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Sam Rayburn Dam and Reservoir Master Plan

Angelina River

Angelina, Jasper, Nacogdoches, Sabine and, San Augustine County, Texas

January 2017

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PREFACE

The Sam Rayburn Reservoir Master Plan (hereafter Plan) is a vital tool produced and used by the U.S. Army Corps of Engineers, Fort Worth District (USACE) to guide the responsible stewardship of USACE-administered resources for the benefit of present and future generations. The Plan provides direction for appropriate management, use, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources at Sam Rayburn Reservoir. The original Plan for Sam Rayburn Reservoir was approved in May 1957, updated in June 1967 and September 1970. The 1970 version, Design Memorandum No. 13C, is the most recent Plan at the time of this current revision, and was intended to serve as a guide for the orderly and coordinated development and management of all land and water resources of the project. These earlier documents presented data on existing conditions, anticipated recreational use, types of facilities needed to service the anticipated use, and an estimate of future requirements.

Sam Rayburn Reservoir is located in the Texas counties of Angelina, Jasper, Nacogdoches, Sabine, and San Augustine. Changes in outdoor recreation trends, regional land use, population, current legislative requirements, and USACE management policy, along with increasing fragmentation of wildlife habitat have created the necessity for a fresh look at the management of USACE-administered federal land at Sam Rayburn Reservoir. By definition, this plan does not address the technical aspects of the primary project purposes of flood risk management, water conservation, or hydroelectric power, but instead seeks to provide a management framework that balances the stewardship of natural resources and provision of high quality recreation opportunities with the primary project purposes. The USACE vision for the future management of the natural resources and recreation program at Sam Rayburn Reservoir is set forth as follows:

> *"The land, water and recreational resources of Sam Rayburn Reservoir will be managed to protect, conserve, and sustain natural and cultural resources, especially environmentally sensitive resources, and provide outdoor recreation opportunities that complement overall project purposes for the benefit of present and future generations."*

This Plan presents an inventory and analysis of land resources, resource management objectives, land use classifications, and resource use framework for each land use classification. It includes the current and projected park facility needs, an analysis of existing and anticipated resource use, and anticipated influences on overall project operation and management.

An Environmental Assessment (EA) of alternative management scenarios set forth in the Plan has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA); regulations of the Council on Environmental Quality; and USACE regulations, including Engineer Regulation 200-2-2: Procedures for Implementing NEPA. The EA can be found in its entirety in Appendix C.

The EA evaluated and analyzed two alternatives; the implementation of the proposed Plan and a No Action Alternative (continued use of the 1970 Master Plan). The EA also analyzed the potential impact that these two alternatives would have on the natural, cultural, and human environments.

Preparation of this Plan was a cooperative effort involving the USACE; tribal representatives; federal, state, and local government agencies; non-government organizations; and members of the general public. Public scoping meetings and scoping comments from government officials and the general public were important for identifying issues needing addressed in the Plan. Chapter 7 provides details regarding the public involvement efforts for the Plan.

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CHAPTER 1 - INTRODUCTION

1.1 PROJECT AUTHORIZATION

Congressional authority for construction of the Sam Rayburn Dam and Reservoir on the Angelina River is contained in the River and Harbor Act approved March 2, 1945 (Public Law 14, 79th Congress, 1st Session) in accordance with the plan outlined in Senate Document 98 (76th Congress, 1st Session). The authorizing act was modified by the River and Harbor Act approved June 30, 1948 (Public Law 858, 80th Congress, 2nd Session). Authority to initiate advance planning on the Sam Rayburn project is contained in the advice of allotment for preconstruction planning C-395, dated September 7, 1955.

Public Law 123, 88th Congress, 1st Session, approved September, 11 1963, changed the name of the project from McGee Bend Dam and Reservoir to Sam Rayburn Dam and Reservoir. The name change was in honor of Congressman Sam Rayburn (1882-1961). Mr. Rayburn was a longtime speaker of the U.S. House of Representatives.

Congressional authority for the recreational program at reservoir projects under the control of the Department of the Army is contained in the Flood Control Act approved December 22, 1944 (Public Law 534, 78th Congress, 2d Session) and amended by additional acts as follows: the Flood Control Act approved July 24, 1946 (Public Law 526, 79th Congress, 2d Session), the Flood Control Act approved September 3, 1954 (Public Law 780, 83d Congress, 2d Session), and the Flood Control Act approved October 23, 1962 (Public Law 874, 87th Congress, 2d Session).

1.2 PROJECT PURPOSE

Sam Rayburn Dam and Reservoir was authorized and constructed for the primary purposes of flood control (now flood risk management), generation of hydroelectric power, and conservation of water for municipal, industrial and agricultural uses. A major secondary use of project lands and waters is public water oriented recreation and environmental stewardship of natural and cultural resources. The reservoir area is heavily utilized by visitors from the major industrial areas of Beaumont, Port Arthur, Houston, Lufkin, and other large population centers.

