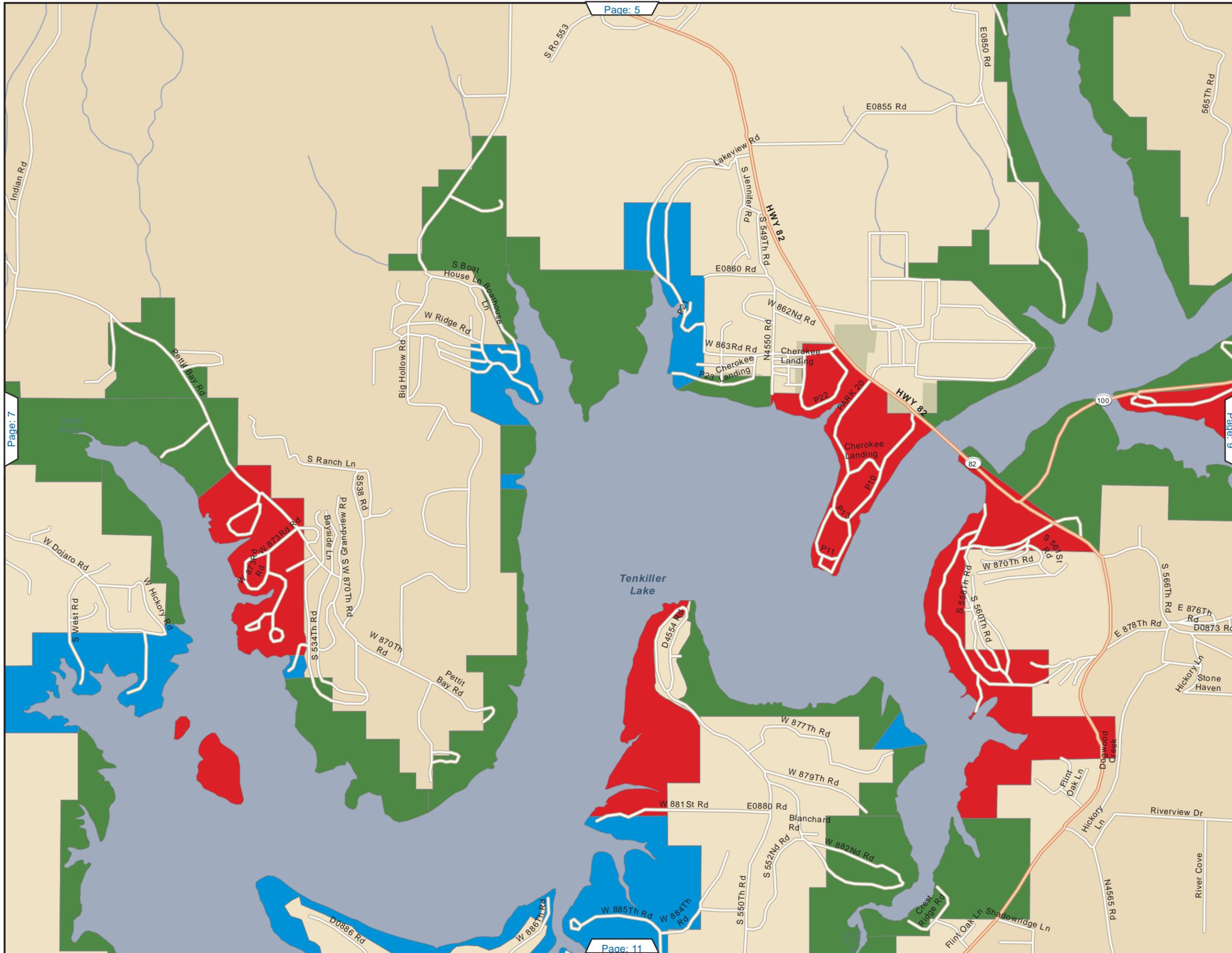
	U. S. Army Corps of Engineers Tulsa District
TENKILLER FERRY DAM AND RESERVOIR <span style="float: right;">ILLINOIS RIVER, OKLAHOMA</span>	
TENKILLER FERRY LAKE	
TENKILLER MASTER PLAN UPDATE	
LAND CLASSIFICATION	
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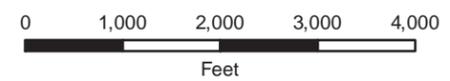
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### Land Classification

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

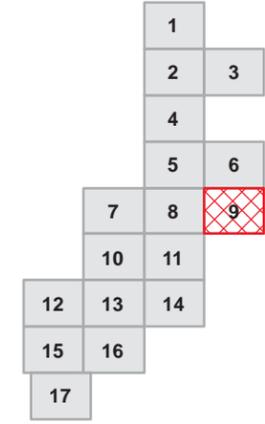
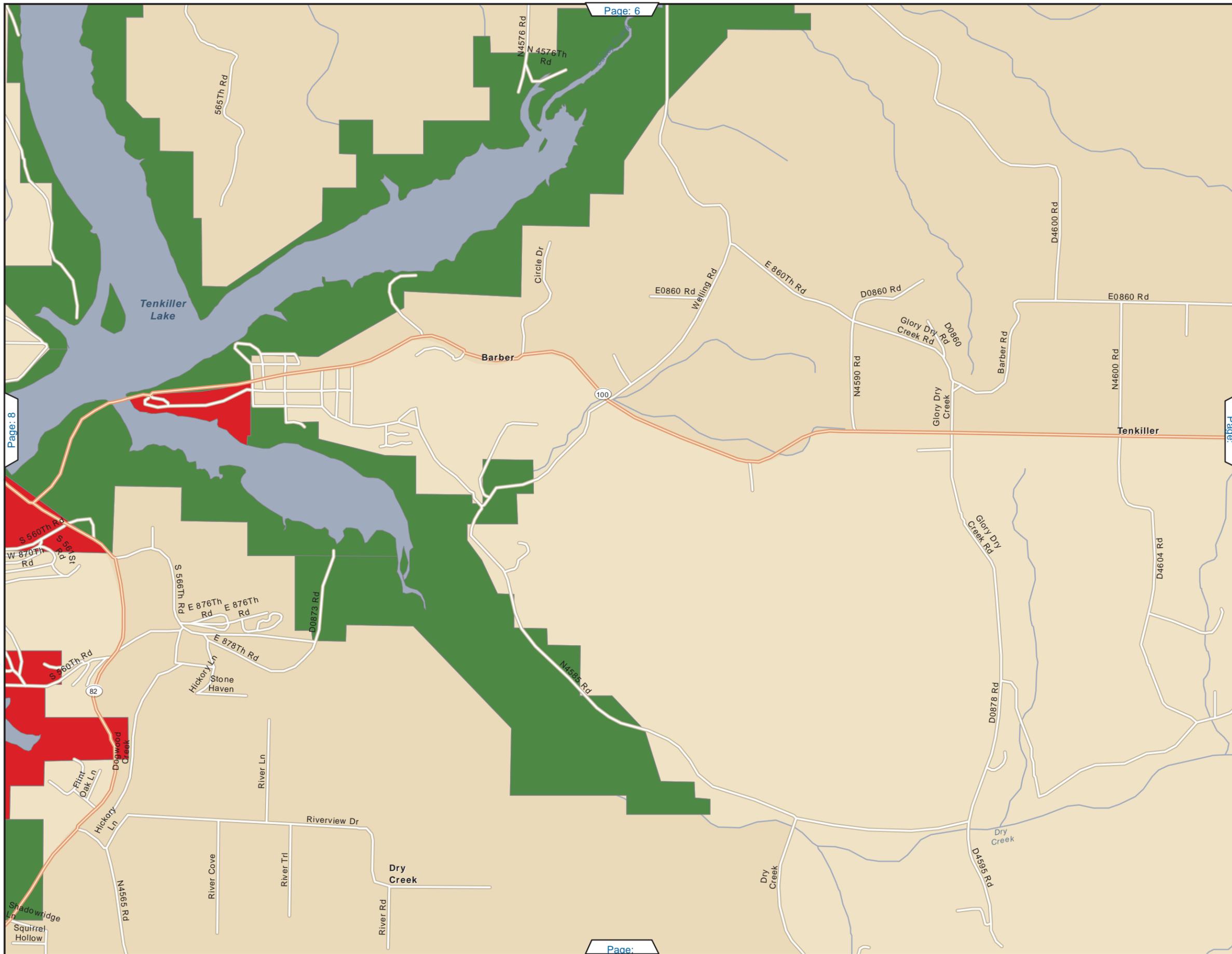
**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

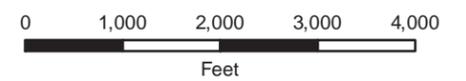
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### Land Classification

- Project Operations
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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

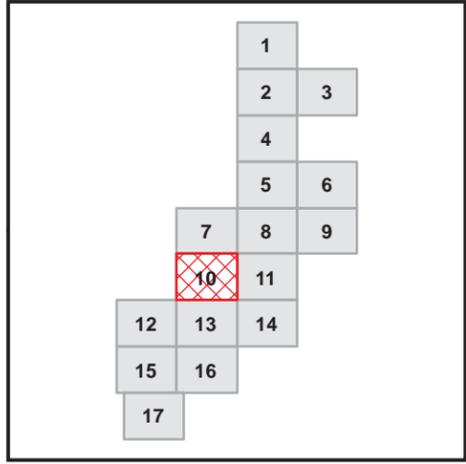
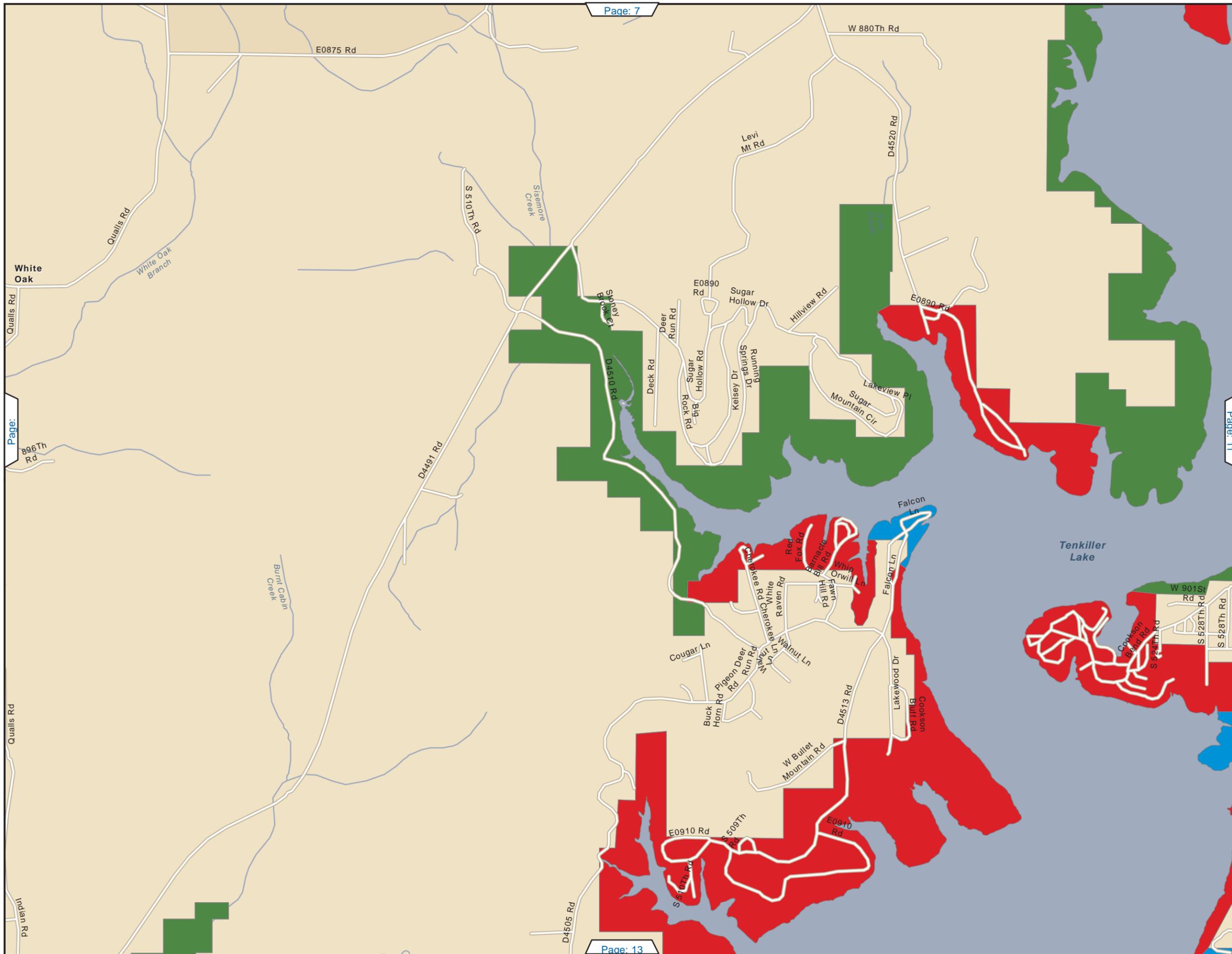
**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**LAND CLASSIFICATION**

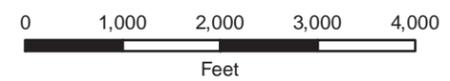
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### Land Classification

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

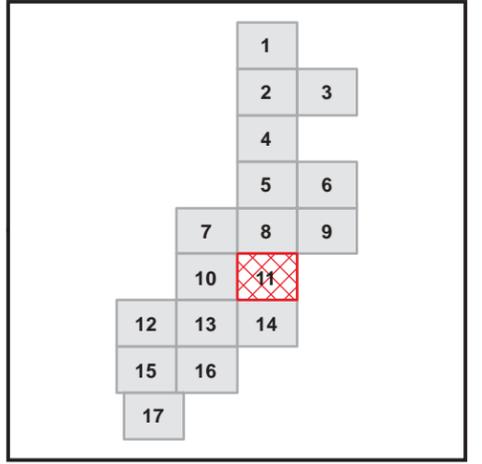
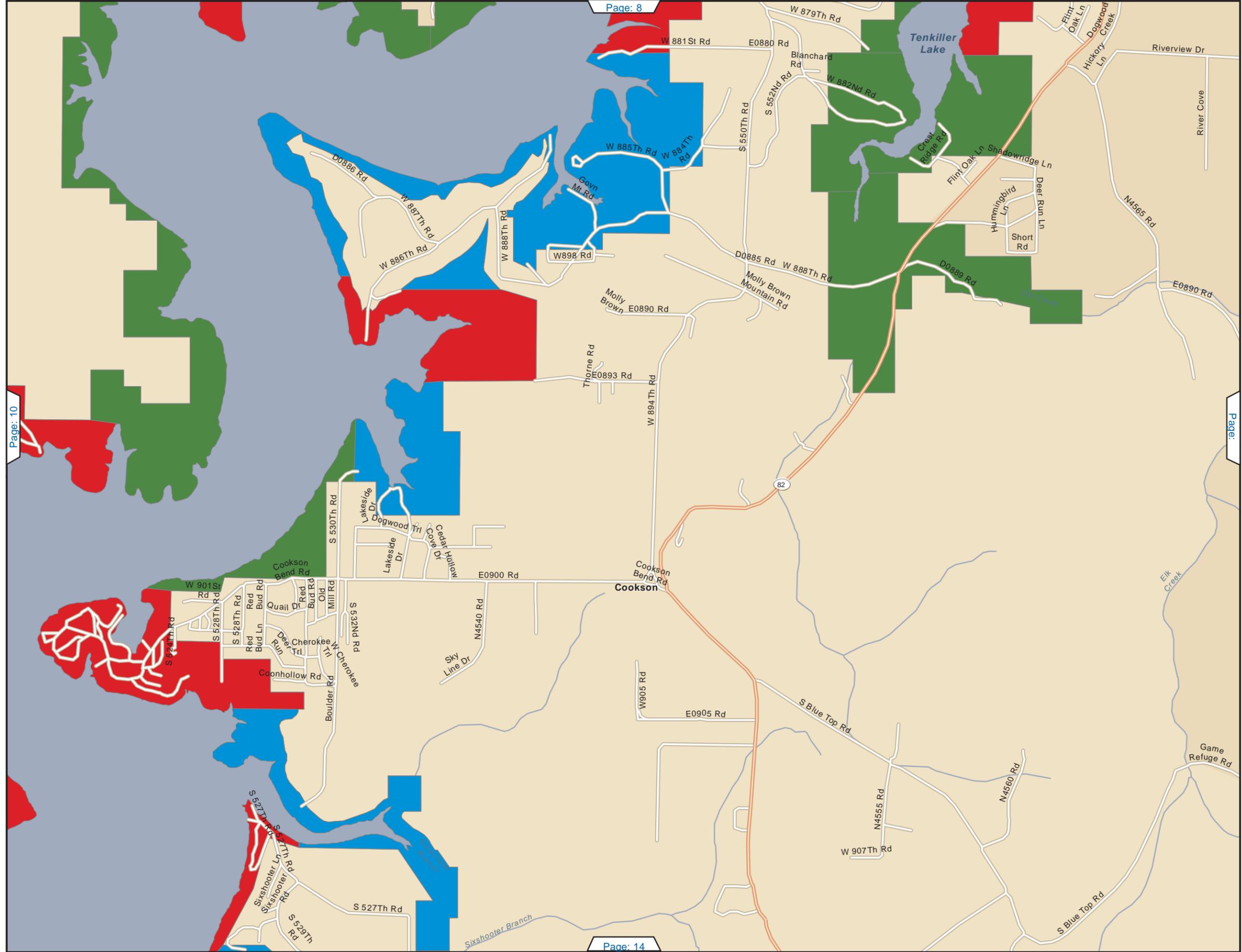
TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

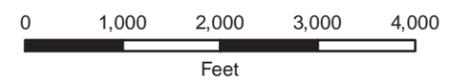
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### Land Classification

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

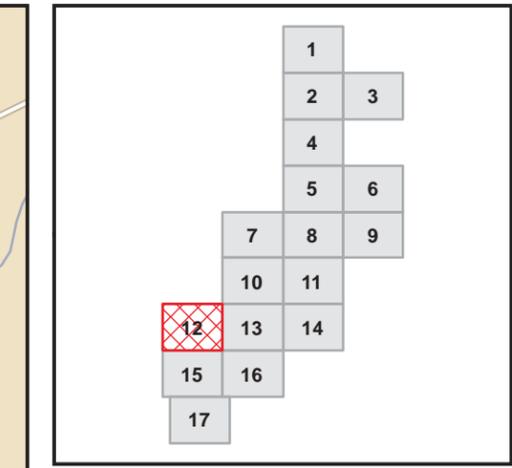
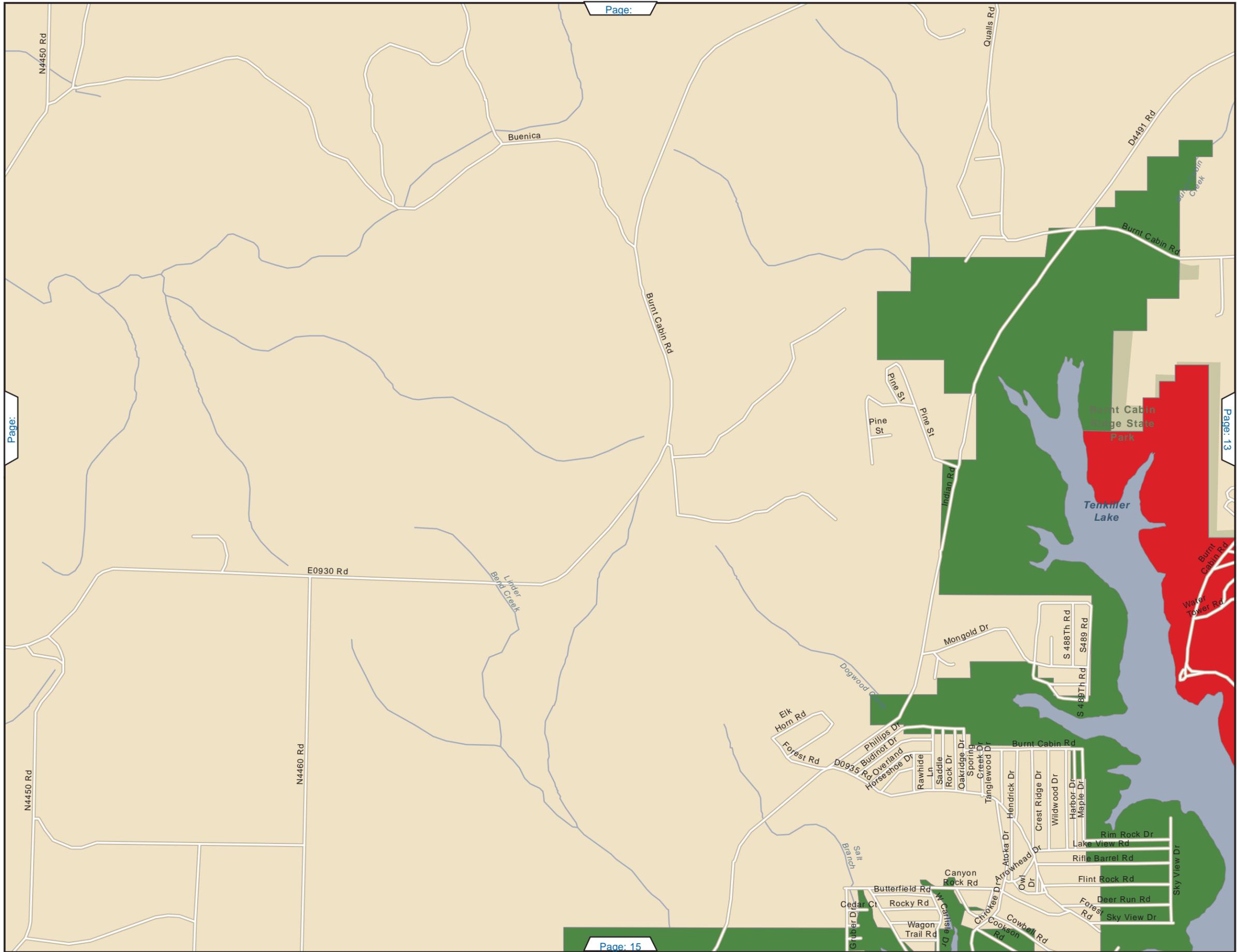
**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

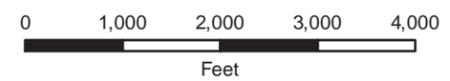
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### Land Classification