1.3 PURPOSE AND SCOPE OF MASTER PLAN

The *Sam Rayburn Dam and Reservoir Master Plan* is the strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the project. The Plan guides the efficient and cost-effective development, management, and use of project lands. This Plan, once referred to as a Design Memorandum, is a vital tool for the responsible stewardship and sustainability of the project's resources for the benefit of present and future generations. The Plan

guides and articulates USACE responsibilities pursuant to federal laws to preserve, conserve, restore, maintain, manage, and develop the land, water, and associated resources. The Plan is dynamic and flexible enough to accommodate changing conditions, focusing on carefully developed goals and objectives. Details of design, management and administration, and implementation are addressed in the *Sam Rayburn Dam and Reservoir Operational Management Plan*. This Plan does not address the specifics of regional water quality, shoreline management, or water level management. The technical aspects of operation and maintenance of primary project operations facilities, including but not limited to the dam, spillway, and gate-controlled outlet is not included in this Plan.

The Master Plan proposes public use development and resource conservation measures necessary to realize the optimal potential of the project. The Plan addresses expressed public interest in the overall stewardship and management of all project lands, waters, forests, recreation facilities and other resources throughout the life of the project, and includes graphics showing the most desirable and feasible locations and types of facilities needed to meet identified needs. Emphasis has been placed on a balanced approach for public access, camping and picnicking, general shoreline use, water-based recreation, and conservation of natural and cultural resources. Adequate facilities and land-based requirements are proposed to ensure 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, assuming the continued availability of Congressionally-appropriated funds, while at the same time conserving and protecting all resources held in the public trust.

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

Additional information regarding environmental impacts to existing conditions as a result of this plan can be found in the Environmental Assessment for the Sam Rayburn Dam and Reservoir in Appendix C.

1.4 DESCRIPTION OF PROJECT AND WATERSHED

Sam Rayburn Reservoir and Dam is located approximately 10 miles northwest of the city of Jasper, Texas, at river mile 25.2 on Angelina River, a tributary of the Neches River (Figure 1.1). The reservoir is located northeast of the City of Lufkin in northern Jasper County and runs northwest to southeast. The reservoir is located in portions of five Texas counties which include Angelina,

Jasper, Nacogdoches, Sabine, and San Augustine. A large portion of the reservoir is located in and adjacent to the Angelina and Sabine National Forests.

The Angelina River originates in east Texas near the city of Henderson in Rusk County and is within the Angelina Watershed, which is a part of the Neches River Basin. The Angelina watershed is roughly elliptical in shape and lies between north latitudes 30°53’ and 32°25’ and west longitudes 93°50’ and 95°22’. The River runs in a generally southerly direction for about 205 miles where it merges with the Neches River, which is at about river mile 126 of the Neches River. This location is 12 miles west of Jasper, Texas. The Angelina River drops from elevation 440 msl at its source to elevation 70 msl at the Sam Rayburn Dam site and continues to drop to elevation 60 feet NGVD at its mouth with the Neches River. The confluence of the Angelina River and Neches River is submerged by B.A. Steinhagen Lake.

The drainage area of the Angelina River is 3,449 square miles and is the principal tributary of the Neches River. Portions of the Angelina watershed lie within the following nine counties; Angelina, Cherokee, Jasper, Nacogdoches, Rusk, Sabine, San Augustine, Shelby, and Smith. The Angelina River has four main tributaries above the Sam Rayburn Dam: Strike Creek, a left bank tributary, enters at mile 178.0 and has a length of 33 miles; Mud Creek enters at mile 168.2 and has a length of 67 miles; Attoyac Bayou enters at mile 53.7 and has a length of 119 miles; and Ayish Bayou enters just above the dam at mile 25.7 and has a length of 70 miles.

Local financial sponsorship of Sam Rayburn Reservoir is provided by the Lower Neches Valley Authority (LNVA). Water stored in Sam Rayburn for use by LNVA is released to B.A. Steinhagen (Dam B) Reservoir, from which it flows into the lower Neches River and on to the LNVA freshwater intakes. LNVA has State-approved rights to the use of essentially the entire dependable freshwater yield of Rayburn Reservoir, approximately 820,000 acre-feet (or 267 trillion gallons) a year. This volume not only meets current demands, but is expected to be sufficient to meet the projected needs of the lower Neches Basin far into the 21st century. In releasing freshwater through Sam Rayburn's and B.A. Steinhagen's powerhouses, electrical power is generated for use in homes and industries within the area. A more thorough discussion of the water supply and hydropower generation agreements and contracts related to Sam Rayburn Reservoir is provided in Chapter 6.