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

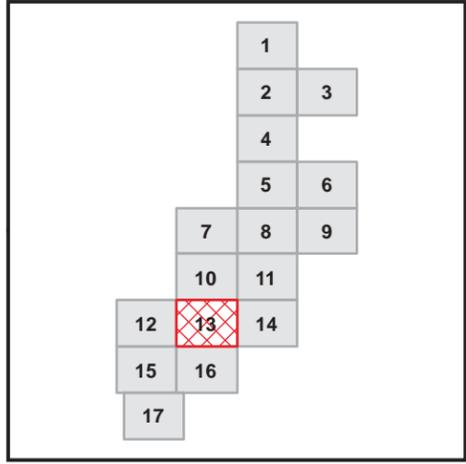
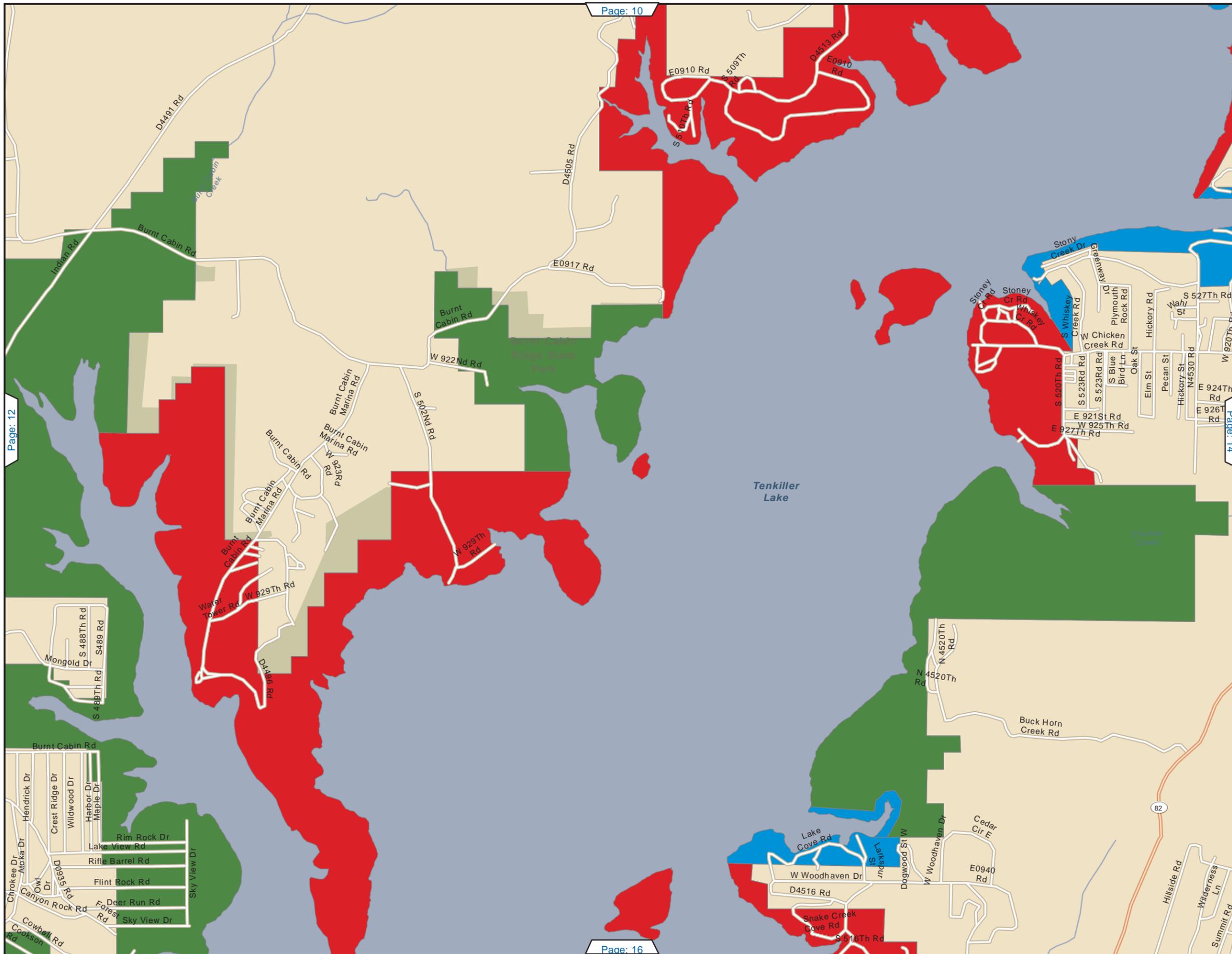
**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**LAND CLASSIFICATION**

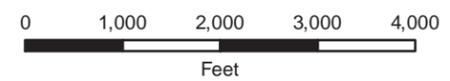
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DATE: APRIL 2015	PLATE NO. TEN15MP-OC-12
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### Land Classification

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Tulsa District

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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

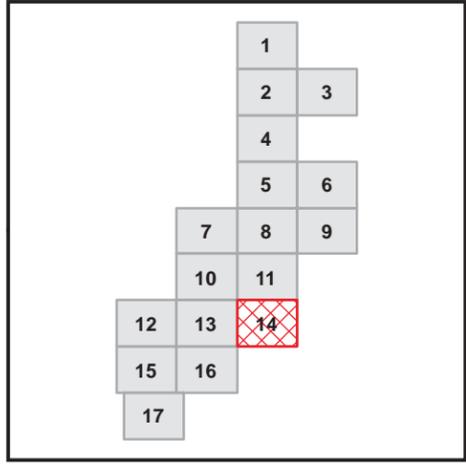
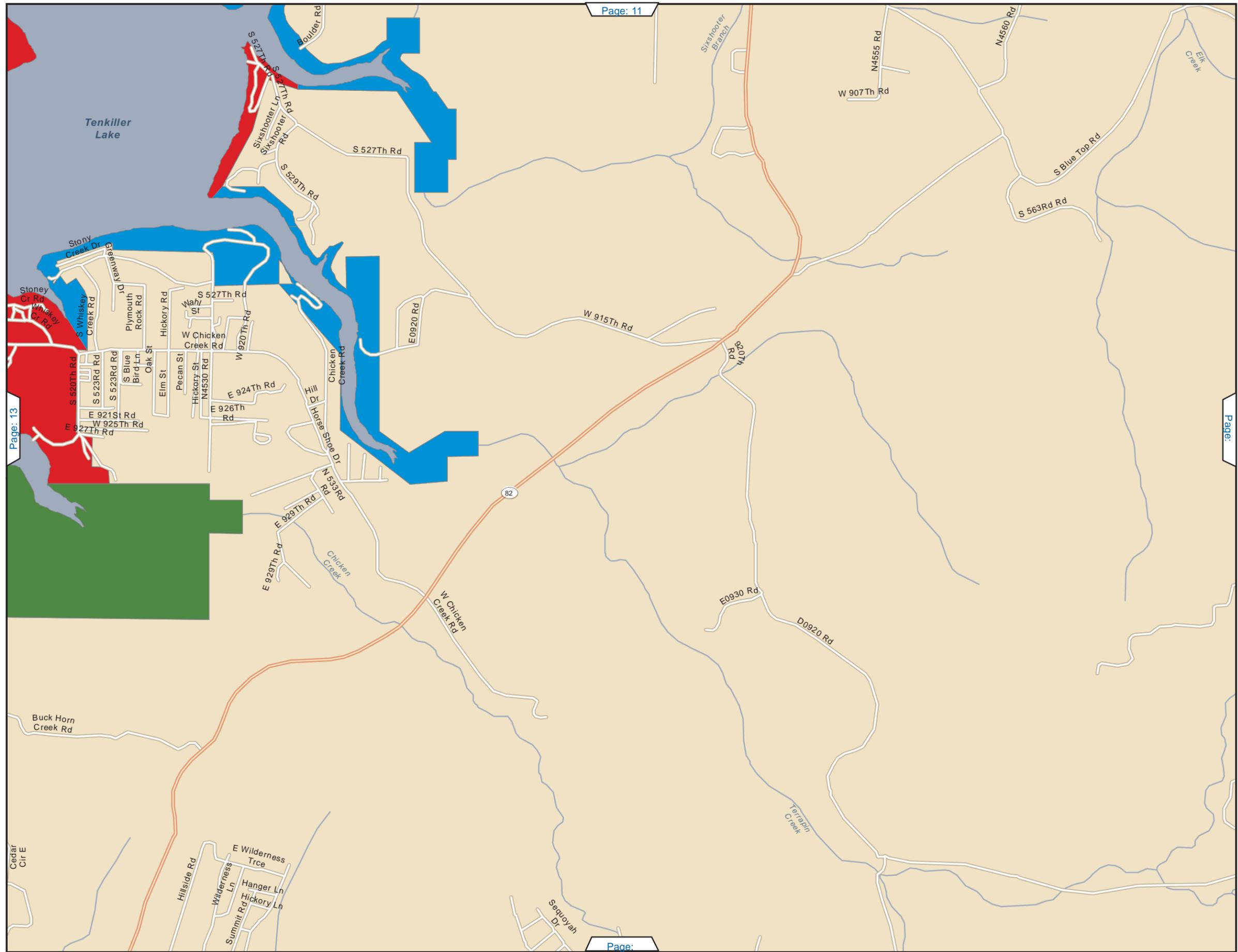
**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

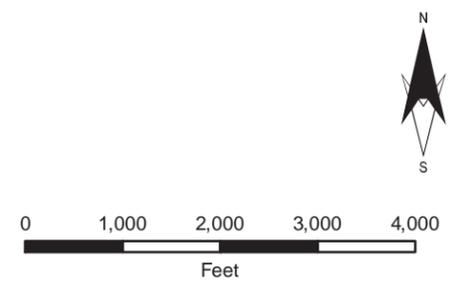
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DATE: APRIL 2015	PLATE NO. TEN15MP-OC-13
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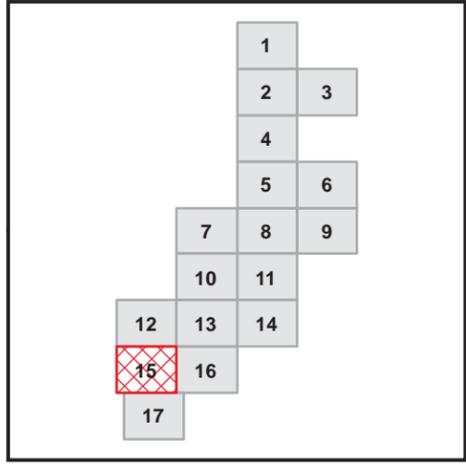
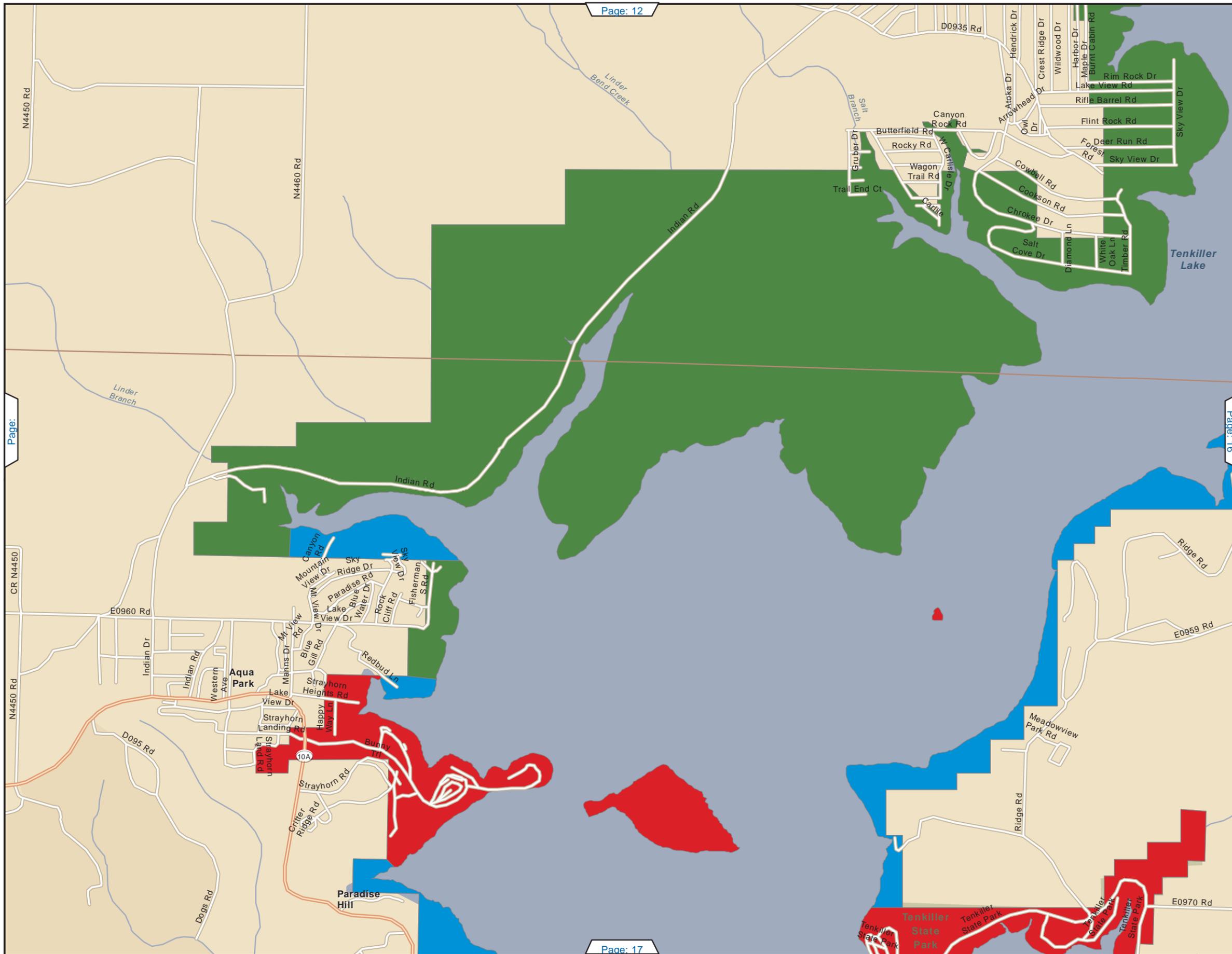


### Land Classification

- Project Operations
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- Low Density Recreation
- Wildlife Management
- Environmentally Sensitive

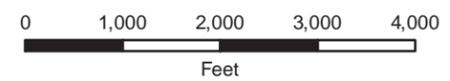


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TENKILLER FERRY DAM AND RESERVOIR <span style="float: right;">ILLINOIS RIVER, OKLAHOMA</span>	
TENKILLER FERRY LAKE	
TENKILLER MASTER PLAN UPDATE	
LAND CLASSIFICATION	
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### Land Classification

- Project Operations
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- Low Density Recreation
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Tulsa District

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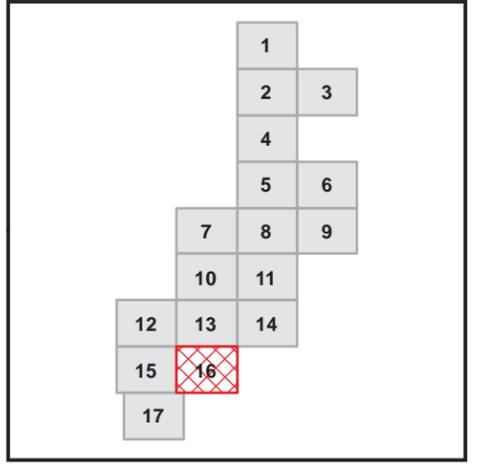
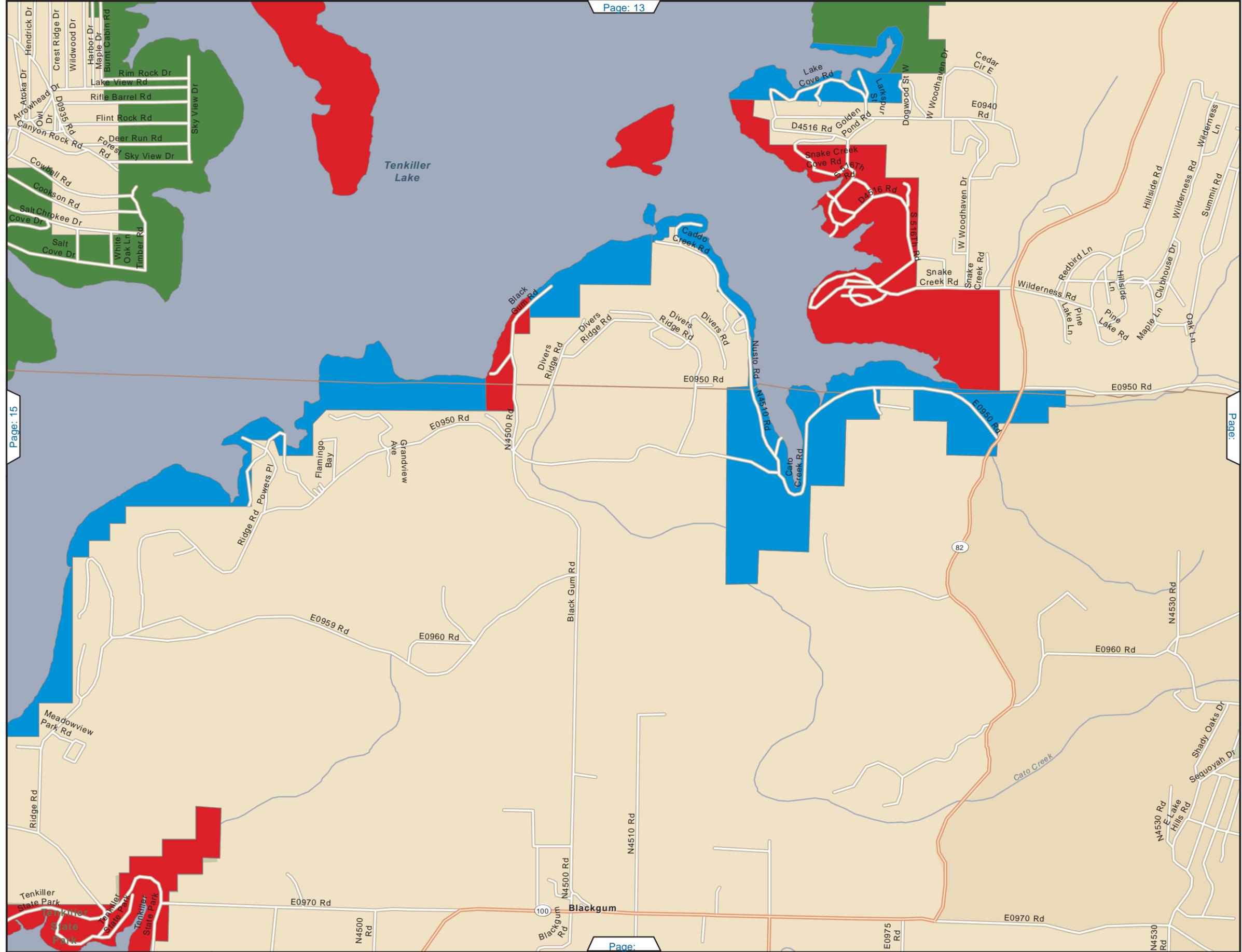
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

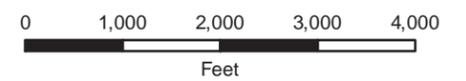
LAND CLASSIFICATION

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### Land Classification

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- Wildlife Management
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Tulsa District

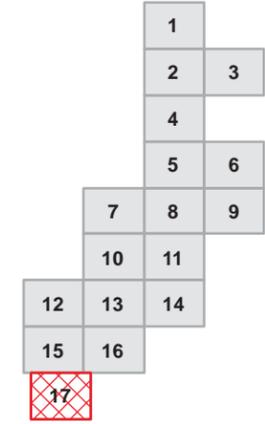
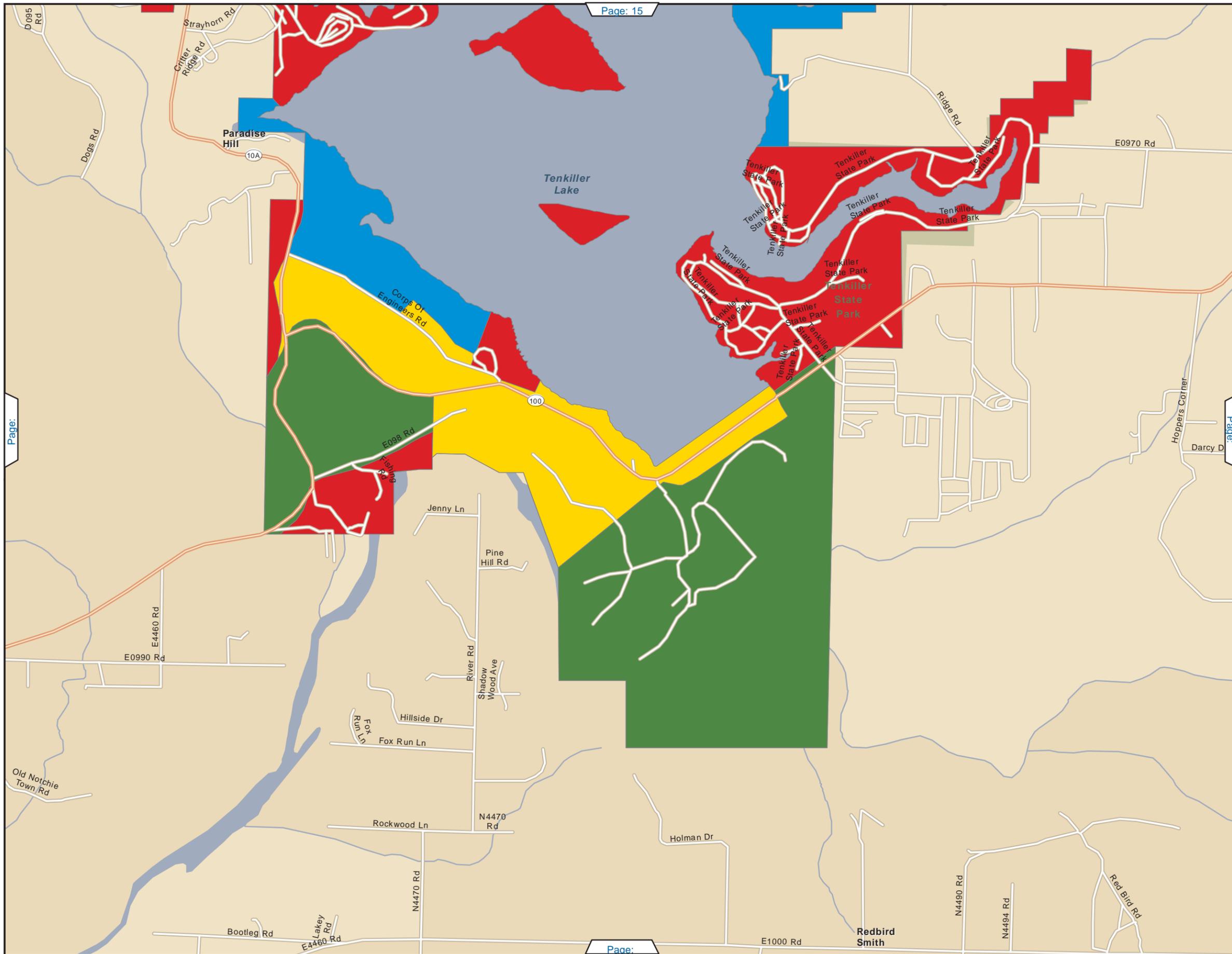
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

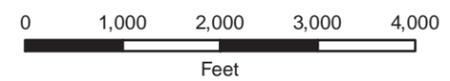
LAND CLASSIFICATION

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### Land Classification

- Project Operations
- High Density Recreation
- Low Density Recreation
- Wildlife Management
- Environmentally Sensitive



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TENKILLER FERRY DAM AND RESERVOIR      ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

LAND CLASSIFICATION

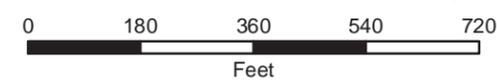
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Item	Existing	Proposed
Boat Ramp Lanes	1	0
Campsites	0	0
Electrical Hook-up	0	0
Water Hydrant	0	0
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	0	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	2	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site





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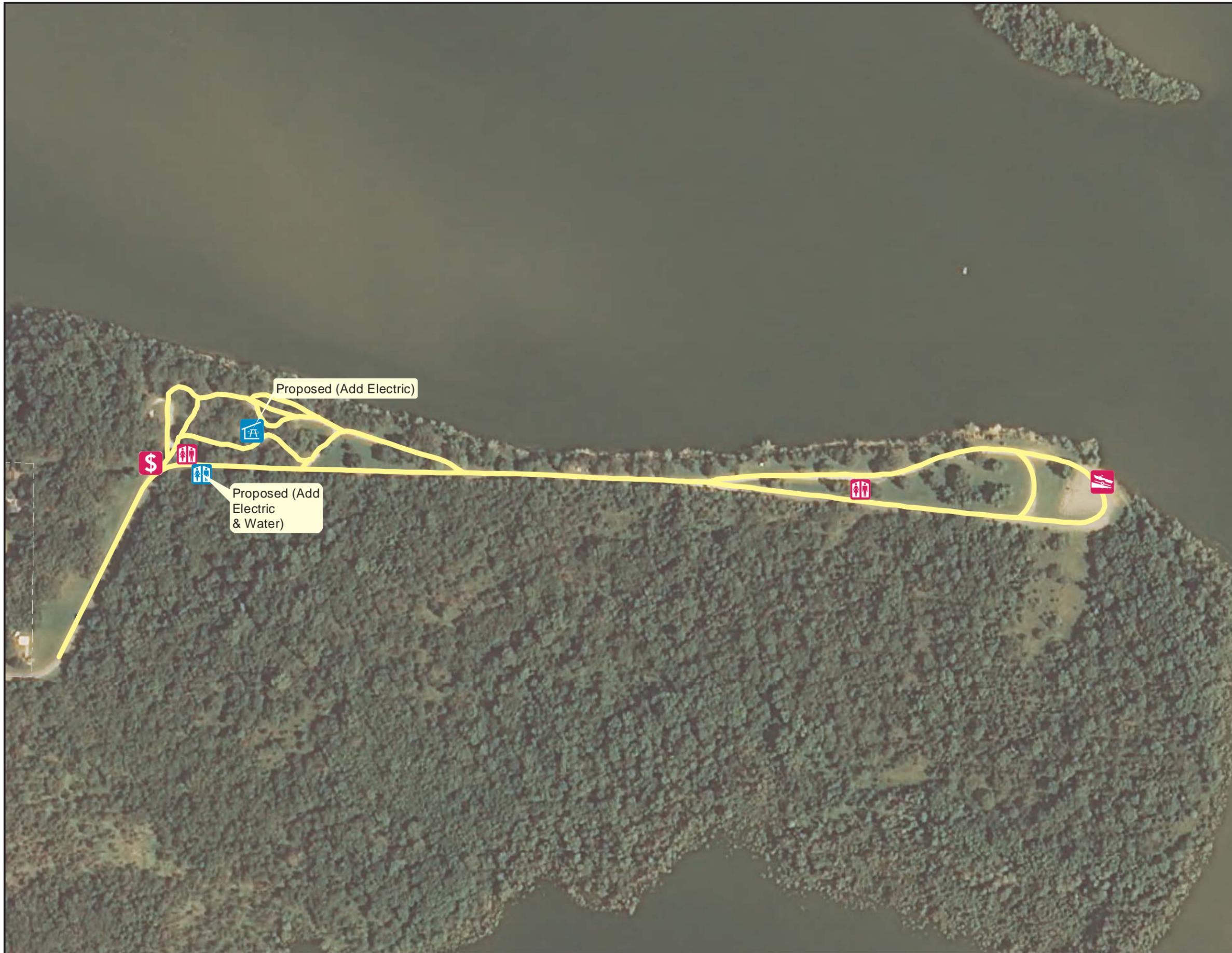
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

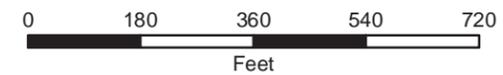
**HORSESHOE BEND  
RECREATION AREA**

DATE:	PLATE NO.
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Item	Existing	Proposed
Boat Ramp Lanes	1	0
Campsites	22	0
Electrical Hook-up	13	9
Water Hydrant	4	18
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	1	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	2	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site





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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

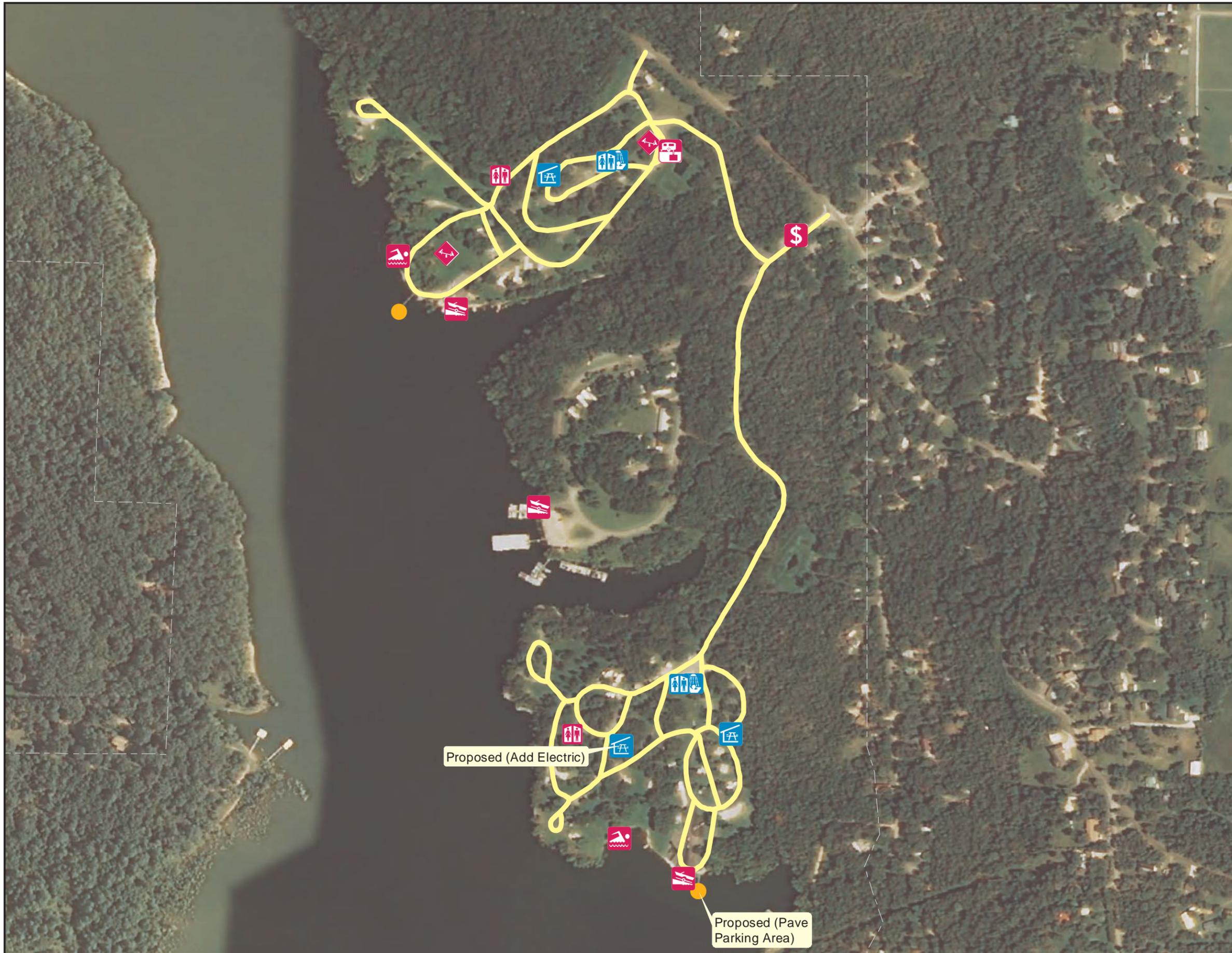
**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**CARTERS LANDING RECREATION AREA**

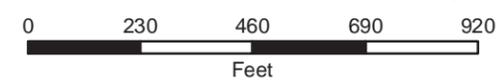
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DATE: APRIL 2015	PLATE NO. TEN15MP-OR-02
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Item	Existing	Proposed
Boat Ramp Lanes	4	0
Campsites	86	0
Electrical Hook-up	73	9
Water Hydrant	48	0
Courtesy Dock	2	0
Dump Station	1	0
Picnic Shelter	3	0
Picnic Sites	0	0
Playground	2	0
Restroom (Waterborne)	2	0
Showers	2	0
Vault Toilet	2	0
Trail	0	0

- Boat Ramp
- Courtesy Dock
- Fishing Dock/Pier
- Dump Station
- Entrance Station
- Picnic Shelter
- Playground
- Restroom (Waterborne)
- Showers
- Swimming Beach
- Trail
- Vault Toilet
- Wildlife Viewing Site



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Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

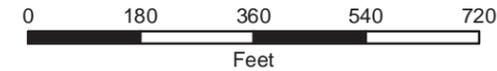
PETTIT BAY RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-03
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Item	Existing	Proposed
Boat Ramp Lanes	2	0
Campsites	41	0
Electrical Hook-up	18	12
Water Hydrant	15	0
Courtesy Dock	1	0
Dump Station	1	0
Picnic Shelter	2	0
Picnic Sites	0	0
Playground	0	1
Restroom (Waterborne)	1	0
Showers	1	0
Vault Toilet	2	1
Trail	0	0

- Boat Ramp
- Courtesy Dock
- Fishing Dock/Pier
- Dump Station
- Entrance Station
- Picnic Shelter
- Playground
- Restroom (Waterborne)
- Showers
- Swimming Beach
- Trail
- Vault Toilet
- Wildlife Viewing Site



U. S. Army Corps of Engineers  
Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

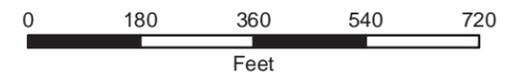
ELK CREEK LANDING RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-04
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Item	Existing	Proposed
Boat Ramp Lanes	1	0
Campsites	0	0
Electrical Hook-up	0	0
Water Hydrant	0	0
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	0	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	0	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site





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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**STANDING ROCK LANDING  
RECREATION AREA**

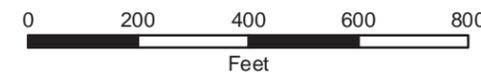
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DATE: APRIL 2015	PLATE NO. TEN15MP-OR-05
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Item	Existing	Proposed
Boat Ramp Lanes	2	0
Campsites	32	0
Electrical Hook-up	1	0
Water Hydrant	0	0
Courtesy Dock	1	0
Dump Station	0	0
Picnic Shelter	2	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	2	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site





U. S. Army Corps of Engineers  
Tulsa District

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TENKILLER FERRY DAM AND RESERVOIR      ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**SIZEMORE LANDING  
RECREATION AREA**

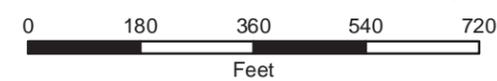
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DATE: APRIL 2015	PLATE NO. TEN15MP-OR-06
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Item	Existing	Proposed
Boat Ramp Lanes	3	0
Campsites	119	0
Electrical Hook-up	68	50
Water Hydrant	28	50
Courtesy Dock	1	0
Dump Station	1	0
Picnic Shelter	2	0
Picnic Sites	0	0
Playground	1	0
Restroom (Waterborne)	3	1
Showers	3	1
Vault Toilet	2	1
Trail	0	0

- Boat Ramp
- Courtesy Dock
- Fishing Dock/Pier
- Dump Station
- Entrance Station
- Picnic Shelter
- Playground
- Restroom (Waterborne)
- Showers
- Swimming Beach
- Trail
- Vault Toilet
- Wildlife Viewing Site



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TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

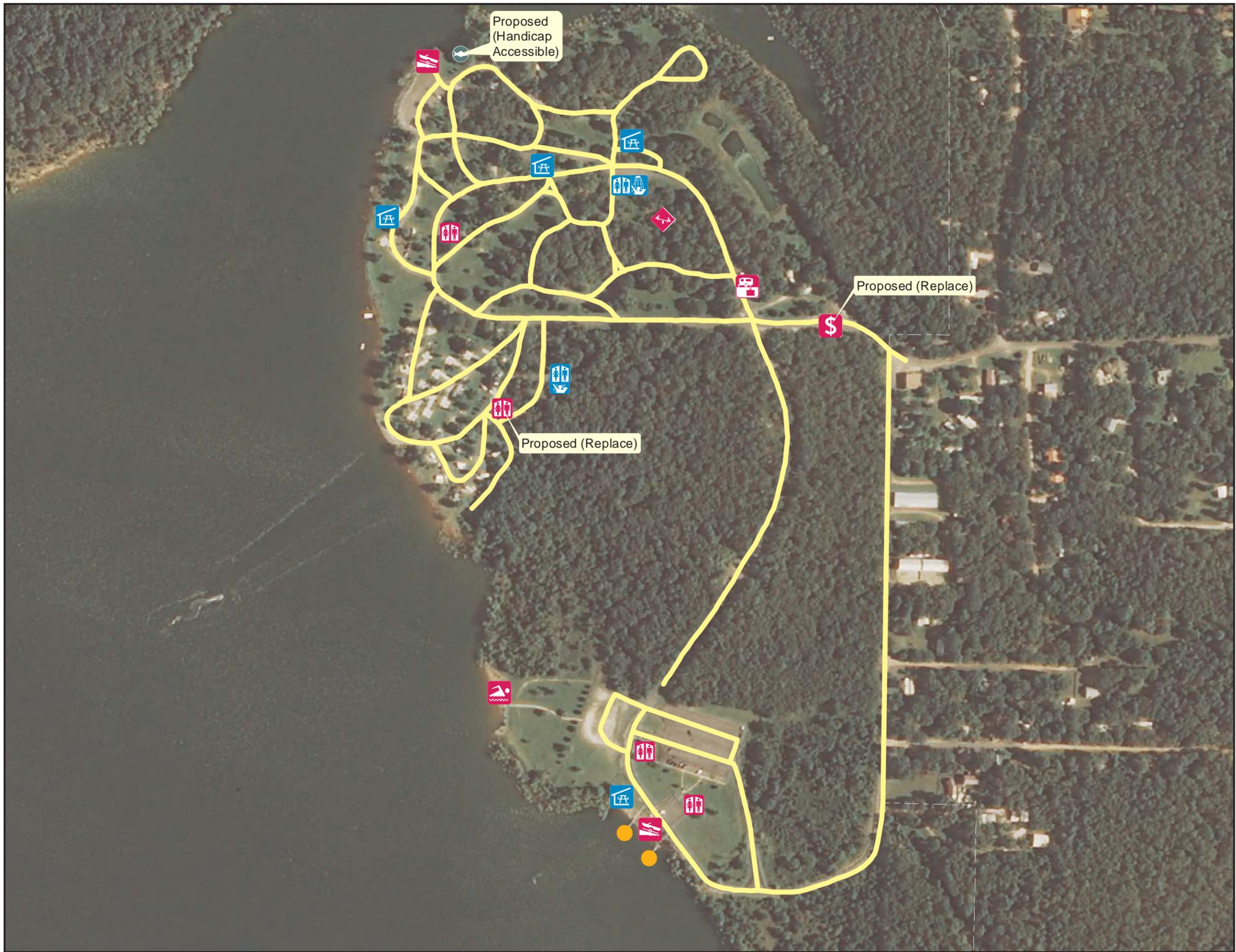
**TENKILLER FERRY LAKE**

**TENKILLER MASTER PLAN UPDATE**

**COOKSON BEND RECREATION AREA**

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DATE: APRIL 2015	PLATE NO. TEN15MP-OR-07
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Item	Existing	Proposed
Boat Ramp Lanes	4	0
Campsites	102	0
Electrical Hook-up	102	0
Water Hydrant	72	0
Courtesy Dock	2	1
Dump Station	1	0
Picnic Shelter	3	0
Picnic Sites	0	0
Playground	1	0
Restroom (Waterborne)	2	0
Showers	2	0
Vault Toilet	4	1
Trail	0	0

- Boat Ramp
- Courtesy Dock
- Fishing Dock/Pier
- Dump Station
- Entrance Station
- Picnic Shelter
- Playground
- Restroom (Waterborne)
- Showers
- Swimming Beach
- Trail
- Vault Toilet
- Wildlife Viewing Site

0 200 400 600 800  
Feet

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Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

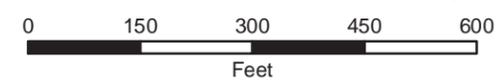
CHICKEN CREEK POINT RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-08
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Item	Existing	Proposed
Boat Ramp Lanes	4	0
Campsites	111	0
Electrical Hook-up	111	0
Water Hydrant	48	4
Courtesy Dock	1	0
Dump Station	1	0
Picnic Shelter	3	0
Picnic Sites	2	0
Playground	2	0
Restroom (Waterborne)	3	0
Showers	3	0
Vault Toilet	1	1
Trail	0	0

- Boat Ramp
- Courtesy Dock
- Fishing Dock/Pier
- Dump Station
- Entrance Station
- Picnic Shelter
- Playground
- Restroom (Waterborne)
- Showers
- Swimming Beach
- Trail
- Vault Toilet
- Wildlife Viewing Site



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Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

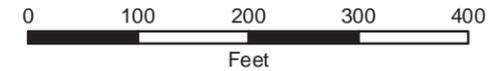
SNAKE CREEK COVE RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-09
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Item	Existing	Proposed
Boat Ramp Lanes	1	0
Campsites	0	0
Electrical Hook-up	0	0
Water Hydrant	0	0
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	0	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	0	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site





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Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

**TENKILLER FERRY LAKE**

TENKILLER MASTER PLAN UPDATE

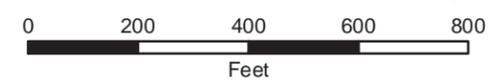
BLACKGUM LANDING  
RECREATION AREA

DATE:	PLATE NO.
APRIL 2015	TEN15MP-OR-10



Item	Existing	Proposed
Boat Ramp Lanes	3	0
Campsites	40	0
Electrical Hook-up	40	0
Water Hydrant	44	0
Courtesy Dock	1	0
Dump Station	1	0
Picnic Shelter	3	0
Picnic Sites	0	0
Playground	1	0
Restroom (Waterborne)	2	0
Showers	2	0
Vault Toilet	3	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site



 U. S. Army Corps of Engineers  
Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

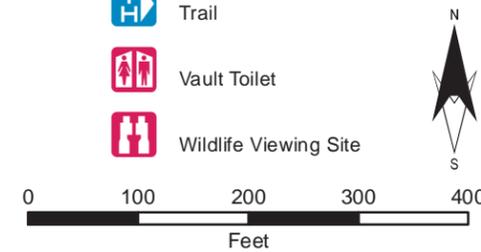
STRAYHORN LANDING RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-11
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Item	Existing	Proposed
Boat Ramp Lanes	0	0
Campsites	0	0
Electrical Hook-up	0	0
Water Hydrant	1	0
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	1	0
Picnic Sites	0	0
Playground	1	0
Restroom (Waterborne)	1	0
Showers	0	0
Vault Toilet	1	0
Trail	1	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
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-  Vault Toilet
-  Wildlife Viewing Site



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Tulsa District

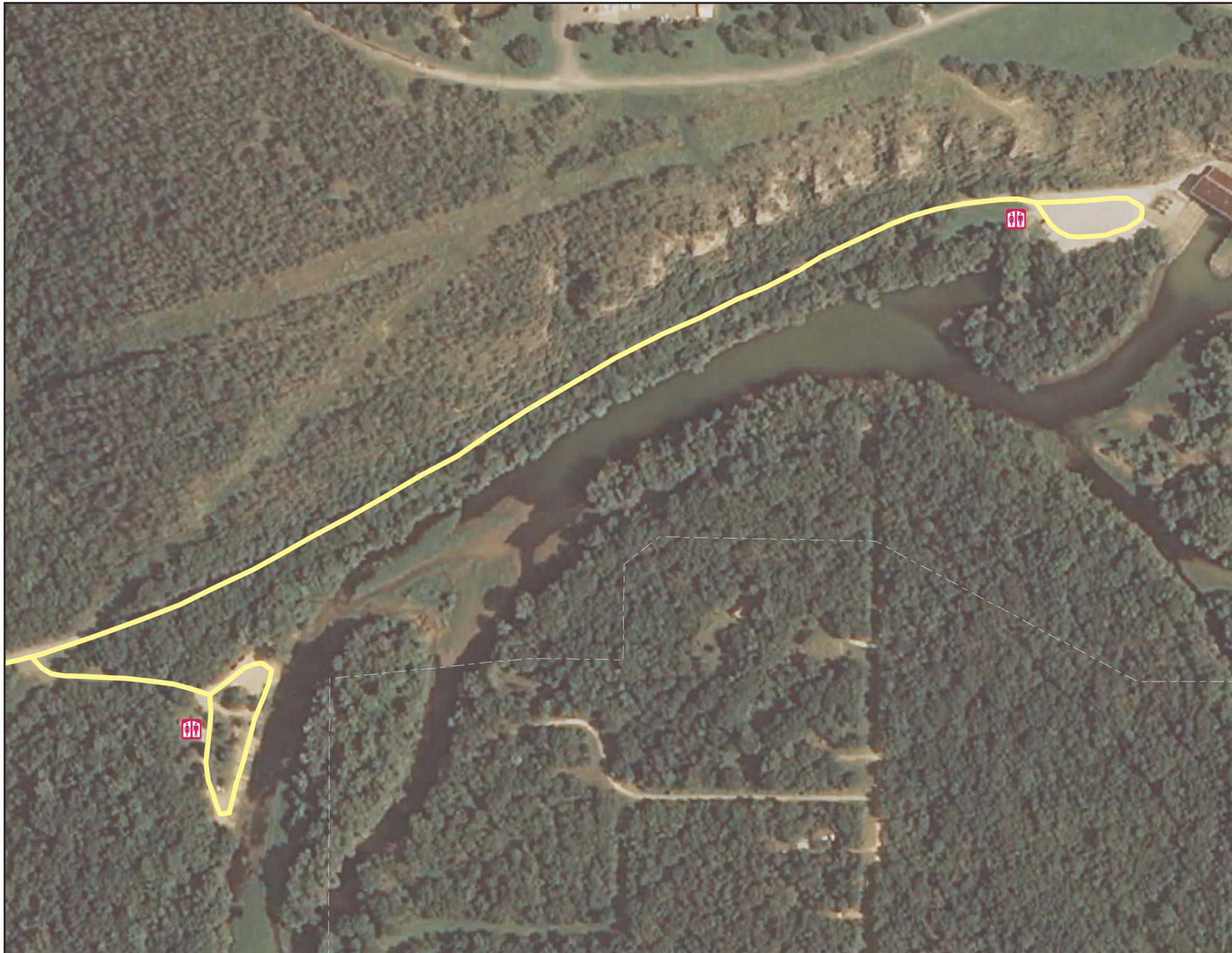
TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA