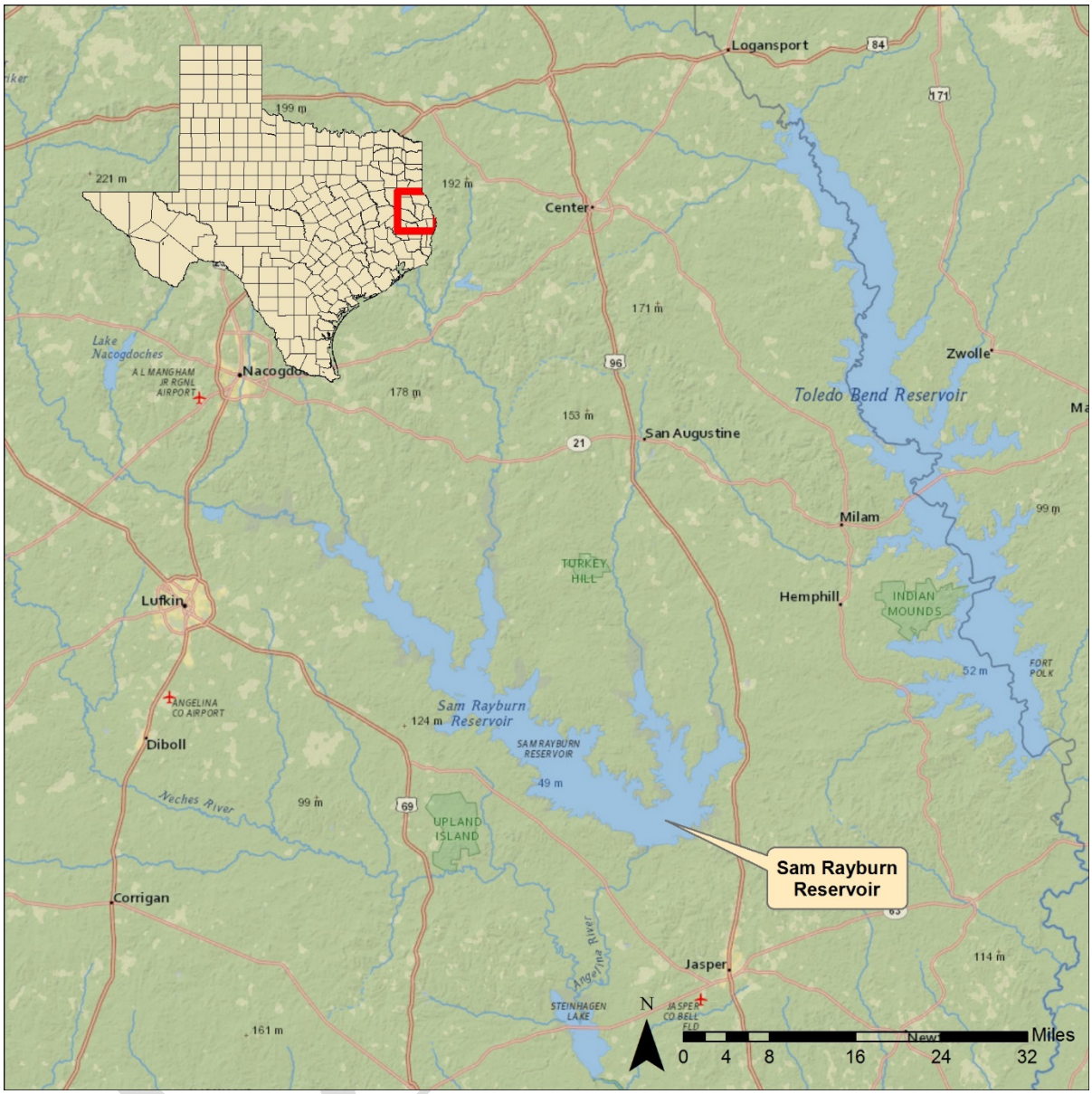

Figure 1-1 Sam Rayburn Reservoir Vicinity Map

1.5 DESCRIPTION OF RESERVOIR

Sam Rayburn Reservoir impounds the Angelina River, which is the principal tributary to the Neches River Basin. It is located within the West Gulf Coast Plains Section of the Coastal Plains. The headwaters are in a region of moderately rolling timbered hills ranging in elevation from 200 to 300 feet NGVD. As the tributaries of Sam Rayburn Reservoir flow south toward the reservoir the terrain becomes flatter with gently rolling topography and a forested landscape.

Clearing of the reservoir was accomplished in accordance with USACE guidelines. A large area in front of the dam was flush cleared between elevations 167.0 and 145.0, and timber and brush at lower elevations were removed or crushed

to prevent projection of the tops into the flush cleared zone. The areas adjacent to public use areas and in the connecting boat lanes also were cleared to these elevations. Extensive areas of dense forest were not cleared, and these provide fishing sites that are major attractions for visitors.

Sam Rayburn Reservoir is operated in conjunction with Town Bluff Dam, also known as Dam B, which impounds B.A. Steinhagen Lake. Sam Rayburn Reservoir provides flood control and water supply from the Angelina River in the lower Neches River Watershed. Sam Rayburn Reservoir discharges into B.A. Steinhagen Lake, whose primary function is to reregulate the hydroelectric power releases from Sam Rayburn Reservoir, thereby reducing the fluctuating stages downstream in the Neches River. The normal operating level of B.A. Steinhagen Lake is between elevation 81.0 and 83.0 msl and there is no flood control storage provided by the lake.

1.5.1 Embankment

The main embankment of rolled earth fill across the Angelina River has a crown width of 42 feet at elevation 190.0 and a length of 12,379 feet extending from stations 94+00 to 207+00. The upstream slope protection consists of 24 inches of riprap on 9 inches of bedding, extending from the top of the dam to the top of the power head and sediment storage at elevation 149.0. The downstream slope protection consists of 18 inches of riprap on 7 inches of bedding extending from the ground surface up to elevation 123.5. All other areas of the embankment will be protected by native grasses. A roadway 24 feet wide with 8-foot shoulders and an additional one foot on each side for the installation of metal guard rails and posts will be provided.