TENKILLER FERRY LAKE

TENKILLER MASTER PLAN UPDATE

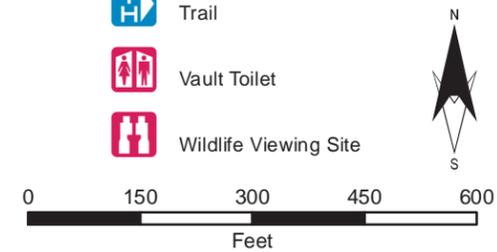
OVERLOOK RECREATION AREA

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-12
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Item	Existing	Proposed
Boat Ramp Lanes	0	0
Campsites	0	0
Electrical Hook-up	0	0
Water Hydrant	0	0
Courtesy Dock	0	0
Dump Station	0	0
Picnic Shelter	0	0
Picnic Sites	0	0
Playground	0	0
Restroom (Waterborne)	0	0
Showers	0	0
Vault Toilet	2	0
Trail	0	0

-  Boat Ramp
-  Courtesy Dock
-  Fishing Dock/Pier
-  Dump Station
-  Entrance Station
-  Picnic Shelter
-  Playground
-  Restroom (Waterborne)
-  Showers
-  Swimming Beach
-  Trail
-  Vault Toilet
-  Wildlife Viewing Site




**U. S. Army Corps of Engineers**  
 Tulsa District

TENKILLER FERRY DAM AND RESERVOIR ILLINOIS RIVER, OKLAHOMA  
**TENKILLER FERRY LAKE**  
**TENKILLER MASTER PLAN UPDATE**  
**TROUT STREAM RECREATION AREA**

DATE: APRIL 2015	PLATE NO. TEN15MP-OR-13
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**APPENDIX B - NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)  
DOCUMENTATION  
(Includes summary of Public Comments)**



**US Army Corps  
of Engineers**®  
Tulsa District

Environmental Assessment  
FOR THE  
**MASTER PLAN**



**Tenkiller Ferry Lake**  
**Cherokee and Sequoyah Counties**  
**OKLAHOMA**

Tulsa District  
U.S. Army Corps of Engineers

**June 2015**

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**FINDING OF NO SIGNIFICANT IMPACT  
TENKILLER FERRY MASTER PLAN  
ILLINOIS RIVER, 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 (RPEC) have assessed the environmental impacts of the Tenkiller Ferry Lake Master Plan.

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 Tenkiller Ferry Lake. The Master Plan provides a comprehensive description of the project, a discussion of factors influencing resource management and development, an identification and discussion of special problems, a synopsis of public involvement and input to the planning process, and descriptions of existing development. The Master Plan revision only concerns areas under the ownership of the U.S. Army Corps of Engineers and does not directly address issues associated with private boat docks or permits for shoreline vegetation modification.

Under the No Action alternative, the 1978 Master Plan would not be revised. The No Action alternative was eliminated from further consideration because the 1978 Master Plan is out of date due to changes in project use conditions and pertinent laws and policies. If the 1978 Master Plan was not revised, future developments or resource management policies would require approval on a case-by-case basis without the benefit of evaluation in the context of an overall plan.

The recommended alternative would result in the classification and reclassification of lands allowing for the most efficient and cost-effective management, development, and use of areas under the ownership of the U.S. Army Corps of Engineers. Land classification components of the recommended alternative include:

Description	Justification
Reclassify 24 acres in Strayhorn Cove from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassify 46 acres on the south shore of Lender Branch Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassify 98 acres in the vicinity of Falcon Lane from Low Density Recreation to High Density Recreation	YES – aligns with SMP and currently permitted private docks.
Reclassify 424 acres in the vicinity of Sisemore Cove from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassify 125 acres in the vicinity of Pettit Creek Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 81 acres in the vicinity of Pettit Creek Cove/Pettit Bay Recreation Area from High Density Recreation to Wildlife Management	YES – geography not suitable for High Density Recreation.
Reclassify 4 acres in the vicinity of S. Bayside Lane from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 77 acres extending east from Pettit Bay PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 60 acres in the S. Boathouse Lane vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.

<b>Description</b>	<b>Justification</b>
Reclassify 118 acres on peninsula across from Standing Rock Landing PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 75 acres in the P-21 road vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 24 acres in the vicinity of the tree nursery above Hwy 82 from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 140 acres from in vicinity of the tree nursery above Hwy 82 from Low Density Recreation to Wildlife Management	YES – shoreline is not suitable for low density recreation.
Reclassify 164 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 190 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 88 acres in T16N, S18 and S19 from Low Density Recreation to Environmentally Sensitive Area	YES – Provide maximum protection for historically significant areas.
Reclassify 335 acres in T15N, S5 and S6 from Low Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 638 acres along Caney Creek, Dry Creek and east bank of Illinois River from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassify 182 acres along Elk creek cove from High Density Recreation to Wildlife Management	YES – shoreline not suitable for high density recreation.
Reclassify 77 acres in Standing Rock area from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Classify 140 acres currently unclassified lands adjacent to cottage site disposal to low density recreation.	YES – area is suitable for low density recreation and is currently used for low density recreation.
Reclassify 83 acres in Carlile Cove from High Density Recreation to Low Density Recreation	YES – area not suitable for high density recreation. Permitted private boat docks and aligns with SMP.
Reclassify 54 acres in south of Carlile Cove from High Density Recreation to Wildlife Management	YES – area not suitable for low density recreation and aligns with aesthetic classification in SMP.
Classify 22 acres currently not classified north of Chicken Creek Point PUA as Low Density Recreation.	YES – area is suitable for low density recreation.
Reclassify 8 acres north of Woodhaven Drive from High Density Recreation to Low Density Recreation	YES – aligns with SMP.
Reclassify 371 acres in Snake Creek Cove from High Density Recreation to Low Density Recreation	YES – aligns with SMP.
Reclassify 30 acres from Wildlife Management to Project Operations	YES – necessary for auxiliary spillway.
Reclassify 5 acres on north side of Hwy 100 from High Density Recreation to Project Operations	YES – currently used for project related stockpiles.
Reclassify 145 acres in the Overlook area from High Density Recreation to Low Density Recreation	YES – Not suitable for high density recreation.

The EA and comments received from other agencies have been used to determine whether the recommended alternative 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, the revision of the 1978 Master Plan for Tenkiller Ferry Lake will have no significant adverse impact to 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.

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Date

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

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## ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the effects of implementing the revised Master Plan for Tenkiller Ferry Lake, Cherokee and Sequoyah Counties, Oklahoma. This EA facilitates the decision process regarding the proposed action and alternatives.

- SECTION 1*                      *INTRODUCTION, PURPOSE, NEED AND SCOPE* of the proposed action summarizes the purpose of a need for the proposed action, provides relevant background information and describes the scope of the EA.
- SECTION 2*                      *ALTERNATIVES INCLUDING PROPOSED ACTION* examines alternatives for implementing the proposed action and describes the recommended action.
- 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, including cumulative effects. *MITIGATION* summarizes mitigation actions required to enable a Finding of No Significant Impact for the proposed alternative.
- SECTION 4*                      *APPLICABLE ENVIRONMENTAL LAWS, REGULATIONS, and POLICY* provides a listing of environmental protection statutes and other environmental requirements.
- SECTION 5*                      *FEDERAL, STATE AND LOCAL AGENCY COORDINATION* provides a listing of individuals and agencies consulted during preparation of the EA.
- SECTION 6*                      *LIST OF PREPARERS* identifies persons who prepared the document and their areas of expertise.
- SECTION 7*                      *REFERENCES* provides bibliographical information for cited sources.
- APPENDICES*                      *A*        NEPA Coordination and Scoping  
   *B*        Fish and Wildlife Coordination  
   *C*        Public and Agency Comments

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# ENVIRONMENTAL ASSESSMENT

## Master Plan Revision

Tenkiller Ferry Lake  
Cherokee and Sequoyah Counties, Oklahoma

### 1.0 INTRODUCTION

The Master Plan (MP) 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 MP guides the efficient and cost-effective management, development, and use of project lands. It is a vital tool for the responsible stewardship and sustainability of project resources for the benefit of present and future generations.

With the proposed MP revision, an Environmental Assessment (EA) is being completed to evaluate existing conditions and potential impacts of proposed alternatives. The EA is prepared pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR, 1500–1517), and the U.S. Army Corps of Engineers (USACE) implementing regulation, Policy and Procedures for Implementing NEPA, Engineer Regulation (ER) 200-2-2 (1988).

#### 1.1. PURPOSE AND NEED FOR THE ACTION

The MP for Tenkiller Ferry Lake was last approved in August 1978 and supplemented in February 1991, December 1990, February 1988, July 1987, September 1986, October 1985, July 1985, October 1983, January 1983, April 1982, and September 1980. During this time, use patterns have changed slightly. Changes involving recreation area closures and improvements have occurred, since the last supplement to the existing MP in 1991, to meet the evolving demands of the public. In addition, cooperative agreements have also occurred to operate and maintain facilities, lessening the financial burden on the tax payers.

The MP is a dynamic operational document that, pursuant to federal laws, guides the comprehensive management and development of all project recreational, natural and cultural resources throughout the life of the USACE project. The MP addresses concepts, not details, of design and administration. Detailed management and administration functions are addressed in the Operational Management Plan (OMP), which is used to implement the concepts of the MP into operational actions.

The MP will be developed and kept current for Civil Works projects operated and maintained by the USACE and will include all land (fee, easements, or other interests)

originally required for the projects and any subsequent land (fee, easements, or other interests) purchased to support the operations and authorized missions of the project.

The MP is not intended to address the specifics of regional water quality, shoreline management, or water level management; these areas are covered in a project's shoreline management plan or water management plan. However, specific issues identified through the MP revision process should be communicated and coordinated with the appropriate internal USACE resource (i.e. Operations for shoreline management) or external resource agency (i.e. Oklahoma State agencies such as the Oklahoma Department of Wildlife Conservation (ODWC), Oklahoma Department of Environmental Quality (ODEQ), Oklahoma Water Resources Board (OWRB), Oklahoma Conservation Commission (OCC), Oklahoma Scenic Rivers Commission (OSRC), Oklahoma Tourism and Recreation Department (OTRD), etc.) responsible for that specific area.

## 1.2. PROJECT HISTORY

Tenkiller Ferry Lake is located on the Illinois River at river mile 12.8, in Cherokee and Sequoyah Counties, Oklahoma (Figure 1). The reservoir is approximately 7 miles northeast of Gore and approximately 22 miles southeast of Muskogee, Oklahoma.

This Initial Appraisal includes all of Tenkiller Ferry Lake and its appurtenant structures including the earthen embankment (dam), spillway, and outlet works; and surrounding lands up to an elevation commensurate with the top of the flood control pool. These lands are comprised of all properties historically acquired to build the project including current USACE lands and those leased by the USACE to, or presently owned and operated by, other governmental entities. Total drainage area for the lake is 1610 square miles.

Tenkiller Ferry Lake was authorized by the Flood Control Act approved June 28, 1938. Installation of power features were authorized by the River and Harbor Act approved July 24, 1946; Project Document Committee No. 1, 75th Congress, 1st Session, HD 758, 79th Congress, 2d Session. The originally-authorized purposes of the lake included flood control and hydroelectric power generation.

Major construction of dam was started in June 1947. The spillway, outlet works, and tunnels were completed in 1951, and embankment closure occurred in May 1952. Impoundment of the power pool began in July 1952. The project was completed for full flood control operation in July 1953. Installation of the two hydropower units was completed in December 1953 and power generation was initiated. Work on the repair and extension of the spillway apron was initiated in July 1960 and completed in August 1961.

The dam structure is a rolled, impervious and semi-pervious earth-filled dam approximately 3,000 feet long with a maximum height of 197 feet above the streambed elevation, 480.20 feet NGVD. Oklahoma State Highway 100 extends across the top of the dam. An earth-filled dike approximately 1,350 feet long is located between the right end of the dam and the spillway.



Figure 1.1. Vicinity Map

The spillway and outlet works include a concrete-gravity spillway, located in a narrow ridge comprising the right abutment of the dam about 800 feet west of the axis of the dam, with a total width of 590 feet. Spillway capacity is 290,400 cubic feet per second (cfs) at maximum pool (elevation 672.2') with flow controlled by ten 50- by 25-foot tainter gates. A flood control outlet extending through the narrow ridge comprising the right abutment consists of a 19-foot conduit. Capacity of the conduit is 23,300 cfs at the top of the flood control pool. Flow through the conduit is controlled by two 9- by 19-foot tractor-type service gates installed at the upstream end of the conduit and operated by individual electric hoists located on the operating floor of the gate tower structure. A 19-foot-diameter penstock is provided through the narrow ridge comprising the right abutment to the powerhouse. Operational channel capacity below the dam is 13,300 cfs. Table 1 shows the Pertinent Data for Tenkiller Ferry Lake.

In fiscal year 2003, Phase 1 of a dam safety project was begun at the lake. Phase 2 began in fiscal year 2004 and was completed in fiscal year 2006. The dam safety project consists of an auxiliary spillway with five 50-foot wide by 35-foot high tainter gates constructed near the right abutment of the embankment. Auxiliary spillway capacity is 248,300 cfs at maximum pool elevation of 674.5 feet. The auxiliary spillway structure is similar to the existing spillway. In addition, a new Highway 100 bridge was built to carry traffic across the upstream approach channel for the new spillway. On November 29, 2006, a ribbon cutting ceremony was held marking the completion of the spillway project.

Table 1.1. Tenkiller Ferry Lake Pertinent Data\* .

<b>Feature</b>	<b>Elevation (feet)</b>	<b>Area (acres)</b>	<b>Capacity (acre-feet)</b>	<b>Equivalent Runoff <sup>(1)</sup> (inches)</b>
Top of Dam	677.2	-	-	-
Top of Gates and Flood Control Pool	667.0	20,800	1,230,800	14.33
Flood Control Storage	632.0-667.0	-	576,700	6.72
Main Spillway Crest	642.0	14,700	791,900	9.22
Top of Conservation Pool & Auxiliary Spillway Crest	632.0	12,900	654,100 <sup>(2)</sup>	7.62
Conservation Storage	594.5-632.0	-	371,000	4.32
Top of Inactive Pool	594.5	-	283,100	3.30

(1) From a 1,610-square-mile drainage area above the dam.

(2) Includes 25,400 acre-feet for water supply; 345,600 acre-feet for power drawdown storage, and 283,100 acre-feet of dead storage.

\*Source: US Army Corps of Engineers, Tulsa District, PERTINENT DATA BOOK, March 2004

## 2.0 ALTERNATIVES AND PROPOSED ACTION

### 2.1. ALTERNATIVES

Alternatives evaluated in this Environmental Assessment are compared to each other and to the No Action Alternative. The EA compares all action and no action alternatives to present a preferential alternative called the Preferred Alternative. Existing land classifications based upon Supplement 10, Dec 1990 of the 1978 Tenkiller Ferry Lake MP include 30,487 acres of land acquired in fee title of which 12,900 acres comprise the pool at conservation elevation 632 feet NGVD and 17,587 acres available for classification. Total lands allocated for classification currently include: 235 acres for project operations, 5,259 acres for recreation-intensive use, 6,905 acres for recreation-low density, and 5,188 acres for wildlife management.

#### **Alternative 1: No Action**

The No Action Alternative is defined as the USACE taking no action and not revising the December 1990, Supplement 10, of the 1978 MP. With this alternative, no new resources analysis and classification would occur at the project. The operation and management of Tenkiller Ferry Lake would continue as outlined in the current MP.

#### **Alternative 2: Land classification remains unchanged.**

1. 235 acres Project Operations
2. 5259 acres High Density Recreation
3. 6,905 acres Low Density Recreation
4. 5,188 acres Wildlife Management

**Alternative 3:** Land classification changes to reflect changes in land classifications to meet authorized project purposes, natural resource management objectives, and recreation management objectives. Land classification changes include:

1. 100 acre increase in Project Operations from wildlife management to include the auxiliary spillway (335 acres total).
2. 1,797 acre decrease in High Density Recreation (3,462 acres total).
3. 1,992 acre decrease in Low Density Recreation (4,913 acres total).
4. 2,567 acre increase in Wildlife Management (7,755 acres total).
5. 158 acre reclassification of High Density Recreation to High Density Recreation – Future Inactive.
6. Establish 777 acres classified as Environmentally Sensitive Area (777 acres total).

**Alternative 4:** Reclassification of all project lands to recreation intensive use (excluding Project Operations) to meet authorized project purposes and maximize recreation management objectives.

1. 100 acre increase in Project Operations.
2. 11,895 acre increase in High Density Recreation.
3. 6,905 acre decrease in Low Density Recreation.
4. 5,188 acre decrease in Wildlife Management.

5. No Establishment of Environmentally Sensitive Areas.

**Alternative 5:** Reclassification of all project lands to wildlife management (excluding Project Operations) to meet authorized project purposes and maximize natural resource management objectives.

1. 100 acre increase in Project Operations.
2. 5,259 acre decrease in High Density Recreation.
3. 6,905 acre decrease in Low Density Recreation.
4. 11,966 acre increase in Wildlife Management.
5. No Establishment of Environmentally Sensitive Areas.

2.2. PROPOSED ACTION

The proposed action is Alternative 3. The proposed action would result in the classification and or reclassification allowing for the most efficient and cost-effective management, development, and use of project lands. Components of the proposed action are presented in Table 2.1.

Table 2.1. Land Use Classification Changes Associated with the Proposed Action.

Description	Justification
Reclassify 24 acres in Strayhorn Cove from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassify 46 acres on the south shore of Lender Branch Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing permitted private docks.
Reclassify 98 acres in the vicinity of Falcon Lane from Low Density Recreation to High Density Recreation	YES – aligns with SMP and currently permitted private docks.
Reclassify 424 acres in the vicinity of Sisemore Cove from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassify 125 acres in the vicinity of Pettit Creek Cove from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 81 acres in the vicinity of Pettit Creek Cove/Pettit Bay Recreation Area from High Density Recreation to Wildlife Management	YES – geography not suitable for High Density Recreation.
Reclassify 4 acres in the vicinity of S. Bayside Lane from High Density Recreation to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 77 acres extending east from Pettit Bay PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 60 acres in the S. Boathouse Lane vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.
Reclassify 118 acres on peninsula across from Standing Rock Landing PUA from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 75 acres in the P-21 road vicinity from Wildlife Management to Low Density Recreation	YES – SMP zoned for docks/existing docks.

Table 2.1 continued. Land Use Classification Changes Associated with the Proposed Action.

<b>Description</b>	<b>Justification</b>
Reclassify 24 acres in the vicinity of the tree nursery above Hwy 82 from High Density Recreation to Wildlife Management	YES – area not suitable for high density recreation.
Reclassify 140 acres from in vicinity of the tree nursery above Hwy 82 from Low Density Recreation to Wildlife Management	YES – shoreline is not suitable for low density recreation.
Reclassify 164 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 190 acres in the Carters Landing PUA from High Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 88 acres in T16N, S18 and S19 from Low Density Recreation to Environmentally Sensitive Area	YES – Provide maximum protection for historically significant areas.
Reclassify 335 acres in T15N, S5 and S6 from Low Density Recreation to Environmentally Sensitive Area	YES – provide maximum protection for historically significant areas.
Reclassify 638 acres along Caney Creek, Dry Creek and east bank of Illinois River from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Reclassify 182 acres along Elk creek cove from High Density Recreation to Wildlife Management	YES – shoreline not suitable for high density recreation.
Reclassify 77 acres in Standing Rock area from Low Density Recreation to Wildlife Management	YES – shoreline not suitable for low density recreation.
Classify 140 acres currently unclassified lands adjacent to cottage site disposal to low density recreation.	YES – area is suitable for low density recreation and is currently used for low density recreation.
Reclassify 83 acres in Carlile Cove from High Density Recreation to Low Density Recreation	YES – area not suitable for high density recreation. Permitted private boat docks and aligns with SMP.
Reclassify 54 acres in south of Carlile Cove from High Density Recreation to Wildlife Management	YES – area not suitable for low density recreation and aligns with aesthetic classification in SMP.
Classify 22 acres currently not classified north of Chicken Creek Point PUA as Low Density Recreation.	YES – area is suitable for low density recreation.
Reclassify 8 acres north of Woodhaven Drive from High Density Recreation to Low Density Recreation	YES – aligns with SMP.
Reclassify 371 acres in Snake Creek Cove from High Density Recreation to Low Density Recreation	YES – aligns with SMP.
Reclassify 30 acres from Wildlife Management to Project Operations	YES – necessary for auxiliary spillway.
Reclassify 5 acres on north side of Hwy 100 from High Density Recreation to Project Operations	YES – currently used for project related stockpiles.
Reclassify 145 acres in the Overlook area from High Density Recreation to Low Density Recreation	YES – Not suitable for high density recreation.

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### **3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

A summary of the environmental and social impacts of the “No Action” and proposed action alternatives are presented in Table 3.1 and Table 3.2. The basis for which beneficial and or adverse impact determinations presented in Tables 3.1 and 3.2 were made are documented in Sections 3.1 through 3.19.

#### **3.1. PROJECT SETTING**

Tenkiller Ferry Lake straddles two ecoregions: the upper one-third portion of the lake is situated in the Dissected Springfield Plateau-Elk River Hills ecoregion of the Ozark Highlands in the Springfield Plateau physiographic region; the lower two-thirds portion of the lake is situated in the Lower Boston Mountains ecoregion of the Boston Mountains in the Ozark Plateau physiographic province.

The Dissected Springfield Plateau-Elk River Hills ecoregion is characterized by moderately to highly dissected and hilly, with narrow ridgetops separated by steep V-shaped valleys. Karst features are common. Spring seeps are common along streams and contribute to stream flow during the normally dry periods of summer and fall. As such, most streams are perennial.

The Lower Boston Mountains ecoregion is characterized by rounded high hills and benches. In drier summer months, streams typically little to no flow, but water still moves through the landscape in interstitial spaces between pools. Stream substrates are mostly rocky and consist of gravel, cobbles, and boulders. In larger water bodies, some organic material or mud substrates may occur.

Natural vegetation in these areas generally consists of species in the oak–hickory forest association and includes species of blackjack oak, post oak, scarlet oak, and black hickory in the drier upland areas. Species that are generally found along stream banks and in floodplains typically consist of bottomland forests and include species of pecan, oak, maple, birch, sycamore, cottonwood, elms, and willow. Common understory species include woody species of sumac, hawthorn, wild plum, and rough leaved dogwood. Herbaceous species include bluestems, sedges, panic grass, and broomsedge.

Tenkiller Ferry Reservoir covers 12,900 acres at normal conservation pool (elevation 632 feet, mean sea level (msl) and encompasses 20,800 acres at flood pool elevation 667 msl. The lake is approximately 34 miles long with approximately 130 miles of shoreline. The shoreline is characterized as gravelly with chert limestone and rocky ledges and overhangs.

The lake provides aquatic habitat for a variety of species of plants and animals, and diverse fish communities, including black bass, white bass, striped bass, crappie, catfish, with trout stocked by the ODWC in the Illinois River below the dam. The trout fishery on the river attracts many visitors to the area.

The American Bald Eagle, gray bat and Ozark big-eared bat, all protected species, are found in the lake area. The ODWC operates project lands as a game management area. The USACE directly manages about 2,598 acres in the interest of wildlife resources.

## 3.2. CLIMATE AND CLIMATE CHANGE

### 3.2.1. Affected Environment

The climate of eastern Oklahoma, including Tenkiller Ferry Lake, lies within the humid, subtropical region, with warm, moist air moving northward from the Gulf of Mexico exerting much influence over the eastern and southern portions of the state. This region is characterized by moderate winters and comparatively long, hot summers.

Cherokee County averages a growing season of 195 days, but plants that can withstand short periods of colder temperatures may have an additional three to seven weeks. Temperatures range from an average daytime high of 92 degrees in July and August to an average low of 27 degrees in January. Average annual precipitation ranges from about 48 inches in western Cherokee County to 51 inches in the east. May and June are the wettest months, on average, but much of the spring through fall receives sufficient rainfall. Nearly every winter has at least one inch of snow, with one year in five having ten or more inches. Winds from the southeast are dominant, averaging nearly seven miles-per-hour. Relative humidity, on average, ranges from 43% to 94% during the day. During the year, humidity is highest in May and June and lowest in March and April. Winter months tend to be cloudier than summer months. The percentage of possible sunshine ranges from an average of about 50% in winter to nearly 75% in summer.

Sequoyah County averages a growing season of 206 days, but plants that can withstand short periods of colder temperatures may have an additional six weeks. Temperatures range from an average daytime high of 93 degrees in July and August to an average low of 27 degrees in January. Average annual precipitation is between 45 and 48 inches across the county. April through June is the rainy season in Sequoyah County, and in some years a second wet season occurs in autumn. Nine in ten winters have at least one inch of snow, with one year in six having ten or more inches. The Arkansas River Valley channels the winds to a predominantly easterly direction, averaging a little less than six miles-per-hour. Relative humidity, on average, ranges from 47% to 92% during the day. During the year, humidity is highest between May and July and lowest in March and April. Winter months tend to be cloudier than summer months. The percentage of possible sunshine ranges from an average of less than 50% in winter to about 75% in summer.

### 3.2.2. Environmental Consequences

The 2012 Update of the Oklahoma Comprehensive Water Plan, Water Demand Forecast Report Addendum, Conservation and Climate Change presents assessments on the impacts of climate change under various scenarios. Climate change scenarios included: Scenario 1 represents the ensemble projection developed from the set of individual projections with

Table 3.1. "No Action" Impact Assessment Matrix.

Name of Parameter	Magnitude of Probable Impact						
	Increasing Beneficial Impact			No Appreciable Effect	Increasing Adverse Impact		
	Significant	Substantial	Minor		Minor	Substantial	Significant
<b>A. Social Effects</b>							
1. Noise Levels				X			
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation				X			
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth and Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy				X			
<b>B. Economic Effects</b>							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services					X		
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Flooding Effects				X			
<b>C. Natural Resource Effects</b>							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat				X			
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity				X			
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened and Endangered Species					X		
<b>D. Cultural Resources</b>							
1. Historic Architectural Values						X	
2. Pre-Historic & Historic Archeological Values						X	

Table 3.2. Impact Assessment Matrix for the Proposed Action.

Name of Parameter	Magnitude of Probable Impact						
	Increasing Beneficial Impact			No Appreciable Effect	Increasing Adverse Impact		
	Significant	Substantial	Minor		Minor	Substantial	Significant
<b>A. Social Effects</b>							
1. Noise Levels				X			
2. Aesthetic Values			X				
3. Recreational Opportunities				X			
4. Transportation				X			
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth and Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use		X					
10. Controversy				X			
<b>B. Economic Effects</b>							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Flooding Effects				X			
<b>C. Natural Resource Effects</b>							
1. Air Quality				X			
2. Terrestrial Habitat		X					
3. Wetlands				X			
4. Aquatic Habitat				X			
5. Habitat Diversity and Interspersion		X					
6. Biological Productivity		X		X			
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened and Endangered Species			X				
<b>D. Cultural Resources</b>							
1. Historic Architectural Values	X						
2. Pre-Historic & Historic Archeological Values	X						

predicted mean annual temperature changes greater than the median projected change (upper half) and predicted mean annual precipitation changes less than the median projected change (lower half) (i.e. hot and dry). Scenario 2 was developed from the lower half of both the temperature and precipitation change; Scenario 3 was developed from the upper half of both temperature and precipitation change (hot and wet); and Scenario 4 was developed from the lower half of temperature change and upper half of precipitation change (warm and wet). Climate change scenario analysis by the OWRB conclude that maximum temperature in August could increase by 3.5°F to 7.5°F above the historical average temperatures (January 1, 1950 to December 31, 2007); annual precipitation deviations from historical averages could range from a decrease of up to 3.5 inches per year to an increase of up to 3.0 inches per year; municipal and industrial water supply demand increases are project to range from between 0 to 500 acre-feet per year to 2,000 to 5,000 acre-feet per year under various climate change scenarios.

Should climate change impacts become significant enough to impact the operation of Tenkiller Ferry Lake, the MP and associated documents would be reviewed and revised as necessary.

### 3.3. GEOLOGY AND SOILS

#### 3.3.1. Affected Environment

The terrain is rugged with elevations varying from about 475 to 1,700 feet. The highest ridges and peaks are capped with sandstone and shales of Pennsylvanian age. The deeply eroded valleys are cut into the underlying Mississippian limestone and Ordovician dolomite. The soils of this region have a high infiltration rate. The soils of this area vary widely in fertility, structure, and use. The majority of the soils are stony in texture and well drained. To the north of the project, the Illinois River and its principal tributaries flow through heavily wooded deeply dissected hillsides surround by low and gently rolling fields. Natural cover consists of hardwood forests with grasses in the medium to open forest canopy areas. Pine tree forests can be found in the rolling hill areas.

The average elevation of the tablelands is about 1,250 feet. The valley slopes are steep and rocky, and most of the area is covered with a light growth of timber and underbrush. The average fall of the Illinois River is about 8 feet per mile, varying from approximately 20 feet per mile in the upper reaches to approximately 3 feet per mile in the lower reaches. The valley averages one-half mile in width, while the river channel varies in width from 200 to 600 feet. The riverbanks average 10 feet in height. The principal tributaries are the Muddy Fork, Osage Creek, Flint Creek, Barren Fork, and Caney Creek. All of these tributaries enter the Illinois River above Tenkiller Ferry Dam, with the Barren Fork being the largest.

Soils within the valley are comprised mostly of alluvially deposited sandy and silty loams formed from the decomposition of local sandstones and shales. These soils generally consist of very deep, moderately drained, and rapidly permeable upland soils that formed in sandy Pleistocene sediments. The type and range sites of these soils are described in the following paragraphs.

1. Claypan prairie is on areas of nearly level to moderately sloping soils on uplands and consists of Okemah silty clay loam, 1 to 3 percent slopes. Soils in the group are 2 percent Mayes and 2 percent Parsons.
2. Heavy Bottomland is on areas that are frequently flooded and consists of Osage clay, 0 to 1 percent slopes. The soils are deep clay and consist of 95 percent Osage soil.
3. Loamy Bottomland is on bottomlands. The soils are deep and loamy and are comprised of Elsay very gravelly loam, 0 to 3 percent slopes, consisting of Healing and Razort soils; Osage clay, 0 to 1 percent slopes, consisting of Verdigris soil; Cleora fine sandy loam, 0 to 2 percent slopes, consisting of Cleora soil; and Mason silt loam, 0 to 1 percent slopes, consisting of 90 percent Mason, 5 percent Speer, 3 percent Cleora, and 2 percent Cupco soils.
4. Loamy Prairie is on uplands. The soils are nearly level to moderately steep and are on convex slopes of low ridges and on the side slopes of moderately steep ridges in broad valleys. The soils are comprised of Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Eram soil; Newtonia silt loam, 1 to 5 percent slopes, consisting of Newtonia, Dennis, Okemah, and Britwater soils; Okemah silty clay loam, 1 to 3 percent slopes, consisting of Okemah and Dennis soils; and Shidler stony silty clay loam, 10 to 25 percent slopes, consisting of Lula and Catoosa soils.
5. Very shallow is in areas of nearly level to gently sloping, very shallow soils. The surface layer is 6 to 10 inches deep over limestone. The soils are comprised of the Shidler-Rock outcrop complex, 2 to 50 percent slopes, and Shidler stony silty clay loam, 10 to 25 percent slopes. Soils are primarily comprised of Shidler soils and are extremely rocky.
6. Eroded Claypan Prairie is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of 88 percent Apperson, 8 percent Okemah, 3 percent Dennis, 1 percent Shidler soils.
7. Eroded Loamy Prairie is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of Okemah and Dennis soils.
8. Eroded Very Shallow is in areas where part or all of the A horizon has been removed by erosion and the soil integrity has been altered. The soils are comprised of Apperson silty clay loam, 3 to 5 percent slopes, consisting of thin Shidler soil.
9. Smooth chert savannah is on cherty uplands on the more gently sloping ridges and footslopes in the Ozark Highlands. The soils are comprised of Clarksville very gravelly silt loam, 5 to 20 percent slopes, consisting of Britwater and Nixa soils;

- Clarksville very gravelly silt loam, 20 to 50 percent slopes, consisting of Britwater and Nixa soils; Tonti gravelly silt loam, 1 to 3 percent slopes, consisting of Captina and Britwater soils; Newtonia silt loam, 3 to 5 percent slopes, consisting of Britwater soil; Healing silt loam, 0 to 1 percent slopes, consisting of Britwater soil; Razort gravelly loam, 0 to 3 percent slopes, consisting of Britwater soil; Stigler silt loam, 0 to 1 percent slopes, consisting of Stigler and Captina soils; Sallisaw loam, 1 to 3 percent slopes, consisting of Sallisaw soil; and Sallisaw loam, 3 to 5 percent slopes, consisting of Sallisaw soil.
10. Loamy Savannah is in areas of nearly level to gently sloping, rolling, deep soils on uplands. The soils are comprised of Shermore loam, 1 to 3 percent slopes, consisting of Stigler soil; Stigler-Wrightsville complex, 0 to 1 percent slopes, consisting of Stigler and Vian soils; and Linker-Hector complex, 3 to 5 percent slopes, comprised of Stigler soil.
  11. Sandy Savannah is in areas of nearly level to steep, sandy soils on uplands. The soils are comprised of Hector fine sandy loam, 3 to 5 percent slopes, consisting of Hector and Linker soils; Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Enders, Linker, and Eram soils; Rock outcrop-Hector complex, 40 to 100 percent slopes, consisting of Linker soil; and Shermore loam, 1 to 3 percent slopes, consisting of Shermore and Linker soils.
  12. Savannah breaks is in steep and very steep, rocky areas that have large sandstones on or near the surface. Large amounts of bare rock on the surface restrict forage production. The soils are comprised of Rock outcrop-Hector complex, 40 to 100 percent slopes, consisting of Hector soil and Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Endsaw soil.
  13. Shallow savannah is in areas of rugged topography on low, mountainous ridges. The soil is comprised of Hector fine sandy loam, 3 to 5 percent slopes, consisting of Hector soil; Enders-Linker-Hector association, 5 to 30 percent slopes, consisting of Hector soil; and Linker fine sandy loam, 3 to 5 percent slopes, consisting of Hector soil.

### 3.3.2. Environmental Consequences

Development history, geology, and property of soil types present on Tenkiller Ferry Project fee lands have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to geology and soils would occur by adoption of the MP revision.

### 3.4. SOCIAL AND ECONOMIC CONDITIONS

#### 3.4.1. Affected Environment

##### *Population*

The total population for the zone of interest is 223,109, as shown in Table 3.3. About 32% of the population is in Muskogee County, 22% in Cherokee County, 19% in Delaware County, 18% in Sequoya County and 9% in Adair County. The population in the zone of interest makes up approximately 6% of the total population of Oklahoma. From 2013 to 2065, the population in the zone of interest is expected to increase to 339,032, an annual growth rate of 0.8% per year. By comparison, the population of Oklahoma is projected to increase at a rate of 0.6% per year. The distribution of the population among gender is approximately 49% male and 51% female in all geographical areas, as shown in Table 3.4.

Table 3.3. 2013 Population Estimates and 2065 Projections.

<b>Geographical Area</b>	<b>2013 Population Estimate</b>	<b>2065 Projection</b>
Oklahoma	3,850,568	5,280,026
Adair County	22,194	32,391
Cherokee County	48,017	79,204
Delaware County	41,377	74,060
Muskogee County	70,303	85,457
Sequoya County	41,218	67,920
<b>Zone of Interest Total</b>	<b>223,109</b>	<b>339,032</b>

Source: U.S. Bureau of the Census, American Fact Finder (2013 Estimate)  
Oklahoma State Data Center (2065 Projections)

Table 3.4. 2013 Population Estimate by Gender.

<b>Geographical Area</b>	<b>Male</b>	<b>Female</b>
Oklahoma	49.5%	50.5%
Adair County	50.0	50.0
Cherokee County	49.3	50.7
Delaware County	49.3	50.7
Muskogee County	48.9	51.1
Sequoya County	49.3	50.7
<b>Zone of Interest Total</b>	<b>49.2</b>	<b>50.8</b>

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

Table 3.5 shows the population by age group. The distribution by age group is similar among the counties, zone of interest and the state overall. The largest age group is the 45 to 54, with 14% of the total population for each geographic area. Approximately 36-38% of the total population for each area is between 25 and 54 years of age.

Population by race and Hispanic Origin is displayed in Table 3.6. For the zone of interest, 57% of the population is White, 20% American Indian or Native Alaskan, 13% two or more

racers, 5% Hispanic, and 4% Black. The remainder of the races makes up less than 1% each. By comparison, for the state, 68% of the population is White, 9% Hispanic, 7% each for Black, American Indian/Native Alaskan, and two or more races, 2% Asian, with the remaining less than 1% each.

### *Education and Employment*

In the zone of interest, for 36% of the population 25 years old and older the highest level of education attained is a high school diploma or equivalent. Twenty-four percent have some college, but no degree, 12% have a Bachelor's degree, 11% 9-12 years education but with no diploma, 7% have an Associate degree, 6% have a graduate or professional degree and 5% have less than nine years of education. The distribution is very similar to the state overall. For Oklahoma, 32% have a high school diploma or equivalent, 24% have some college, but no degree, 16% have a Bachelor's degree, 9% 9-12 years of school but no diploma, 8% have a graduate or professional degree, 7% have an Associate degree, and 5% less than nine years of schooling. Table 3.7 shows the population over 25 years of age by highest level of educational attainment for each of the geographical areas.

Employment by sector is presented in Table 3.8. In the zone of interest, approximately 19% of the workforce is employed in the Health Care and Social Assistance Sector, followed by 13% in Public Administration, 12% in Retail Trade, 11% in Educational Services, 10% in Manufacturing, and 8% in Accommodation and Food Services. Similarly, the largest employment sector in the state was also Health Care and Social Assistance, with 14% of the total employment. The second largest employment sector in the state is Retail Trade with 11%, followed by Educational Services and Manufacturing and Accommodations & Food Services, each with 9%, Public Administration with 7%, and Administrative and Support with 6%. While manufacturing has importance in both the zone of interest and state, it is evident the economies are driven by service sector employment.

As shown in Table 3.9, the unemployment rate is slightly higher in the zone of interest, at 5.6%, than the state overall, with 4.4%. The difference is driven by a significantly higher unemployment rate in Sequoyia County, at 7.2 % and a moderately higher rate in Adair and Muskogee Counties with just over 5%. Cherokee and Delaware Counties have unemployment rates closer to the state rate.

Table 3.5. 2013 Population Estimate by Age Group.

Area	Age Group												
	<5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 34	35 to 44	45 to 54	55 to 59	60 to 64	65 to 74	75 to 84	85 and over
Oklahoma	264,159	262,213	256,213	260,843	277,306	512,819	464,680	513,248	243,245	208,692	292,159	165,856	63,599
Adair County	1,540	1,701	1,840	1,690	1,314	2,700	2,874	3,090	1,392	1,283	1,805	957	241
Cherokee County	3,240	3,134	3,028	3,983	4,782	5,751	5,272	6,007	3,027	2,637	3,927	1,968	732
Delaware County	2,155	2,698	2,549	2,660	2,052	4,008	4,465	5,762	3,011	3,287	5,406	2,694	647
Muskogee County	4,985	4,573	5,039	4,716	4,699	8,938	8,563	9,687	4,406	4,494	5,797	3,389	1,371
Sequoia County	2,548	2,844	3,212	2,900	2,332	4,777	5,457	6,011	2,829	2,409	3,883	1,958	674
Zone of Interest	14,468	14,950	15,668	15,949	15,179	26,174	26,631	30,557	14,665	14,110	20,818	10,966	3,665

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

Table 3.6. 2013 Population Estimate by Race/Hispanic Origin

Area	Race / Hispanic Origin							
	White	Black	American Indian or Native Alaskan	Asian	Native Hawaiian or Other Pacific Islander	Other Race	Two or more	Hispanic
Oklahoma	2,582,335	269,717	255,929	66,720	4,208	2,854	258,840	345,139
Adair County	9,453	80	8,102	144	3	13	3,383	1,249
Cherokee County	23,699	547	13,304	304	59	51	6,489	3,035
Delaware County	27,151	108	8,831	513	22	3	3,488	1,278
Muskogee County	40,984	7,766	9,610	411	11	23	8,050	3,802
Sequoya County	27,200	787	4,965	257	0	6	7,133	1,486
Zone of Interest	128,487	9,288	44,812	1,629	95	96	28,543	10,850

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

Table 3.7. 2013 Population Estimate by Highest Level of Educational Attainment, Population 25 Years of Age and Older.

Area	Highest Educational Attainment							
	Population 25 Over	<9 Years	9 to 12 Years, No Diploma	High School	Some College No Degree	Associate Degree	Bachelor Degree	Graduate or Professional Degree
Oklahoma	2,464,298	113,560	221,671	782,753	595,862	171,995	387,885	190,572
Adair County	29,280	1,102	3,382	11,447	6,791	1,838	3,184	1,536
Cherokee County	29,321	1,437	2,931	8,607	7,529	1,633	4,405	2,779
Delaware County	29,280	1,102	3,382	11,447	6,791	1,838	3,184	1,536
Muskogee County	46,645	2,171	4,879	15,361	11,902	3,982	5,867	2,483
Sequoya County	27,998	1,652	3,579	11,385	5,702	1,949	2,561	1,170
Zone of Interest	162,524	7,464	18,153	58,247	38,715	11,240	19,201	9,504

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

Table 3.8. 2013 Annual Average Employment by Sector.

Sector	Oklahoma	Adair County	Cherokee County	Delaware County	Muskogee County	Sequoyah County	Zone of Interest
Agriculture, Forestry, Fishing, and Hunting	10,284	99	641	42	94	71	947
Mining	59,551	ND	41	ND	65	77	183
Utilities	16,561	76	238	53	380	106	853
Construction	79,148	67	330	434	1,423	240	2,495
Manufacture	138,198	1,543	186	777	3,792	127	6,424
Wholesale Trade	62,171	68	ND	118	862	80	1,128
Retail Trade	177,903	500	1,659	1,268	3,154	1,336	7,918
Transportation and Warehousing	51,901	53	61	120	899	244	1,377
Information	23,704	23	72	64	339	73	569
Finance and Insurance	55,645	123	311	272	681	281	1,668
Real Estate and Rental and Leasing	22,890	13	203	58	386	42	702
Professional, Scientific and Technical Services	68,853	49	168	147	481	312	1,155
Management of Companies and Enterprises	16,590	ND	ND	ND	52	ND	52
Administrative and Support and Waste Management and Remediation Services	99,720	33	121	226	1,257	227	1,864
Educational Services	143,973	758	2,102	971	2,439	1,204	7,474
Health Care and Social Assistance	210,892	591	2,463	1,314	5,424	2,585	12,377
Arts, Entertainment and Recreation	34,998	ND	416	1,058	1,553	568	3,595
Accommodation and Food Services	139,481	285	1,186	880	2,372	820	5,544
Other Services (except Public Administration)	36,221	85	316	230	555	139	1,325
Public Administration	112,276	279	4,089	462	3,284	488	8,601
<b>TOTAL</b>	<b>1,560,960</b>	<b>4,647</b>	<b>15,206</b>	<b>8,510</b>	<b>29,491</b>	<b>9,062</b>	<b>66,916</b>

Source: Oklahoma Employment Security Commission, citing Quarterly Census of Employment and Wages Program, Bureau of Labor Statistics

ND = Not disclosed for confidentiality purposes

Table 3.9. Labor Force, Employment and Unemployment Rates, November 2014.