1.5.2 Spillway

The original spillway, replaced in 1996, consisted of an uncontrolled broad-crested weir 2,200 feet in length, located in a saddle about 7,000 feet west of the right abutment of the main embankment and about 5,000 feet west of the outlet works and powerhouse. The crest of the original uncontrolled spillway was at elevation 176.0. The labyrinth spillway, completed in 1996, consists of an approach channel, a labyrinth weir, downstream chute, a stilling basin with baffle blocks, and a discharge pilot channel. Earthen embankment wing dikes flank the weir structure and extend to high ground at the ends of the original weir. The labyrinth weir has an overall width of 640 feet, a crest elevation of 176.0 feet, and runs 16 cycles at 200 feet each for an effective length of 3,200 feet. Under conditions of maximum spillway design discharge, the reservoir water surface will be at elevation 186.91 with a spillway discharge of 222,500 cubic feet per second.

1.5.3 Dikes

There are three saddle dikes on the eastern bank. The dikes were constructed of rolled earth and have a crown width of 10 feet. Dike A is 1,517 feet in length and originally had a maximum height of 22 feet. During the spillway modification and freeboard restoration, Dike A was raised 2.5 feet to a crest elevation of 192.5 feet NGVD. Dike C is 2,300 feet long and has a maximum height

of 18 feet and top elevation of 190.0 feet NGVD. Brookeland Dike (Dike B) is 880 feet long with a top elevation of 183 feet NGVD and height of 14 feet. The slopes on the dikes are 1 vertical on 3 horizontal. Dike A is protected on the upstream slope by 12-inch riprap overlying 6 inches of bedding material and on the downstream slope by turf. Both the upstream and downstream slopes of Dike C are protected by grass turf.

1.5.4 Flood Control Outlet Works

The powerhouse and outlet works are located in a dam about 2,000 feet west of the main embankment. The dam is composed of a concrete structure approximately 166 feet wide with earthen embankments on each side. The outlet works consist of two gated 10 by 20-foot rectangular concrete-lined conduits placed adjacent to the powerhouse penstocks. The conduits are 180 feet long with intake inverts at elevation 105.0 feet NGVD and outlet inverts at elevation 85.0 feet NGVD. The conduits are equipped with 10 by 20-foot tractor-type gates.

1.5.5 Flood Control Outlet Works Stilling Basin

The stilling basin structure is located on the left side of the powerhouse tailrace. Discharges from the conduits flow down a parabolic expanding chute, about 90-long, into a 146-foot long, 44-foot wide stilling basin in which the hydraulic jump is formed. The floor of the stilling basin is at elevation 61.0 feet NGVD and is 12 foot thick. The stilling basin has concrete training walls on either side which have a slight batter on each face. The training wall on the left rises to elevation 117.0 feet NGVD, while the training wall on the right rises to elevation 107.0 feet NGVD.

There are two rows of 6-foot 9 inch high baffle blocks and an end sill 6-foot 9 inch high to dissipate the energy of the discharge from the flood conduits. The first row has 4 baffle blocks, while the second row has 3 blocks that are staggered from the first row. The outlet work discharge channel converges with the hydropower discharge channel

1.5.6 Outlet Works Discharge Channel

A discharge channel approximately 1,800 long was excavated from the stilling basin end sill to the Angelina River. The channel has a trapezoidal cross-section with side slopes of 1 vertical to 2.5 horizontal, a bottom width of 200 feet, and a bottom level at elevation 78.0 feet NGVD. The side slopes of discharge channel below the stilling basin is lined with riprap for erosion protection for approximately 100 feet downstream.

1.5.7 Hydropower Facilities

The Sam Rayburn Hydroelectric Power Plant is made up of two generators capable of generating 26,000 kilowatts each. The plant generates electricity through two power intakes, with two water passages each, located within the concrete portion of the dam. During generation the plant carries water stored in the reservoir to two hydraulic turbines connected to the generators. The power plant serves as a peaking plant to supplement power to the grid during peak utilization times. The power is marketed by the Southwestern Power Administration, an agency of the U.S. Department of Interior. The reservoir stores 1,452,000 acre-feet of water dedicated

to support the power head and production of hydroelectric power. The plant is scheduled for a major renovation and generator rehabilitation in 2020, upgrading the plant and the associated facilities.

1.5.8 Water Supply Facilities

The city of Lufkin has contracted for water in Sam Rayburn Reservoir but no withdrawal facilities have been constructed to date.

Photo 1-1 Release of Water for Hydroelectric Power (USACE Photo)

1.6 PROJECT ACCESS

Sam Rayburn Reservoir is located in the heart of the Pineywoods Region of Southeast Texas, also known as "Deep East Texas." The dam and the Project Office are located approximately 10 miles from Jasper, Texas. The reservoir is readily accessible over paved federal, state and county roads. Other all-weather county roads have been improved in response to the conversion of forest and agricultural lands to public parks, home sites, and recreational uses. The principal highways are U.S. Highways 59, 69, and 96, which parallel the reservoir and bring traffic from the largest population centers. State Highways 103, 147, and 255 cross the reservoir at the upper reaches of the reservoir, the central reservoir area and across the dam, respectively. State Farm-Market roads are paved from the primary roads to the developed areas along the shoreline of the reservoir.