<b>Area</b>	<b>Civilian Labor Force</b>	<b>Number Employed</b>	<b>Number Unemployed</b>	<b>Unemployment Rate</b>
Oklahoma	1,796,308	1,717,345	78,963	4.4
Adair County	9,506	8,983	523	5.5
Cherokee County	22,841	21,865	976	4.3
Delaware County	18,759	17,862	897	4.8
Muskogee County	30,625	28,963	1,662	5.4
Sequoia County	16,242	15,078	1,164	7.2
Zone of Interest	97,973	92,751	5,222	5.6

Source: Oklahoma Employment Security Commission

#### *Households and Income*

There are approximately 84,000 households in the zone of interest with an average household size of 2.61 persons. For the state, there are 1.4 million households, with an average size of 2.55 persons per household, as shown in Table 3.10.

Table 3.10. 2013 Households and Household Size.

<b>Area</b>	<b>Number of Households</b>	<b>Average Household Size</b>
Oklahoma	1,444,081	2.55
Adair County	8,046	2.76
Cherokee County	16,875	2.68
Delaware County	16,589	2.47
Muskogee County	26,802	2.51
Sequoia County	15,624	2.65
Zone of Interest	83,936	2.61

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

As shown in Table 3.11, the zone of interest is slightly poorer than the state overall. In the zone of interest, the median household income is almost \$36,000, compared to the state median household income of \$45,000. Within the zone of interest, the median household incomes are similar, with Muskogee County having the highest (\$39,000) and Adair County

the lowest (\$33,000). Similarly, the zone of interest has a lower per capita income (\$19,000) compared to the state (\$24,000). Within the zone of interest, Delaware County has the highest per capita income (\$21,000) and as with median income, Adair has the lowest per capita income (\$15,000).

Table 3.11. Median and Per Capita Income, 2012.

<b>Area</b>	<b>Median Household Income</b>	<b>Per Capita Income</b>
Oklahoma	\$45,339	\$24,208
Adair County	32,556	15,116
Cherokee County	37,260	18,582
Delaware County	36,588	21,109
Muskogee County	38,502	19,868
Sequoya County	35,742	18,131
Zone of Interest	N/A	19,028

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

### 3.4.2. Environmental Consequence

Social and economic conditions have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to social and economic conditions would occur by adoption of the Tenkiller Ferry Lake MP revision.

## 3.5. EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

### 3.5.1. Affected Environment

Executive Order 12989 requires each Federal agency to make environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Under NEPA, the identification of a disproportionately high and adverse human health or environmental effect on a low-income population, minority population, or Indian tribe does not preclude a proposed agency action from going forward, nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. Rather, the identification of such an effect serves to heighten agency attention to alternatives (including alternative sites), mitigation strategies, monitoring needs, and preferences expressed by the affected community or population.

Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the Bureau of the Census Reports on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

Minorities are comprised of individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority populations are identified where either: (a) the minority populations of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed/transient set of individuals (such as migrant workers or Native American), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as to not artificially dilute or inflate the affected minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

Disproportionately high and adverse human health effects: When determining whether human health effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) Whether the health effects, which may be measured in risks and rates, are significant or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death; and (b) Whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group; and (c) Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

Disproportionately high and adverse environmental effects: When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable: (a) Whether there is or will be an impact on the natural or physical environment that significantly and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment; and (b) Whether environmental effects are significant and are or may be having an adverse impact on minority populations, low-income populations, or Indian

tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group; and (c) Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposure from environmental hazards.

### 3.5.2. Environmental Consequences

Disproportionately high and adverse human health and environmental effects on minority and low-income populations have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to minority and low-income communities would occur by adoption of the Tenkiller Ferry Lake MP revision.

## 3.6. EXECUTIVE ORDER 13045, PROTECTION OF CHILDREN

### 3.6.1. Affected Environment

Executive Order 13045 requires Federal agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that may affect children disproportionately. The executive order defines environmental health and safety risks as risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to). The Order further requires Federal agencies to ensure that its policies, programs, activities, and standards address these disproportionate risks. Executive Order 13045 is addressed in this NEPA document to examine the effects this action will have on children.

### 3.6.2. Environmental Consequences

Environmental health and safety risks to children have been considered in recommended zoning classifications and reclassifications and no significant impacts to children would occur by adoption of the Tenkiller Ferry Lake MP revision. Furthermore, the review conducted indicates, at present, a low to moderate environmental health risk to children due to the presence of cyanobacteria at cellular densities high enough to merit administrative action (WHO 1999) and capable of producing neurotoxins (nerve toxins) and hepatotoxins (liver toxins). Symptoms experienced due to acute exposure to neurotoxins could possibly include muscle cramps, twitching, paralysis, cardiac or respiratory failure, death in animals (WHO 1999). While the MP will result in no significant impacts to environmental health and safety to children, it is recommended that information regarding possible adverse health effects related to primary and secondary water contact be posted at public use facilities when cyanobacteria bloom conditions warrant.

## 3.7. CULTURAL RESOURCES

### 3.7.1. Affected Environment

#### *Historic and Archaeological Features*

##### A. History

Tenkiller Ferry Lake is located in a region that once was the Cherokee Nation (one of the Five Civilized Tribes relocated to Indian Territory during the 1800s). Among the early settlers of the area were: John Ross, Principal Chief of the Cherokee Nation; George M. Murrell, who operated a steam mill on the east side of the Barren Fork near present-day Welling; Mark Bean and Reuben Sanders, who operated a salt works in the early 1800s; and Samuel Mackey, who started another salt works in 1828. Another early day settler was Samuel Newton, who with his wife Mary established a mission in 1830.

Historical sites in the vicinity of the project are: the City of Tahlequah, which is the oldest incorporated town in Oklahoma; the Cherokee Agency, located three miles northwest of Tahlequah; Cherokee National Capitol, which was erected in 1867 by the Tribal Council and served as the Capitol Building until 1907 (now the Cherokee County Courthouse); Bacone College, established at Tahlequah in 1880 and moved to the City of Muskogee in 1882 (originally known as Indian University, it is still active); Jane Ross Miags house, a home built over a century ago for the daughter of John Ross; the Murrell Home, which is four miles south of Tahlequah on State Highway 82 and one mile east; Park Hill (District), center of cultural, political, and economic life of the Cherokee Nation from 1836 to 1900, now overshadowed by the City of Tahlequah; and Riley's Chapel, a Methodist Mission established in 1844, located two miles southeast of Tahlequah.

##### B. Archaeology

Archaeological sites representative of the Paleo-Indian, Archaic, Woodland, Caddoan/Mississippian, Protohistoric (Contact), and Historic Periods are known in the larger vicinity of Tenkiller Ferry Reservoir in northeastern Oklahoma. This culture-historical sequence falls generally within the overall sequence that has been established for eastern Oklahoma. Many archaeological sites in this area have undisturbed, deeply-buried deposits; many are comprised of multi-component prehistoric and/or historic occupations. Several cultural resources investigations, including archaeological survey and excavation, were conducted incident to and post-construction of Tenkiller Ferry Reservoir. 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 (OAS). Ultimately, as a major river flowing out of the western Ozarks, the entire Illinois River Valley can be classified as an area of high sensitivity for the location of cultural resources.

## *Cultural History Sequence*

To aid in comparing divergent cultures and sequences in eastern Oklahoma, the following general adaptation types are used to characterize prehistoric cultural traditions.

### A. Paleo-Indian 12,000 to 8500 BP

Specialized, large-game hunting by small bands of hunter-gatherers was the adaptation type associated with this period. Signature stone tools are unnotched projectile points of fluted or lanceolate type, often found in contexts where mammoth or bison remains also occur. Structural remains are poorly understood, the probable result of a mobile lifestyle and the use of perishable construction materials. Three main complexes identified within this period are Clovis, Folsom, and Late Paleo-Indian (e.g., Dalton). The extent of the Paleo-Indian period was approximately 12,000 BP to 8,500 BP.

### B. Archaic 8500 to 2000 BP

Plant foraging was an important subsistence strategy of hunter gatherer groups in this period and was associated with increased seasonal variability of resources during the mid-Holocene Hypsithermal period. Repeated occupation of sites and features such as rock-lined hearths and roasting pits, and grinding tools reflect intensive plant processing and the cyclical exploitation of resources. Bison were hunted on a smaller scale than previously, with greater reliance on small mammals, mussels and fish. Stone tools were often thermally cured, and included distinctive stemmed and notched projectile points. 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.

### C. Woodland 2000 to 1200 BP (AD 1 to 800)

Archaeologists in Oklahoma associate the use of ceramics in describing Woodland cultural components. Incipient horticulture was the adaptation type associated with this period, marked by the introduction of cultigens in eastern Oklahoma. Evidence for semi-permanent villages, increased reliance on wild and domestic plants, widespread use of ceramics and elaborate burials reflect the more sedentary lifestyle of Woodland cultures. Small game remained essential in subsistence. Tool assemblages are distinguished by small, corner-notched projectile points, which suggest invention of the bow and arrow.

### D. Caddoan/Mississippian AD 800 to 1500

Agriculture, supplemented by hunting and gathering, was the adaptation type associated with village societies. Agricultural tools were recognized in artifact assemblages, along with triangular arrowpoints for hunting and pottery types that in eastern Oklahoma serve to denote this period as the Caddoan/Mississippian. Village cultures are often identified in lowland terraces of waterways where agriculture was viable. Some archaeological sites from this time period have mounds associated, suggesting that those sites have some larger ceremonial or social function. Some mounds contain primary or secondary burials, but a few represent

mounds on which a structure was located. Mounds such as these likely had a very specific role in the ceremonial lives of the region's inhabitants.

#### E. Protohistoric (Contact) AD 1500 to 1825

This period was defined by transitory contacts of European explorers in the eastern woodlands and central plains, substantiated by little or no historical documentation. Lifeways were subsumed under the Plains Village adaptation type, which is the Plains adaptation largely contemporaneous with Caddoan/Mississippian villages. 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 south-central Kansas. Great Bend manifestations likely represent the proto-Wichita villages encountered by Francisco Coronado in 1541. Slightly later Proto-Wichita sites from the early 1700's have been identified in Kay County, north-central Oklahoma, and closer to the Tenkiller Ferry Reservoir area in Tulsa County, Oklahoma. These early 1700's Proto-Wichita sites are evidence of French influence on the southern Plains, as artifact assemblages from these sites contain metal musket parts from French firearms, glass trade beads (French), and European gunflints.

#### F. Historic 1825 to present

The Reservation Period (1825-1900) was marked by the displacement and resettling of Native American tribes throughout the greater Oklahoma region. The Cherokee Nation was created in northeastern Oklahoma in 1828, soon thereafter incorporating the Quapaw and Seneca tribes. After the Civil War, the area was further divided into reserves for the Peoria, Ottawa, Wyandotte and others. From 1838 to 1871 the Neosho Agency held jurisdiction over all tribes but the Cherokee. Between the 1830s and 1850s Anglo-Americans legally occupied tribal lands to operate mission schools, trading posts, ferries, mills and blacksmith shops. The period 1850-1900 was marked by increasing Anglo-American land speculation and enhanced military supply lines through the study region that connected Fort Gibson, Fort Scott and Fort Leavenworth during the Civil War. Pioneer settlement of homesteads and towns began in earnest in southeastern Kansas during the 1860s following the removal of Native American tribes to Oklahoma. This trend was somewhat delayed in northeastern Oklahoma where the Cherokee Nation maintained a loose hold on sovereignty. By the 1890s, however, towns such as Miami and Ottawa in northeastern Oklahoma were firmly rooted.

##### 3.7.2. Environmental Consequences

Effects to Cultural Resources have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to Cultural Resources would occur by adoption of the Tenkiller Ferry Lake MP revision. The MP revision would result in substantial beneficial impacts to pre-historic and historic archaeological sites afforded additional protections resulting from a reclassification of areas as environmentally sensitive (Table 3.2).

### 3.9. AIR QUALITY

#### 3.9.1. Affected Environment

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transportation of pollutants from specific source areas is often times augmented by local topography and meteorology. As with many areas throughout the Great Plains, relatively level topography characteristic of Oklahoma allows for uninhibited circulation of air pollutants. The State of Oklahoma ranks high in the nation in average daily wind speed. Average annual wind speed in the Tulsa, OK region is 10.2 miles per hour based on 64 years of records through 2012 (NOAA 2015 <http://www1.ncdc.noaa.gov/pub/data/ccd-data/wndspd12.txt>).

The primary legislation governing federal air quality is the Clean Air Act Amendments (CAAA) of 1990. The CAAA delegates primary responsibility for clean air to the US Environmental Protection Agency (USEPA). The USEPA published a conformity rule on November 30, 1993, requiring all federal actions to conform to appropriate State Implementation Plans (SIPs) established to improve ambient air quality. Areas are classified as either “attainment” or “nonattainment” with respect to state and federal ambient air quality standards. The classifications are made by comparing actual monitored air pollutant concentrations to state and federal standards. The Conformity Rule applies to Federal actions in non-attainment areas. Sequoyah and Cherokee Counties are located within the Metropolitan Fort Smith Interstate Air Quality Control Region (AQCR) and are designated in attainment and meeting National Ambient Air Quality Standards (NAAQS) for all criteria pollutants designated in the Clean Air Act (40 CFR Part 81.337). Consequently, a conformity determination is not required.

NAAQS currently exist for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, particulate matter less than 10 micrometers in size, and particulate matter less than 2.5 micrometers in size (USEPA 2012). The ODEQ monitors air quality stations for both criteria pollutants and air toxins.

#### 3.9.2. Environmental Consequences

Air quality within the Metropolitan Fort Smith Interstate AQCR has been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to air quality would occur by adoption of the Tenkiller Ferry Lake MP revision.

### 3.10. TERRESTRIAL VEGETATION

#### 3.10.1. Affected Environment

Natural vegetation of the Boston Mountains includes mostly oak-hickory forest. Within upland areas forests and woodlands are primarily comprised of blackjack oak, post oak, and black hickory. On north-facing slopes and in broader ravines white oak, chinquapin oak, bitternut hickory, and mockernut hickory are present. On narrower floodplains and ravines sycamore, cottonwood, elm, and willow are more frequently encountered. Throughout the

Boston Mountains ecoregion shortleaf pine and eastern red cedar are common on disturbed sites, on shallow soils, and on south or west facing slopes. Big bluestem, switchgrass, Indian grass, and little bluestem are important understory species under medium to open forest canopy. Broadleaf uniola, longleaf uniola, wild ryes, and low panicums are present under heavy overstory canopy.

Within the dissected Springfield Pateau-Elk River Hills, natural vegetation includes oak-hickory and some oak-hickory-pine forests. Upland forest areas are oak-woodland, mixed deciduous forests and mixed deciduous-shortleaf pine forests primarily comprised of black oak, white oak, blackjack oak, post oak, winged elm, hickories, and shortleaf pine. Floodplains and low terraces include bottomland oaks, maples, hickories, birch, American elm, and sycamore.

### 3.10.2. Environmental Consequences

Terrestrial vegetation communities and resources have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts to terrestrial vegetation communities would occur by adoption of the Tenkiller Ferry Lake MP revision. The MP revision would result in minor beneficial impacts to terrestrial vegetation communities by bringing land classifications into alignment with current USACE land management, environmental management, and real estate policy (Table 3.2).

## 3.11. PRIME FARMLAND

### 3.11.1. Affected Environment

According to the U.S. Department of Agriculture (USDA), the definition of “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 available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

### 3.11.2. Environmental Consequences

No prime farmland exists in the project area on public lands and waters managed by the USACE. No significant adverse impact to prime farmland would result from adoption of the Tenkiller Ferry MP revision.

## 3.12. WATER QUALITY

### 3.12.1. Affected Environment

In general, Tenkiller Ferry Lake is classified as eutrophic based on Trophic State Index (TSI) index values calculated by the OWRB in 2012. Elevated nutrient (nitrogen and phosphorus) concentrations, elevated levels of chlorophyll a, and increasing incidence of nuisance algal blooms support this classification. The lake is listed in the State of Oklahoma Water Quality Standards (WQS Title 785, Chapter 45) as a nutrient limited water (NLW) indicating the Aesthetics designated beneficial use is considered threatened by excess nutrients as determined by Carlson's TSI (WQS). Currently 785:45-5-29 identifies the nutrient limited watershed area for Tenkiller Lake as the entire watershed and drainage area of Tenkiller Lake, including the Illinois River and Caney Creek and all direct and indirect tributaries. The NLW designation of Tenkiller Lake and its watershed will remain in effect until an impairment study can be conducted that demonstrates beneficial uses designated for Tenkiller Ferry Lake are impaired by nutrients. The 2012 303(d) List of Impaired Waters reports Tenkiller Ferry Lake does not support designated beneficial uses in the following categories: 1) Fish and Wildlife Propagation owing to turbidity values exceeding the WQS numeric criteria; 2) Public and Private Water Supply owing to chlorophyll a values exceeding WQS numeric criteria; and, 3) Aesthetics owing to elevated nutrient concentrations resulting in the NLW classification in the WQS.

Overall, water quality in Tenkiller Ferry Lake can be characterized as good. Recorded pH values range from 6.56 to 9.02 standard units (less than 1% of recorded values exceed WQS numeric criteria) and fluctuate seasonally with algal activity. Surface total nitrogen values range from 0.40 milligrams per liter (mg/l) to 3.43 mg/l and surface total phosphorus values range from 0.005 mg/l to 0.097 mg/l and the ratio of nitrogen to phosphorus in the reservoir indicates the nutrient most limiting for biological growth and primary production is phosphorus. Specific conductance values range from 177 micro Siemens per centimeter ( $\mu\text{S}/\text{cm}$ ) to 278  $\mu\text{S}/\text{cm}$  indicating low concentrations of ionized salts. Fecal coliform counts are generally below WQS, however occasional exceedances have been reported historically resulting in the temporary closure of swimming beaches.

The frequency and duration of harmful algae blooms (HABs) and nuisance algae blooms have increased in Tenkiller Ferry Lake since 2000. The majority of nuisance and harmful algae blooms have been cyanobacteria blooms; however occasional dinoflagellate blooms are reported in isolated coves of the lake. Recorded cyanobacterial bloom cell densities frequently exceed established World Health Organization public health guidelines for primary body contact for low ( $> 20,000$  cells/ml cyanobacteria) and moderate ( $> 100,000$  cells/ml cyanobacteria) risk of adverse health effects. Additionally, the hepatotoxin (liver toxin) microcystin has regularly been detected in Tenkiller Ferry Lake at concentrations ranging from non-detect to 0.252 micrograms per liter ( $\mu\text{g}/\text{l}$ ), and below the WHO recreation guidelines of 20  $\mu\text{g}/\text{l}$ .

### 3.12.2. Environmental Consequences

Water resources and water quality have been considered in recommended zoning classifications and reclassifications. No significant adverse impacts water quality would occur by adoption of the Tenkiller Ferry Lake MP revision.

## 3.13. WILD AND SCENIC RIVERS

### 3.13.1. Affected Environment

Pursuant to the Wild and Scenic River Act (Public Law 90-542), Wild River Areas are defined as those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. Scenic river areas are defined as those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. While there are no designated wild and scenic rivers pursuant to PL 90-542, the State of Oklahoma has designated reaches of the Illinois River and the Barren Fork as scenic rivers in Oklahoma Title 82, Parts 1460-1461 as amended. The portions of the Illinois River and Barren Fork in the upper end of Tenkiller Ferry Project fee title lands are designated as scenic river by Oklahoma.

### 3.13.2. Environmental Consequences

Some portions of the Tenkiller Ferry Project fall within river segments designated by the State of Oklahoma as scenic. In total, the State of Oklahoma has designated 117 miles of river within the Illinois River basin as scenic. Scenic river designations, Oklahoma Title 82, Part 1460-1461, within the Illinois River basin above project lands include 12 miles of Flint Creek above its confluence with the Illinois River. 70 miles of the Illinois River and 35 miles of the Barren Fork from its confluence with the Illinois River have been designated as scenic with 5.4 designated miles of the Illinois and 3.3 miles Barren Fork on the Tenkiller Ferry Project. The designation of these river reaches as scenic by the State of Oklahoma extends special protections of these waters including no degradation of water quality, a specific numerical nutrient criterion ( $\leq 0.037$  mg/l phosphorus), no new or increased point source discharges, and special source groundwater (Class I) classification (very vulnerable) for all ground water underneath scenic river water bodies. No significant adverse impacts to designated wild and scenic rivers would occur by adoption of the Tenkiller Ferry Lake MP revision.

## 3.14. WETLANDS

### 3.14.1. Affected Environment

Emergent aquatic vegetation occurs in the shallow water areas throughout Tenkiller Ferry Lake. The USFWS National Wetlands Inventory (NWI) identifies 14,743 acres of wetlands on project lands. The vast majority, 87 percent, of these wetlands are within the area defined by the conservation pool of the lake. The remaining wetland classifications in the NWI comprise less than 1% of wetland resources present and consist of palustrine wetlands categorized as freshwater emergent wetlands, freshwater forested wetlands, and scrub-shrub wetlands.

### 3.14.2. Environmental Consequences

No significant adverse impacts to designated wetlands would occur by adoption of the Tenkiller Ferry Lake MP revision.

## 3.15. FISH AND WILDLIFE

### 3.15.1. Affected Environment

The lake provides fishing opportunities for the boater and bank angler. Cooperative efforts between the USACE and the ODWC have improved fishing success rates with installation of fish habitat and maintenance of access areas throughout the project. Common sport fish species present in Tenkiller Ferry Lake include largemouth bass, spotted bass, smallmouth bass, white crappie, black crappie, white bass, and channel catfish. Other species include a variety of smaller sunfish, minnows, darters, and shad. Additional angler opportunities exist in the tailwater trout fishery. This fishery is managed by the ODWC as a put-and-take fishery through active annual stocking of rainbow and brown trout. Other species present in the lake tailwaters include crappie, bass, sunfish, flathead catfish, and channel catfish. Currently, the ODEQ has not issued any fish consumption advisories for mercury or pesticides for Tenkiller Ferry Lake.

The ODWC Tenkiller Reservoir Management Plan reports very little habitat variation exists in Tenkiller Ferry Lake with little standing timber and rip-rap available only along the one-half mile length of the earthen dam embankment with the majority of fish habitat provided by native chert and or limestone outcrops. Management goals of the ODWC for Tenkiller Ferry Lake for all species include determining angler satisfaction and desires, catch rate, and harvest of sportfish species, build a minimum of ten spawning benches per year for smallmouth bass, and place ten artificial habitat structures accessible to bank anglers and maintain existing habitat shelters for crappie species.