A review of the Texas Transportation Plan – 2040 indicates two long-range planning projects of significance to the Sam Rayburn Reservoir area. The I-69 project is a proposed national interstate highway extending from Texas to Michigan. The proposed route would follow the existing route of US 59 along the eastern edge of Sam Rayburn Reservoir. The first section of I-69 was established through the City of Houston in 2011 and construction of future sections is proceeding as funding allows. Completion of sections through Lufkin and Nacogdoches would increase access to the Sam Rayburn Reservoir area, but will take many years to complete. A second major initiative would be improvements to US 96 from Beaumont to Marshall creating what TxDOT describes as an “Alternative Rural Corridor”. The improvements envisioned by TxDOT include upgrades to what TxDOT describes as “Super 2” standards which may include passing lanes, continuous 4-lane widening, and overpasses at priority locations. US 96 already provides good access to the east and south areas of Sam Rayburn Reservoir, but implementing the above actions would further improve regional access.

1.7 PRIOR DESIGN MEMORANDA

Nineteen separate Design Memorandums (DM) were prepared from 1956 thru 1962 setting forth design criteria for all aspects of the project including the prime flood risk management and hydropower facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the master plan for recreation development and land management. A complete list of the DMs are provided in Appendix B of this plan.

1.8 PERTINENT PROJECT INFORMATION

Table 1.1 below provides pertinent information regarding existing reservoir storage capacity at Sam Rayburn Reservoir. Figures were calculated from the 171.0 msl conservation pool.

Table 1.1 Water Storage Capacity and Related Pertinent Data

Feature	Elevation (msl)[1]	Area (acres)	Capacity (acre-feet)	Equivalent Runoff[2] (inches)
Top of Dam Top of Parapet Wall	190.0 193.6	- -	- -	- -
Maximum Pool (Design) Maximum Recorded Pool (1992)	183.0 186.91	180,000	5,588,544	30.50
Upper Guide Contour for Easement Acquisition	179.0-189.0	164,900	4,899,034	-
Spillway Crest	176.0	153,800	4,420,949	24.15
Top of Flood Control Pool	173.0	142,700	3,976,169	21.73
Top of Power Pool	164.4	112,590	2,876,033	15.51
Power Head and Sediment Storage	149.0	72,013	1,460,990	-
Invert of Lowest Intake	105.0	4,836	18,956	0.12
Streambed	70.0			

(1) Feet above mean seal level
(2) Notes:
(3) Drainage area is 3,449 square miles. One inch of runoff equals 183,947 acre-feet.
Source: USACE Periodic Inspection Report, April 2016

Table 1.2 provides pertinent information regarding acreages by land use classifications at Sam Rayburn Reservoir. Acreages have been revised and updated from previous the Master Plan to reflect current land use and management resource objectives. Acreages were calculated by historical real estate records and Geographical Information Systems (GIS) data.

Table 1.2 Acreage by Land Use Classification

Classification	Acres
Project Operations	370
High Density Recreation	1,598
Environmental Sensitive Areas	1,809
Multiple Resource Management Lands:	
Low Density Recreation	2,249
Wildlife Management	896
Vegetative Management	10,296
Future/Inactive Recreation Areas	718
Total Land Classifications	**17,936**
Water Surface:	
Restricted	40
Designated No-wake [(1)]	190
Open Recreation	112,360
Total Water Surface[(2)]	112,590
Total Fee 114,857 acres (REMIS) **Total Flowage Easement 45,124 acres** (REMIS)	

[(1)] No-wake areas located at boat ramps and marinas

[(2)] Total water surface as measured by TWDB and USACE in 2004 Volumetric Survey. A previous volumetric survey in 1971 had estimated the water surface acreage at 114,500 which is the figure used in numerous publications prior to the date of this Master Plan.

Note: Acreages are calculated using GIS technology and may vary from official land acquisition records and will also vary depending on changes in lake levels, sedimentation and shoreline erosion.

Note: U.S. Forest Service Ownership includes approximately 1,962 acres above 164 feet MSL, 21,940 acres below 164 MSL, and 9,225 flowage easement acres.

CHAPTER 2 - PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

2.1 PHYSIOGRAPHIC SETTING

2.1.1 Ecoregion Overview

Sam Rayburn Dam and Reservoir is located in the South Central Plains level III ecoregion and Southern Tertiary Uplands level IV ecoregion (Figure 2.1) as mapped and described by the Environmental Protection Agency (EPA) The 2012 Texas Conservation Action Plan (TCAP) refers to this ecoregion as the Western Gulf Coastal Plain ecoregion and locally the ecoregion is often called the Pineywoods of east Texas. The vegetation of the South Central Plains level III ecoregion is sometimes described as the western edge of the southern coniferous forest belt of the continental United States.

The Southern Tertiary Uplands ecoregion generally covers the remainder of longleaf pine range north of the Flatwoods ecoregion on Tertiary sediments. Longleaf pine often occur on sand ridges and uplands, with open forests found on other soil types and locations in the Southern Tertiary Uplands and the Flatwoods. On more mesic sites, some American beech or magnolia-beech-loblolly pine forests occur. Some sandstone outcrops (Catahoula Formation) have distinctive barrens or glades in Texas and Louisiana. Seeps in sand hills support acid bog species including southern sweetbay, hollies, wax-myrtles, insectivorous plants, orchids, and wild azalea; this vegetation becomes more extensive in the Flatwoods. The region is more hilly and dissected than the Flatwoods to the south, and soils are generally better drained over the more permeable sediments. Currently, it has more pine forest than the oak-pine and pasture land cover to the north in the Tertiary Uplands ecoregion. Large parts of the region are public National Forest land, including the 153,179-acre Angelina National Forest, which lies on the north and south shores of Sam Rayburn Reservoir.

2.1.2 Climate

The climate of the Angelina watershed is considered to be generally mild with the annual normal temperature being about 66 degrees Fahrenheit throughout the watershed. However, sharp extremes are occasionally recorded as short duration freezes occur occasionally throughout the winter. The summers are hot and fairly humid. Southerly winds prevail during the spring, summer and fall months.

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

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

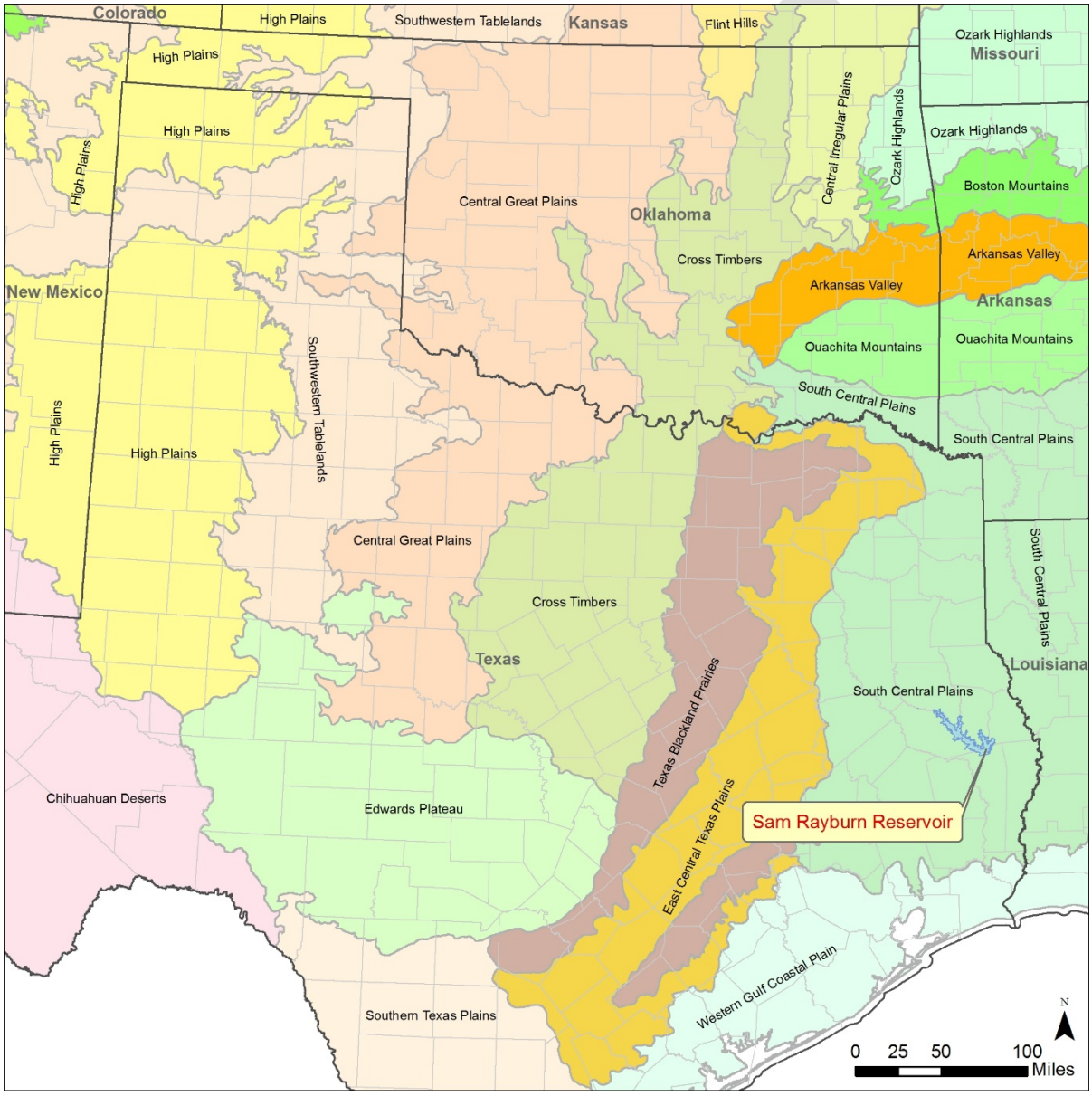

Figure 2-1 Ecoregions of Texas (Source: Environmental Protection Agency)

2.1.3 Geology

The Neches River Basin, in which the Sam Rayburn Reservoir lies, is wholly located within the sub-province of the Gulf Coastal Plains within the Interior Coastal Plains physiographic province. The Interior Coastal Plains comprise alternating belts of resistant un-cemented sand among weaker shales that erode into long, sandy ridges. The formations outcropping in the region consist of sedimentary deposits of marine and non-marine origin of Tertiary age. The formations dip gently southward to the Gulf of Mexico at approximately with the older formations outcropping upstream from the younger.

The upper half of the basin is underlain by Eocene formations which, due to differential in duration of the strata, tend to produce a hilly region that becomes heavily forested in the southern portion. The strata are principally marine and beach deposited sands and clays with some sandstone, shale and siltstone beds. The more weather resistant strata tend to form ridges of hills following the east-west strike of the strata with steep northern faces and gently sloping southern faces. Sam Rayburn Reservoir, except for small portions adjacent to the dam, is located in this area.