Current fishery management objectives for Tenkiller Ferry Lake include the following:

1. Review creel options to determine if a creel survey can be conducted with limited manpower with acceptable confidence intervals.
2. Smallmouth bass. Collect additional population size structure information through fall-night electrofishing. Increase the number of spawning benches and habitat designed for smallmouth. Continue to educate anglers about the importance of preventing introduction of invasive species by placing informational signs at boat ramps, distributing brochures, and through public meetings.
3. Crappie. Monitor the population and collect data to determine the effectiveness of the creel and size limits. Maintain existing and establish new brush piles/fish attractors. Continue to educate anglers about importance of preventing introduction of invasive species.
4. Largemouth bass. Continue to educate anglers about the importance of preventing introduction of invasive species such as zebra mussels, alligator weed, and others. Increase the amount of available habitat.

5. Spotted bass. Reduce the number of fish in the population. Continue to educate anglers about the importance of preventing introduction of invasive species.

USACE licenses 2590.125 acres of land to the ODWC for the purposes of wildlife management. The majority of which comprises the Tenkiller Wildlife Management Area (WMA) in Cherokee and Sequoyah Counties. The Tenkiller WMA is a mixture of upland areas and riparian habitat associated with Tenkiller Lake and is managed for both game and non-game species. Game species of interest within the Tenkiller WMA include bear, white-tailed deer, turkey, quail, rabbit, squirrel, dove, coyote, bobcat, gray fox, raccoon, skunk, mink and opossum. Non-game species of interest within the Tenkiller WMA include bald eagles and other raptors, migratory shore birds, and various song birds. The ODWC submits a five year management plan to USACE for review and approval on an annual basis. In addition to the areas leased to the ODWC, several units managed by USACE also provide excellent game and non-game habitat. USACE managed units are approximately 5,165 acres. These areas are also popular with both hunters and individuals wishing to observe wildlife in their natural habitat. Species that are located in these areas includes: white-tailed deer, squirrel, cottontail rabbit, raccoon, turkey, quail (limited), dove, eagles, waterfowl, and various song birds. There is currently no ODWC published wildlife management plan available for lands leased by ODWC at Tenkiller Ferry Lake.

#### 3.15.2. Environmental Consequences

Impacts to fish and wildlife at Tenkiller Ferry Project have been considered. No significant adverse impacts to designated fish and wildlife resources would occur by adoption of the Tenkiller Ferry Lake MP revision. The MP revision would result in substantial benefits to fish and wildlife. Lands classified for wildlife management would increase by 2,567 acres to 7,755 acres total and lands classified for high density and low density recreation would decrease by 1,797 acres and 1,992 acres, respectively. The proposed reclassification of lands to wildlife management would result in greater management opportunities to increase habitat diversity and biological productivity (Table 3.2).

### 3.16. EXECUTIVE ORDER 13112, INVASIVE SPECIES

#### 3.16.1. Affected Environment

On February 3, 1999, President Clinton issued Executive Order 13112 (EO 13112), Invasive Species, which notes that invasive species annually cause significant economic, ecological, and alien species whose introduction does or is likely to cause economic and environmental harm or harm to human health. EO 13112 requires Federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States; and that all feasible and prudent measure to minimize risk or harm will be taken in conjunction with the actions. EO 13112 is addressed in this NEPA document to incorporate measures that will prevent the inadvertent spread of exotic and invasive species.

Invasive species currently known to occur at the Tenkiller Ferry Project, their severity, and acres impacted are presented in Table 3.12.

Table 3.12. Invasive Species Known to be Present on Tenkiller Ferry Project Fee Lands.

Species Common Name	Type of Occurrence	Acreage Impacted
Grass carp	Minor	50
Eurasian collared dove	Significant Major	10,000
European starling	Minor	10,000
Autumn olive	Minor	1,000
Johnson grass	Minor	5,000
Purple star thistle	Minor	1,000
Eastern red cedar	Significant Major	10,000
Sericea lespedeza	Minor	100
Tall fescue	Minor	1,000

### 3.16.2. Environmental Consequences

The effects of invasive species at Tenkiller Ferry Project have been considered. Adoption of the Tenkiller Ferry MP revision would result in no significant adverse impacts to the Tenkiller Ferry Project due to the presence or future introduction of invasive species.

## 3.17. EXECUTIVE ORDER 13186, PROTECTION OF MIGRATORY BIRDS

### 3.17.1. Affected Environment

On January 10, 2001, President Clinton issued Executive Order 13186 (EO 13186), Responsibility of Federal Agencies to Protect Migratory Birds, which notes that migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats. EO 13186 requires, in part, Federal agencies to integrate conservation principles, measures, and practices into agency activities and prevent or abate the pollution or detrimental alteration of the Environment for the benefit of migratory birds, as practicable.

The USFWS has identified 24 migratory birds present on Tenkiller Ferry Project lands and categorized and identified on the migratory birds of concern list required under EO 13186. Migratory birds listed on the birds of conservation concern include: Bachman’s sparrow (*Aimophila aestivalis*), bald eagle (*Haliaeetus leucocephalus*), Bell’s vireo (*Vireo bellii*), Bewick’s wren (*Thryomanes bewickii*), blue-winged warbler (*Vermivora pinus*), dickcissel (*Spiza americana*), fox sparrow (*Passerella iliaca*), golden eagle (*Aquila chrysaetos*), Harris’s sparrow (*Zonotrichia querula*), Hudsonian godwit (*limosa hemastica*), Kentucky warbler (*Oporornis formosus*), Le Conte’s sparrow (*Ammodramus leconteii*), least bittern (*Ixobrychus exilis*), loggerhead shrike (*Lanius ludovicianus*), painted bunting (*Passerina ciris*), prairie warbler (*Dendroica discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), sedge wren (*Cistothorus platensis*), short-eared owl (*Asio flammeus*), Swainson’s warbler (*Limnithlypis swainsonii*), wood thrush (*Hylocichla mustelina*), and worm eating warbler (*Helmitheros vermivorum*).

### 3.17.2. Environmental Consequences

Effects to migratory birds documented to utilize the Tenkiller Ferry Project lands and waters for migration and resting areas, breeding, wintering, and year-round use have been considered. No significant adverse impacts to migratory birds would result by adoption of the Tenkiller Ferry Lake MP revision. Lands classified for wildlife management would increase by 2,567 acres to 7,755 acres total and lands classified for high density and low density recreation would decrease by 1,797 acres and 1,992 acres, respectively. The proposed reclassification of lands to wildlife management would result in greater management opportunities to increase habitat diversity and could provide increased nesting, feeding, and resting areas for migratory birds (Table 3.2).

## 3.18. EXECUTIVE ORDERS 12962 AND 13474, RECREATIONAL FISHERIES

### 3.18.1. Affected Environment

Executive Orders 12962 and 13474 (an amendment to Executive Order 12962) require Federal agencies, to the extent permitted by law and where practicable, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities in cooperation with States and Tribes and ensure that recreational fishing shall be managed as a sustainable activity in national wildlife refuges, national parks, national monuments, national marine sanctuaries, marine protected areas, or any other relevant conservation or management areas or activities under any Federal authority, consistent with applicable law.

### 3.18.2. Environmental Consequences

The lake provides fishing opportunities for the boater and bank angler. Cooperative efforts between the USACE and the ODWC have improved fishing success rates with installation of fish habitat and maintenance of access areas throughout the project. Common sport fish species present in Tenkiller Ferry Lake include largemouth bass, spotted bass, smallmouth bass, white crappie, black crappie, white bass, and channel catfish. Other species include a variety of smaller sunfish, minnows, darters, and shad. Additional angler opportunities exist in the tail water trout fishery. This fishery is managed by the ODWC as a put-and-take fishery through active annual stocking of rainbow and brown trout. Other species present in the lake tailwaters include crappie, bass, sunfish, flathead catfish, and channel catfish.

Wildlife and fisheries are managed cooperatively between the ODWC and USACE. USACE currently licenses 2,590 acres of land to ODWC. This area comprises the Tenkiller Wildlife Management Area. USACE also currently licenses 0.125 acres to ODWC for placement and operation of a Supersaturated Dissolved Oxygen System (SDOX) to support the ODWC management goals and objectives associated with the tailwater trout fishery. ODWC's primary objective in these areas is to manage game species with the understanding those actions benefit both game and non-game species. These areas will continue being managed by this agency under their license.

ODWC is also the primary agency responsible for performing fisheries management. ODWC objectives for fisheries are to continue to monitor current populations, insure the populations are healthy and stable, and reduce the number of spotted bass in the reservoir. ODWC does annual sampling and data analysis to assure fisheries populations stay within an acceptable range. They also make adjustments in creel and size limits as necessary to keep existing populations healthy. ODWC can also supplement fish populations with their hatchery program.

Adoption of the Tenkiller Ferry Lake MP revision would not result in significant adverse impacts to reservoir fisheries and fish and wildlife management activities of ODWC. The MP revision would allow for greater fisheries management opportunities (e.g., placement of submerged structures for recruitment) along shoreline areas where lands have been reclassified from high and low density recreation to wildlife management (Table 3.2).

### 3.19. FEDERALLY THREATENED AND ENDANGERED SPECIES

#### 3.19.1. Affected Environment

The U.S. Fish and Wildlife Service (USFWS) identified three Federally threatened and six Federally endangered species with possible distributions in Sequoyah and Cherokee Counties, Oklahoma. The threatened species which may occur on the Tenkiller Ferry Project are the piping plover (*Charadrius melodus*), red knot (*Calidris cantus rufa*), and rabbitsfoot (*Quadrula cylindrical cylindrical*). Endangered species which may occur on the Tenkiller Ferry Project include the American burying beetle (*Nicrophorus americanus*), interior least tern (*Sterna antillarum*), Neosho mucket (*Lampsilis rafinesqueana*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), Ozark big-eared bat (*Corynorhinus (=plecotus) townsendii ingens*). Candidate species for inclusion on the Federal threatened and endangered species list were identified as being present on the Tenkiller Ferry Project by the USFWS includes the Arkansas darter (*Ethieostoma cragini*). This official list of threatened and endangered species was provided by the USFWS on February 10, 2015, Consultation Tracking Number: 02EKOK00-2015-E-00694.

#### 3.19.2. Environmental Consequences

There are no federally listed threatened and endangered species which would be impacted by adoption of the Tenkiller Ferry Lake MP revision. USACE would continue to comply with applicable laws and USACE policy and guidance related to impacts to threatened and endangered species. Soil disturbing activities associated with land management, public recreation area maintenance, outgranted recreation area maintenance and improvements and other routine O&M activities will be assessed individually as they arise.

Cherokee and Sequoyah Counties are within the American burying beetle (ABB) range published March 6, 2014 by the USFWS and portions of the Tenkiller Ferry Project fall within the ABB Conservation Priority Areas for Oklahoma. According to the most current 2014 ABB positive late season survey results available from the USFWS Oklahoma Ecological Services Field Office there are two locations within 2 miles of project fee lands where beetles were found to be present. Prior to initiation of any soil disturbing activities at Tenkiller Ferry Lake, the Tulsa District will coordinate ABB survey efforts and data

collection under the conditions of the April 10, 2013 Biological Opinion issued to the Tulsa District by the USFWS in accordance with American Burying Beetle, Reasonable and Prudent Measure #1.

Lands classified for wildlife management would increase by 2,567 acres to 7,755 acres total and lands classified for high density and low density recreation would decrease by 1,797 acres and 1,992 acres, respectively. The proposed reclassification of lands to wildlife management would result in greater management opportunities to increase habitat diversity and biological productivity on project lands where threatened and endangered species may occur (Table 3.2).

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#### 4.0 APPLICABLE FEDERAL LAWS

Table 4.1. Relationship of Plans to Federal Environmental Protection Statutes and other Environmental Requirements.

Policies	Compliance of Alternatives
Archeological and Historic Preservation Act, 1974, as amended, 16 U.S.C. 469, <u>et seq.</u>	All plans in full compliance
Clean Air Act, as amended, 42 U.S.C. 7609, <u>et seq.</u>	All plans in full compliance
Clean Water Act, 1977, as amended (Federal Water Pollution Control Act, 33 U.S.C. 1251, <u>et seq.</u>	All plans in full compliance
Endangered Species Act, 1973, as amended, 16 U.S.C. 1531, <u>et seq.</u>	All plans in full compliance
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1-12, <u>et seq.</u>	All plans in full compliance
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, <u>et seq.</u>	All plans in full compliance
Land and Water Conservation Fund Act, 1965, as amended, 16 U.S.C. 4601, <u>et seq.</u>	All plans in full compliance
National Historic Preservation Act, 1966, as amended, 16 U.S.C. 470a, <u>et seq.</u>	All plans in full compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321, <u>et seq.</u>	All plans in full compliance
Native American Graves Protection and Repatriation Act, 1990, 25 U.S.C. 3001-13, <u>et seq.</u>	All plans in full compliance
Rivers and Harbors Act, 33 U.S.C. 401, <u>et seq.</u>	All plans in full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, <u>et seq.</u>	All plans in full compliance
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, <u>et seq.</u>	Not Applicable
Water Resources Planning Act, 1965	All plans in full compliance
Floodplain Management (E.O. 11988)	Not Applicable
Protection of Wetlands (E.O. 11990)	All plans in full compliance
Recreational Fisheries (E.O. 12962)	All plans in full compliance
Environmental Justice (E.O. 12898)	All plans in full compliance
Protection of Children (E.O. 13045)	All plans in full compliance
Invasive Species (E.O. 13112)	All plans in full compliance
Protection of Migratory Birds (E.O. 13186)	All plans in full compliance
Recreational Fisheries (E.O. 13474)	All plans in full compliance
Farmland Protection Policy Act, 7 U.S.C. 4201, <u>et seq.</u>	Not Applicable

Note: Full compliance – Having met all requirements of the statutes, Executive Orders, or other environmental requirements for the current stage of planning, operations, and or project execution.

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## 5.0 FEDERAL, STATE, AND LOCAL AGENCY COORDINATION

The Environmental Assessment (EA) was coordinated with the following 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 in the appendices. The mailing list for the 30-day public review period for this EA is in Appendix A.

U.S. Fish and Wildlife Service  
U.S. Environmental Protection Agency, Region VI  
U.S. Department of Agriculture, Natural Resources Conservation Service  
Southwestern Power Administration  
Oklahoma Department of Wildlife Conservation  
Oklahoma Department of Environmental Quality  
Oklahoma Water Resources Board  
Oklahoma Conservation Commission  
Oklahoma Natural Heritage Inventory  
Oklahoma Archeological Survey  
Oklahoma State Historic Preservation Officer  
Oklahoma Tourism and Recreation Department  
Oklahoma Scenic Rivers Commission  
Alabama-Quassarte Tribal Town, Oklahoma  
Caddo Indian Tribe of Oklahoma  
Cherokee Nation, Oklahoma  
Kialegee Tribal Town, Oklahoma  
Sixshooter Resort, Tenkiller Ferry Lake, Oklahoma  
Pine Cove Marina, Tenkiller Ferry Lake, Oklahoma  
Pettit Bay Marina, Tenkiller Ferry Lake, Oklahoma  
Burnt Cabin Marina, Tenkiller Ferry Lake, Oklahoma  
Caney Ridge Marina, Tenkiller Ferry Lake, Oklahoma  
Cookson Bend Marina, Tenkiller Ferry Lake, Oklahoma  
Snake Creek Marina, Tenkiller Ferry Lake, Oklahoma  
Strayhorn Cove Marina, Tenkiller Ferry Lake, Oklahoma  
Elk Creek Marina, Tenkiller Ferry Lake, Oklahoma  
Barnacle Bills Resort and Marina, Tenkiller Ferry Lake, Oklahoma

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## **6.0 LIST OF PREPARERS**

Tony Clyde, Ph.D. – Limnologist; 16 years U.S. Army Corps of Engineers, Operations Division

David Gade, Ph.D. – Limnologist; 16 years U.S. Army Corps of Engineers, Regional Planning and Environmental Center (RPEC), NEPA & Cultural Resources Section

Kenneth L. Shingleton – Archeologist; 22 years U.S. Army Corps of Engineers, Operations Division

Norman Lewis – Regional Economist; 9 years U.S. Army Corps of Engineers, Regional Planning and Environmental Center (RPEC), Economics Section

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**APPENDIX A – NEPA Coordination and Scoping**

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

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Curry:

The Tulsa District is initiating a review and revision of the master plan (MP) for Tenkiller 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 Tenkiller 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 Tenkiller 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 Tenkiller Lake is scheduled for 6:00 to 8:00 p.m. on April 17, 2014, at the Gore Gymnasium, 215 E. 4<sup>th</sup> Street, Gore, 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 Tenkiller Lake. We welcome your comments and participation at the public workshop and throughout the master plan review process. Questions should be directed to Ms. Tish Livesay, Tenkiller Lake Manager, at 918-487-5252 or e-mail [Patricia.Livesay@usace.army.mil](mailto:Patricia.Livesay@usace.army.mil).

Sincerely,

A handwritten signature in black ink, appearing to read "S. L. Nolen", with a long horizontal flourish extending to the right.

Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. O'Neill:

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Sincerely,

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Thompson:

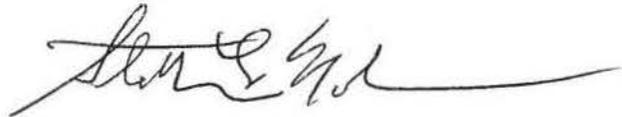
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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Strong:

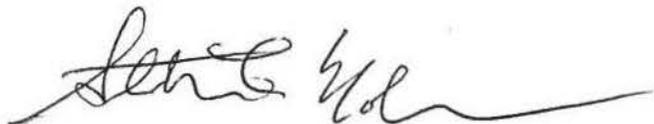
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Stephen L. Nolen  
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UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT  
1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Smithee:

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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Thralls:

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DEPARTMENT OF THE ARMY  
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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4809

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Ms. Phillips:

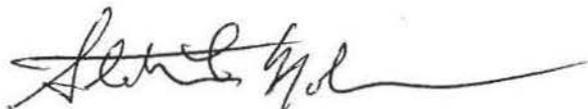
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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

Dr. Robert L. Brooks  
University of Oklahoma  
Oklahoma Archeological Survey  
111 E. Chesapeake  
Norman, OK 73019-0575

Dear Mr. Brooks:

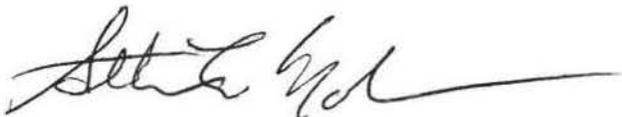
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MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Dr. Blackburn:

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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Ms. Snodgrass:

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TULSA OK 74128-4609

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Chief Yargee:

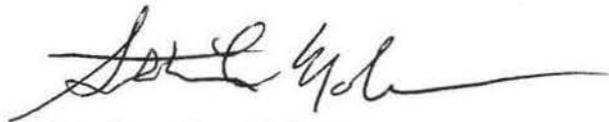
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1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

Chairperson Brenda Shemayne Edwards  
Caddo Indian Tribe of Oklahoma  
P.O. Box 487  
Binger, OK 73009

Dear Ms. Edwards:

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TULSA OK 74128-4609

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

Principal Chief Bill John Baker  
Cherokee Nation, Oklahoma  
P.O. Box 948  
Tahlequah, OK 74465

Dear Chief Baker:

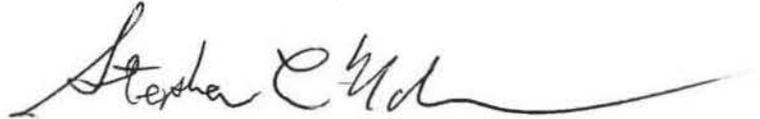
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UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT  
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MAR 26 2014

Operations Division  
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MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

Principal Chief Bill John Baker  
Cherokee Nation, Oklahoma  
P.O. Box 948  
Tahlequah, OK 74465

Dear Chief Baker:

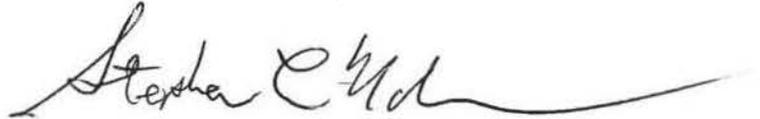
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Sincerely,

A handwritten signature in black ink, appearing to read "Stephen L. Nolen", with a long horizontal flourish extending to the right.

Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Hobia:

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

Principal Chief A.D. Ellis  
Muscogee (Creek) Nation, Oklahoma  
P.O. Box 580  
Okmulgee, OK 74447

Dear Chief Ellis:

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

Principal Chief Scott Bighorse  
Osage Nation, Oklahoma  
P.O. Box 779  
Pawhuska, OK 74056

Dear Chief Bighorse:

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Chief Harjo:

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

Mekko George Scott  
Thlopthlocco Tribal Town, Oklahoma  
P.O. Box 188  
Okemah, OK 74859

Dear Mr. Scott:

The Tulsa District is initiating a review and revision of the master plan (MP) for Tenkiller 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 Tenkiller Lake.

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

Chief George Wickliffe  
United Keetoowah Band of Cherokee Indians in Oklahoma  
P.O. Box 746  
Tahlequah, OK 74465-0746

Dear Chief Wickliffe:

The Tulsa District is initiating a review and revision of the master plan (MP) for Tenkiller 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 Tenkiller Lake.

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Stephen L. Nolen  
Chief, Natural Resources  
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DEPARTMENT OF THE ARMY  
UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT  
1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Standing:

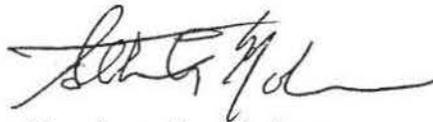
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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch

## **APPENDIX B – Fish and Wildlife Coordination**

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

MAR 26 2014

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Aldrich:

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Stephen L. Nolen  
Chief, Natural Resources  
and Recreation Branch



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

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Butler:

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Chief, Natural Resources  
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UNITED STATES ARMY CORPS OF ENGINEERS, TULSA DISTRICT  
1645 SOUTH 101 EAST AVENUE  
TULSA OK 74128-4609

**MAR 26 2014**

Operations Division  
Natural Resources and Recreation Branch

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

Dear Mr. Hatcher:

The Tulsa District is initiating a review and revision of the master plan (MP) for Tenkiller 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 Tenkiller Lake.