The Sam Rayburn Dam site is underlain by the Catahoula formation of Oligocene age. The Catahoula formation consists of non-marine lagunal and deltaic deposits of clay, silts, some moderately hard sandstone and siltstone, and beds of turf and volcanic ash, some of which altered to Fuller's earth. All the formations in this region are considered young on the geological time scale and contain few strata that could be considered hard rock. Many of the sand and silt horizons are indurate. Generally, the clays are compact and shale-like in structure.

2.1.4 Topography

The topographic features of the reservoir vary from hilly and rolling to broad slopes and flat terrain. The uplands are moderately to sharply dissected, while the lowlands are relatively flat. There are a number of tributary streams whose valleys have formed major embankments and numerous coves that are of value to the scenic interest and variety of the shoreline. A large part of the reservoir is in the Angelina National Forest, which is heavily timbered with pine and mixed hardwoods. Near its confluence with the Neches River, the Angelina River enters the Texas Pine Flats where the timber is less dense and there is little topographic relief

The Angelina River is formed by the junction of the Shawnee and Barnhart Creeks in southwestern Rusk County near Henderson, Texas, which is at elevation 475 ft. msl. The river flows in a general southeasterly direction to its confluence with the Neches River. The river system's average streambed slopes vary widely. Shawnee Creek's average streambed slope is a steep 10.3 feet per mile, while it drops off to less dramatic slopes of 3.3 feet per mile between the Shawne and Barnhart Junction and Mud Creek. This is compared to the almost level slopes of 1.1

foot per mile from there to the head of Sam Rayburn Reservoir and to the less than .5 foot per mile in the pine flats below the reservoir.

2.1.5 Hydrology and Groundwater

The Angelina River has four main tributaries above the Sam Rayburn Dam. Stricker Creek, a left bank tributary, enters at mile 178.0 and has a length of 33 miles. Mud Creek enters at mile 168.2 and has a length of 67 miles. Attoyac Bayou enters at mile 53.7 and has a length of 119 miles. Ayish Bayou enters just above the dam at mile 25.7 and has a length of 70 miles.

The land in the Sam Rayburn Reservoir area is characterized by a low, flat valley with slow runoff and poor drainage. Since deliberate impoundment, in March 1965, the average annual runoff into Sam Rayburn Reservoir is 2,381,900 acre-feet or 12.95 inches of runoff. The annual inflow has ranged from a minimum of 585,500 acre-feet in 1971 to a maximum of 4,605,100 acre-feet in 1991. The maximum monthly inflow was 1,201,400 acre-feet computed in March 2001. On occasion, the monthly inflow has been zero.

Hydrology

The Sam Rayburn Reservoir watershed drains approximately 1,385 square miles and spans ten counties (Angelina, Cherokee, Jasper, Nacogdoches, Newton, Rusk, Sabine, San Augustine, Shelby, and Smith) encompassing the towns of Henderson, Jacksonville, Lufkin, Nacogdoches, and Tyler, Texas. At conservation pool, the reservoir contains approximately 112,590 surface acres of water, at flood control pool, the surface water area expands to 142,700 acres. Depths range from 12 feet to 90 feet deep.

The drainage are upstream Sam Rayburn Reservoir is 3,449 square miles. The total drainage area of the Angelina River is 3,556 square miles and it is the principal tributary of the Neches River. Portions of the Angelina watershed lie within the following nine counties; Angelina, Cherokee, Jasper, Nacogdoches, Rusk, Sabine, San Augustine, Shelby, and Smith. The Angelina River has four main tributaries above the Sam Rayburn Dam: Strike Creek, a left bank tributary, enters at mile 178.0 and has a length of 33 miles; Mud Creek enters at mile 168.2 and has a length of 67 miles; Attoyac Bayou enters at mile 53.7 and has a length of 119 miles; and Ayish Bayou enters just above the dam at mile 25.7 and has a length of 70 miles.

Ground Water

The water table in the area surrounding the reservoir generally follows the configuration of the local topography. The reservoir has raised the water table in a narrow belt around their margin but most of this water can be considered as temporary bank storage in as much as it returns to the reservoir when the pool level drops. As classified by the Texas Water Development Board, there are four aquifers in the subject area: The Catahoula formation, a primary aquifer; the Sparta

formation, a secondary aquifer; and two minor aquifers, the Yegua formation and the Jackson group. The Sparta formation is the most northerly outcropping aquifer in the area. Because the Sparta has contact with Sam Rayburn water at maximum pool level only, it receives very little recharge from the reservoir.

Continuing in a downstream direction the next outcropping formation is the Yegua, a minor aquifer. Though the Yegua aquifer supplies water for several small towns, its lithologic characteristics still render it a minor aquifer. Recharge from reservoir water appears to be insignificant. The outcrops of the Jackson group adjoin the Yegua outcrop belt. The Jackson aquifer like the Yegua, is considered a minor aquifer but generally yields less water than the Yegua. Only minor recharge from the reservoir appears to be taking place. The outcrop of the Catahoula formation, the primary aquifer of the area, is exposed to reservoir water at the Sam Rayburn Dam. Only about half the width of the belt is in contact with the reservoir. The Catahoula is the basal member of the Gulf Coast Aquifer, which consists of a sequence of several sedimentary formations. Some reservoir water probably recharges the Catahoula, but the quantity would be small because of the limited area of contact, cementation of the sands and the lens-like nature of its members.