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Stephen L. Nolen  
Chief, Natural Resources  
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**APPENDIX C – Public and Agency Comments**

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## Oklahoma Archeological Survey

THE UNIVERSITY OF OKLAHOMA

May 7, 2015

Stephen L. Nolen  
Chief, Natural Resources and Recreation Branch  
Department of the Army  
Corps of Engineers, Tulsa District  
1645 South 101<sup>st</sup> East Avenue  
Tulsa, OK 74128-4609

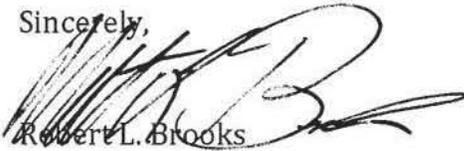
Re: *Draft Master Plan: Tenkiller Ferry Lake, Illinois River, Oklahoma.*

Dear Mr. Nolan:

Thank you for the opportunity to comment on the draft of a master plan for Tenkiller Lake. I have some comments on the document that pertain to the cultural resource sections. I found the Cultural Resources section (2.7) to be a little minimalist. While I would not expect the master plan to go into an in-depth summary of the archaeological and historic resources, it should provide a little more substance. For example, how many archaeological sites are documented for the lake, what are the highlights? You also could have included a couple of sentences documenting the previous work that has been conducted. For example, if you compare it to the historic date immediately above, it would appear that the history of the area is much richer than the archaeological record because of the specificity of the narrative. My other comment concerns the Historic Properties Management Plan. It would seem that the HPMP should be an integral part of lake management activities. It is noted that Tenkiller does not have a HPMP. But, my impression from reading how and where this is stated, it does not appear to be a high priority in the master plan. I certainly hope this is not the case as Tenkiller holds numerous significant archaeological sites than merit better documentation and protection.

This review was conducted in cooperation with the State Historic Preservation Office, Oklahoma Historical Society.

Sincerely,



Robert L. Brooks  
State Archaeologist

Cc: SHPO



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

June 4, 2015

Dr. Tony Clyde  
U.S. Army Corps of Engineers, Tulsa District  
ATTN: Natural Resource and Recreation Branch (Tenkiller Master Plan Revision)  
1645 S. 101<sup>st</sup> East Avenue  
Tulsa, OK 74128

Dear Dr. Clyde,

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

The enclosed comments are divided into two documents. The first document includes Southwestern's comments on the Draft Master Plan, and the second document includes Southwestern's comments on the Draft Environmental Assessment for the Master Plan Revision.

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](mailto:Tyler.Gipson@swpa.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Fritha Ohlson".

Fritha Ohlson  
Director  
Division of Resources and Rates

Enclosures

cc:  
Nicki Fuller  
Executive Director  
Southwestern Power Resources Association

**Southwestern Power Administration**  
**Specific Comments on the**  
**DRAFT MASTER PLAN**  
**Tenkiller Ferry Lake**  
**Dated March 2015**

(Note that paragraphs are numbered from the beginning of the referenced section or sub-section.)

1. General: Throughout the document, the U.S. Army Corps of Engineers is referred to as both “USACE” (first occurrence on page 2-1) and “Corps” (first occurrence on page 2-20). Suggest using only one abbreviation throughout the document and defining the chosen abbreviation at its first instance of use.
2. General: Suggest removing individual references to the National Geodetic Vertical Datum (NGVD) and including a note at the beginning of the document stating that all elevations in the document are in NGVD unless otherwise specified. Individual references to NGVD occur on pages 2-1 (once) and 2-21 (three times).
3. General: Suggest consistently capitalizing table headings using title case, as done with Table 2.1 Vegetative Resources of the Tenkiller Ferry Project. For example, Table 1.1 Tenkiller Ferry Lake and Dam pertinent data should be Table 1.1 Tenkiller Ferry Lake and Dam Pertinent Data.
4. Page ii, TABLE OF CONTENTS, sections 2.10 and 2.11. The section titles are out of alignment with other chapter section titles. Please correct.
5. Page 1-4, CHAPTER 1 – INTRODUCTION, 1-2. PROJECT PURPOSE, first sentence. Suggest adding navigation to the list of project purposes as navigation is listed as a project purpose in the water control manual.
6. Page 1-4, CHAPTER 1 – INTRODUCTION, 1-3. PURPOSE AND SCOPE OF MASTER PLAN. Suggest adding the following sentence, or similar, to the end of the paragraph: “The Master Plan is not intended to address the specifics of regional water quality, shoreline management, or water level management; these areas are covered in a project’s shoreline management plan or water management plan.”
7. Page 1-4, CHAPTER 1 – INTRODUCTION, 1-3. PURPOSE AND SCOPE OF MASTER PLAN, first paragraph, first sentence. To avoid redundancy, suggest revising the sentence to state “This report proposes public use classifications necessary to develop and conserve...”.
8. Page 1-4, CHAPTER 1 – INTRODUCTION, 1-4. DESCRIPTION OF PROJECT AND WATERSHED, second paragraph. Suggest relocating this paragraph after the fourth paragraph, which describes the spillway and outlet works, for better flow of information. Also suggest adding the release capacity of the auxiliary spillway.

9. Page 1-6, CHAPTER 1 – INTRODUCTION, 1-5. PRIOR DESIGN MEMORANDA.  
Suggest organizing the content in table format, as was done for the information in section 1.6 PERTINENT PROJECT INFORMATION.
10. Page 1-6, CHAPTER 1 – INTRODUCTION, 1-5. PRIOR DESIGN MEMORANDA, fifth table entry. Suggest removing auxiliary spillway design memoranda as it appears to not be relevant to the other listed recreation design memoranda.
11. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, first paragraph, last sentence. Suggest de-capitalizing “Project Purposes”, “Flood Control” and “Hydroelectric Power”.
12. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, second paragraph, second sentence. Please correct “kilawatt” to “kilowatt”.
13. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, Second paragraph, Second sentence. Suggest the following rewording: “...and produces commercial electric power which provides an average annual benefit of \$8.6 million a year.”
14. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, third paragraph, first sentence. Suggest changing “Tenkiller Lake” to “Tenkiller Ferry Lake” to be consistent throughout the document. Also suggest the same change for additional instances of “Tenkiller Lake”, which occur on pages 2-6, 6-3, and 8-1.
15. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, third paragraph, first sentence. The value of 654,100 acre-feet includes only conservation and dead storage, not flood control storage as stated. Please correct the sentence to state “Tenkiller Ferry Lake has 947,700 acre-feet of storage that is utilized for flood control, water supply, and generation of hydroelectric power.” The following comment provides for rewording the first through sixth sentences, which would address this comment as well.
16. Page 2-1, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-1. DESCRIPTION OF RESERVOIR, third paragraph first through sixth sentences. Suggested rewording: “Tenkiller Ferry Lake has 371,000 acre-feet of conservation storage that is fully allocated to hydropower (345,600 acre-feet) and water supply (25,400 acre-feet). An acre-foot of water is equivalent to one foot of water spread over one acre of land. The conservation pool, with top at elevation 632.00 feet, covers an area of 12,900 acres. The inactive pool, with top at elevation 594.5 feet, covers an area of 7,373 acres with an inactive storage of 283,100 acre-feet. The flood control pool, with top at elevation 667.00 feet, covers an area of 20,800 acres with a flood storage of 576,700 acre-feet. This flood control pool...”

17. Page 2-2, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-3. SEDIMENTATION AND SHORELINE EROSION. Suggest adding a sentence about the 2015 bathymetric survey and including results if available before the master plan is finalized.
18. Page 2-2, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, first paragraph, first sentence. Suggest defining “Oklahoma Water Resources Board” as “OWRB” at its first instance of use and removing the definition on page 6-3.
19. Page 2-2, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, second paragraph, third sentence. Suggest defining “mg/l” at its first instance of use, such as “milligrams per liter (mg/l)”.
20. Page 2-2, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, second paragraph, fourth sentence. Suggest defining “ $\mu\text{S/cm}$ ” at its first instance of use, such as “micro Siemens per centimeter ( $\mu\text{S/cm}$ )”.
21. Page 2-3, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, second paragraph, last sentence. Suggest changing “historical” to “historically”.
22. Page 2-3, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, third paragraph, last sentence. Suggest changing “from non-detect to 5 ug/l to 0.252 ug/l” to “from non-detect to 0.252 microgram per liter (ug/l)” to be consistent with wording in the Draft Environmental Assessment.
23. Page 2-3, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-4. WATER QUALITY, third paragraph, last sentence. If the suggested change from the previous comment is not implemented, suggest defining “ug/l” at its first instance of use, such as “microgram per liter (ug/l)”.
24. Page 2-3, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2.5. TOPOGRAPHY, GEOLOGY, AND SOILS, fourth paragraph, first sentence. It seems unlikely that the terrain only varies from 2,500 to 1,250 feet, as Tenkiller Lake’s top of conservation pool is 632 feet, and it states later in the paragraph that the average elevation of the tablelands is 1,250 feet. Please correct, if necessary, or specify which portion of the terrain is being discussed.
25. Page 2-4, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-5. TOPOGRAPHY, GEOLOGY, AND SOILS, fifth paragraph, last sentence. Suggest removing “and most important”.
26. Page 2-6, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-6. RESOURCE ANALYSIS, 2.6.1 Fish and Wildlife Resources, second paragraph, second sentence. Suggest changing “ODWC” to

“Oklahoma Department of Wildlife Conservation (ODWC)” in order to define the acronym at its first instance of use.

27. Page 2-7, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-6. RESOURCE ANALYSIS, 2.6.4. Invasive species, first paragraph. Suggest adding a space after the paragraph and before the title of Table 2.1.
28. Page 2-9, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-6. RESOURCE ANALYSIS, 2.6.6. Wetlands, first paragraph, second sentence. Suggest changing “USFWS” to “U.S. Fish and Wildlife Service (USFWS)” in order to define the acronym at its first instance of use.
29. Page 2-20, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2.9. RECREATION FACILITIES, ACTIVITIES, AND NEEDS, 2.9.1. Zones of Influence, last sentence. The population characteristics described in section 2.8. DEMOGRAPHICS included only five counties, excluding Mayes and Wagoner counties, thus this sentence is incorrect. Suggest clarifying that the seven counties are the basis for describing the visitation, not population characteristics of Tenkiller Ferry Lake.
30. Page 2-24, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-10. PERTINENT PUBLIC LAWS, item e. Suggest adding the following sentence: “Section 5 of the Flood Control Act of 1944 authorized the Southwestern Power Administration to market and deliver the electricity generated at Tenkiller Ferry and other U.S. Army Corps of Engineers water resources projects.”
31. Page 2-27, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-10. PERTINENT PUBLIC LAWS, item cc. Public Law 93-303, second sentence. Suggest defining the “Environmental Protection Agency” as “USEPA” at its first instance of use and removing the definition on page 6-3.
32. Page 2-31, CHAPTER 2 – PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT, 2-11. EXECUTIVE ORDERS AND CIRCULARS. Suggest adding an item for Executive Order (EO) 13514 since this EO is referenced later in the document. Additionally or alternatively, suggest adding an item for EO 13693, which was issued on March 19, 2015, and revoked EO 13514.
33. Page 3-1, CHAPTER 3 – RESOURCE OBJECTIVES, 3-1. RESOURCE OBJECTIVES, first paragraph, item 9. Suggest defining “SMP” as Shoreline Management Plan at its first instance of use, and removing the definitions on pages 5-4 and 8-6.
34. Page 3-2, CHAPTER 3 – RESOURCE OBJECTIVES, 3-1. RESOURCE OBJECTIVES, B. Wildlife and Fisheries Management, third paragraph, second sentence. Suggest removing “our” from the sentence.
35. Page 3-3, CHAPTER 3 – RESOURCE OBJECTIVES, 3-1. RESOURCE OBJECTIVES, B. Wildlife and Fisheries Management, fourth paragraph, last sentence. Suggest defining

“OMP” as “Operational Management Plan” at its first instance of use, and removing the definition on page 8-7.

36. Page 3-4, CHAPTER 3 – RESOURCE OBJECTIVES, 3-1. RESOURCE OBJECTIVES, E. Project-Wide Resource Objectives, third paragraph, item 5. Suggest removing “...periodic fluctuations...” and replacing with “...ongoing and sometimes significant fluctuations...”. The lake elevation is more than two feet above or below conservation pool 48% of the time, and developers need to be prepared for regular fluctuations.
37. Page 4-1, CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS, 4.1. LAND ALLOCATION, last sentence. The sentence states that 30,487 acres of land were purchased for the creation of Tenkiller Ferry Lake, however, the next paragraph, 4.1.1. Operations, states that 30,493 acres of land were purchased. Please verify the value and correct as necessary.
38. Page 4-1, CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS, 4.1. LAND ALLOCATION, 4.1.2. Recreation, first sentence. Please correct “purchases” to “purchased”.
39. Page 4-1, CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS, 4-2. LAND CLASSIFICATION, first paragraph, fourth sentence. Please correct the word “allocation” to “classification”.
40. Page 4-3, CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS. 4-2. LAND CLASSIFICATION, 4.2.5. Multiple Resource Managed Lands, e. Water Surface. The paragraph for water surface appears to be incorrectly included under subsection 4.2.5. Multiple Resource Managed Lands. Suggest re-classifying the water surface discussion as subsection 4.2.6. Water Surface.
41. Page 4-3, CHAPTER 4 – LAND ALLOCATION, LAND CLASSIFICATION, WATER SURFACE, AND PROJECT EASEMENT LANDS. 4-2. LAND CLASSIFICATION, Table 4.1 Land classifications at Tenkiller Ferry Lake. Please correct “Environmental Sensitive” to “Environmentally Sensitive”.
42. Page 5-2, CHAPTER 5 – RESOURCE PLAN, 5.1 CLASSIFICATION AND JUSTIFICATION, Table 5.1 and Table 5.2. Suggest removing the word “Allocated” in the third column and replacing with “Classified” as the document has previously stated that all land is allocated to Project Operations.
43. Page 5-3, CHAPTER 5 – RESOURCE PLAN. 5-1, CLASSIFICATION AND JUSTIFICATION, B. High Density Recreation, fifth paragraph, fifth sentence. Suggest removing “our” from the sentence.
44. Page 5-6, CHAPTER 5 – RESOURCE PLAN, 5.2. SPECIAL CONSIDERATIONS, first paragraph, last sentence. Suggest defining “HPMP” as “Historical Property Management Plan” at its first instance of use and removing the definition on page 8-7.

45. Page 6-1, CHAPTER 6 – SPECIAL TOPICS/ISSUES/CONSIDERATIONS, 6.2. AMERICAN BURYING BEETLE (ABB). Suggest defining “ABB” in the following paragraph, rather than the section title.
46. Page 6-3, CHAPTER 6 – SPECIAL TOPICS/ISSUES/CONSIDERATIONS, 6.3 WATER QUALITY, fifth paragraph, first sentence. Please correct “reservoir” to “reservoirs”.
47. Page 6-3, CHAPTER 6 – SPECIAL TOPICS/ISSUES/CONSIDERATIONS, 6.3 WATER QUALITY, fifth paragraph, third sentence. Please correct “decline” to “declining”.
48. Page 6-4, CHAPTER 6 – SPECIAL TOPICS/ISSUES/CONSIDERATIONS, 6-4. INVASIVE SPECIES, third paragraph. This paragraph is unclear. First sentence states that there are no zebra mussels in the lake, while the second sentence states that zebra mussels are impacting intakes at water supply facilities and the powerhouse at Tenkiller. The third sentence then states again that zebra mussels are not in the lake. Please clarify.
49. Page 7-1, CHAPTER 7 – PUBLIC AND AGENCY COORDINATION, 7.1 PUBLIC AND AGENCY COORDINATION, first paragraph, second sentence. Suggest replacing the word “Project” with “Lake” so that it reads “Tenkiller Ferry Lake MP.”
50. Page 8-3, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.2. RECLASSIFICATION OF LAND ALLOCATION, Table 8.1 Fee land reclassification proposals evaluated, Reclassification Proposals 17 through 20. The total of these four proposed reclassifications to Environmentally Sensitive Areas is only 777 acres; however, it is stated elsewhere in the document that there will be 789 acres classified as Environmentally Sensitive. Please verify and correct as needed.
51. Page 8-4, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.2. RECLASSIFICATION OF LAND ALLOCATION, Table 8.1 Fee land reclassification proposals evaluated, Reclassification Proposal 24. Suggest adding “as Low Density Recreation” to the end of the proposal description, as it appears this is the chosen classification for the 140 acres.
52. Page 8-4, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.2. RECLASSIFICATION OF LAND ALLOCATION, Table 8.1 Fee land reclassification proposals evaluated, Reclassification Proposals 25 and 26. Suggest removing the extra space between the proposals for consistency with table formatting.
53. Page 8-4, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.3. AMERICAN BURYING BEETLE (ABB). Suggest removing the duplicate definition of “ABB” since it has already been defined on page 6-1.
54. Page 8-5, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8-4. SHORELINE MANAGEMENT, second paragraph, first sentence. Please correct EO “13504” to EO “13514”. Alternatively, suggest replacing the referenced EO with EO 13693, which was issued on March 19, 2015, and revoked EO 13514.
55. Page 8-5, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8-4. SHORELINE MANAGEMENT, second paragraph, second sentence. Suggest changing “The use of alternative energy...” to “The use of renewable energy...”

56. Page 8-5, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8-4. SHORELINE MANAGEMENT, second paragraph, fourth sentence. While most local utilities have some renewable form of energy in their portfolio, the vast majority of energy still comes from conventional fossil fuels. Suggest modifying the sentence, such as “USACE recognizes that local utilities and individual permittees have increasing options available to provide energy produced by renewable resources and...”
57. Page 8-6, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.5 RECREATION, second paragraph, fourth sentence. Suggest de-capitalizing the word “projects” as it is not referring to a proper noun.
58. Page 8-6, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.6. ENCROACHMENTS, second sentence. The word “Project” is used twice in the sentence. Suggest de-capitalizing the words, or changing to the full name “Tenkiller Ferry Lake”, as “Project” has not been defined.
59. Page 8-7, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.8. CULTURAL RESOURCES, first sentence. The phrase “are managed” implies that there is an existing Historic Property Management Plan (HPMP) for Tenkiller Ferry Lake; however, it is later stated in the same paragraph that there is no existing plan. Suggest changing “are managed” to “should be managed”.
60. Page 8-7, CHAPTER 8 –SUMMARY OF RECOMMENDATIONS, 8.8. CULTURAL RESOURCES, last sentence. Suggest de-capitalizing “the Project” or changing to the full name “Tenkiller Ferry Lake”.

June 4, 2015

**Southwestern Power Administration (Southwestern)  
Specific Comments on  
Draft Environmental Assessment for the MASTER PLAN REVISION  
Tenkiller Ferry Lake, April 2015**

(Note: Paragraphs are numbered from the beginning of the referenced section or sub-section)

1. General: Throughout the document, the U.S. Army Corps of Engineers is referred to as both "USACE" (first occurrence on page 3-21) and "Corps" (first occurrence on page 1-1). Suggest using only one abbreviation throughout the document and defining the chosen abbreviation at its first instance of use.
2. General: The terms "Master Plan" and "MP" are both used frequently throughout the document. Suggest either only using the term "Master Plan" in the document, or defining Master Plan as "MP" at its first instance of use, and consistently using the defined abbreviation.
3. General: Suggest consistently capitalizing table headings using title case, as done with Table 3.5. 2013 Population Estimate by Age Group. For example, Table 3.4. 2013 population estimate by gender should be Table 3.4. 2013 Population Estimate by Gender.
4. Page 1-1, 1.0 INTRODUCTION, 1.1. PURPOSE AND NEED FOR THE ACTION, first paragraph, first sentence. Suggest listing supplements to the 1978 Master Plan in ascending, rather than descending, chronological order.
5. Page 1-2, 1.0 INTRODUCTION, 1.1. PURPOSE AND NEED FOR THE ACTION, fourth paragraph, last sentence. Suggest defining "Oklahoma Department of Wildlife Conservation" as "ODWC" at its first instance of use and using the acronym consistently throughout the document ("Oklahoma Department of Wildlife Conservation" is used again on pages 3-1 and 3-2).
6. Page 1-2, 1.0 INTRODUCTION, 1.1. PURPOSE AND NEED FOR THE ACTION, fourth paragraph, last sentence. Suggest defining "Oklahoma Department of Environmental Quality" as "ODEQ" at its first instance of use and removing the duplicate definition on page 3-20.
7. Page 1-2, 1.0 INTRODUCTION, 1.1. PURPOSE AND NEED FOR THE ACTION, fourth paragraph, last sentence. Suggest defining "Oklahoma Water Resources Board" as "OWRB" at its first instance of use and using the acronym consistently throughout the document ("Oklahoma Water Resources Board" is used again on pages 3-5 and 3-22). Alternatively, since OWRB is not used elsewhere in the document, suggest replacing "OWRB" with "Oklahoma Water Resources Board" (and leaving additional references as they are).
8. Page 1-3, 1.0 INTRODUCTION, 1.2. PROJECT HISTORY, fifth paragraph. Suggest relocating this paragraph after the seventh paragraph, which describes the spillway and outlet works, for better flow of information. Also suggest adding the release capacity of the auxiliary spillway.

9. Page 2-3, 2.0 ALTERNATIVES AND PROPOSED ACTION, 2.1 Alternatives, Table 2.1 Land use classification changes associated with the proposed action. The total of the four reclassifications to Environmentally Sensitive Areas is only 777 acres, however, it is stated under the proposed Alternative 3 that there will be 789 acres classified as Environmentally Sensitive. Please verify and correct as needed.
10. Page 3-5, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.3. GEOLOGY AND SOILS, 3.3.1. Affected Environment, first paragraph, first sentence. It seems unlikely that the terrain only varies from 2,500 to 1,250 feet, as Tenkiller Lake's top of conservation pool is 632 feet, and it states later in the paragraph that the average elevation of the tablelands is 1,250 feet. Please correct, if necessary, or specify which portion of the terrain is being discussed.
11. Page 3-5, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.3. GEOLOGY AND SOILS, 3.3.1. Affected Environment, second paragraph, last sentence. Suggest removing "and most important".
12. Page 3-22, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.12. WATER QUALITY, 3.12.1. Affected Environment, first paragraph, third sentence. Please correct "Carlson's Trophic State Index (WQS)" to "Carlson's TSI", as Trophic State Index was defined as "TSI" earlier in the paragraph.
13. Page 3-22, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.12. WATER QUALITY, 3.12.1. Affected Environment, second paragraph, third sentence. Suggest defining "mg/l" at its first instance of use, such as "milligrams per liter (mg/l)".
14. Page 3-22, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.12. WATER QUALITY, 3.12.1. Affected Environment, second paragraph, fourth sentence. Suggest defining " $\mu\text{S/cm}$ " at its first instance of use, such as "microSiemens per centimeter ( $\mu\text{S/cm}$ )".
15. Page 3-22, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.12. WATER QUALITY, 3.12.1. Affected Environment, third paragraph, last sentence. Suggest defining "ug/l" at its first instance of use, such as "micrograms per liter (ug/l)".
16. Page 3-24, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.15 FISH AND WILDLIFE, 3.15.1. Affected Environment, first paragraph, last sentence. Suggest changing "Oklahoma DEQ" to "ODEQ", which has been previously defined in the document.
17. Page 3-28, 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES, 3.19 FEDERALLY THREATENED AND ENDANGERED SPECIES, 3.19.1 Affected Environment, last sentence. Please correct "was provide" to "was provided".

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