Permanent Salt Water Barrier

The Permanent Salt Water Barrier, located near Beaumont, Texas on the Neches River, is operated and maintained by the Lower Neches Valley Authority (LNVA). The main purpose of the Salt Water Barrier is to prevent salt water from intruding in the Neches River upstream of the city of Beaumont during low flow periods. The Neches River is especially vulnerable to taking on saltwater during times of low river flow or drought. Annual dry spells in Texas result in reduced flows down the Neches River allowing saltwater from the Gulf of Mexico to make its way upstream. Prior to project implementation, the LNVA constructed temporary steel sheet pile saltwater barriers and depended upon the Sam Rayburn Reservoir to send freshwater downstream to keep the saltwater at bay.

2.1.6 Soils, Sedimentation, and Shoreline Erosion

The soils reflect their parent materials in that they are predominantly sand, clay, and sandy clay. The soils of the Piney Wood region consist mainly of fine sands (sugar-sands) and sandy loams. The alluvial soils throughout the reservoir area occur only in narrow strips along the numerous streams. These soils consist of deep beds of materials washed from adjacent uplands. The predominant uplands soils are the Lufkin fine sandy loam and the Susquehanna group and the bottom lands are Bibb fine sandy loam, Bibb clay and Bibb clay loam. The soils have been developed mostly from beds of noncalcareous clay, sandy clay, clay shale or sand. Detailed information on all soil types surrounding Sam Rayburn Reservoir is available on websites maintained by the Natural Resources Conservation Service, U.S. Department of Agriculture.

The terrain of the Angelina River headwaters is light colored, has loamy surfaces and deep reddish clay subsoils. As the tributaries of Sam Rayburn flow southward, the soil tends to be acidic, with sandy to loamy surfaces and deep, reddish loam or clay subsoils. Pine and hardwood forests cover most of the Angelina River watershed area, but nearly 25 percent of the watershed is considered prime farmland.

Sedimentation

During the design of Sam Rayburn Reservoir, it was estimated the rate of sedimentation in the reservoir would be 0.083 acre-feet per square mile of drainage area per year. This would amount to approximately 288 acre-feet of sediment being deposited annually. The reservoir capacity below elevation 149.0 msl, top of power head, 1,460,990 acre-feet, was allocated for sediment storage.

Erosion

Shoreline Erosion at Sam Rayburn Reservoir is affected by several hydrologic factors such as soil type, lake level, wind or wave velocity, wind or wave directions, wind or wave duration, and ground slopes. The effects of erosion around the reservoir vary from those areas of almost no erosion to those evident in areas where erosion has progressed to a point beyond the Government property line. Generally the soil involved in known colloquially as sugar sand, has the texture of course sugar, and behaves much as would be expected from the name. In addition to the extreme susceptibility of the soil to erosion, the problem is generally compounded by the tree growth in the area. The net effect is that tree roots, combined with other ground cover, tend to hinder surface erosion and thus wave action undercuts the shoreline rather than forming beaches as would be normally expected. Eventually the overburden which has been undercut collapses and the process begins again. Vegetation then falls into the reservoir as a result of the overburden collapse is not removed in order that it may assist in temporarily hindering wave action causing erosion.

2.1.7 Borrow Areas

Prior to construction of Sam Rayburn Reservoir, perpetual easements were acquired on certain tracts for the purpose of obtaining construction materials including earth, gravel and other materials needed for project construction activities. The area in question contains 109 acres and is known as USACE Tract A-110E. Materials obtained from the site were utilized in the initial construction of the Sam Rayburn Dam/Levee as well as construction of other prime facilities and recreation areas. Today, the perpetual easement continues to be utilized by USACE as a source of earth, gravel, and other materials in operation and maintenance activities of Sam Rayburn Reservoir. Site restoration efforts have been made in the former borrow areas in order to stabilize soils and minimize erosion and other impacts to the site.

2.2 ECOREGION AND NATURAL RESOUCES ANALYSIS

Natural resources include the vegetation, wetland, wildlife, fisheries and aquatic resources, and the endangered, threatened and candidate species present in the vicinity of Sam Rayburn Reservoir. In addition, the Angelina National Forrest managed by U.S. Forest Service, and state resources are present within Sam Rayburn Reservoir project lands and are summarized under this report.

2.2.1 Vegetation

USACE regulations and policy require a basic inventory of the vegetation at all operational projects. This inventory, referred to in EP 1130-2-540 as a Level 1 inventory, classifies the vegetation in accordance with the National Vegetation Classification System (NVCS) down to the Sub-Class level which is a very broad classification level. The inventory data, presented in Table 2.1, is recorded in the USACE national database referred to as the Operations and Maintenance Business Information Link (OMBIL) and is useful in providing a general characterization of the vegetation on all operational projects. Daily management of USACE lands requires more detailed knowledge of the vegetation down to the Association level within the NVCS, and for most management prescriptions, down to the individual species level of dominant vegetation.

Table 2.1 Vegetation Classification Records

Order	Class	Sub-Class	Acreage
Non-Vegetated (includes open water surface of the lake)	Non-Vegetated	Non-Vegetated	93,891
Herb Dominated	Herbaceous Vegetation	Annual graminoid or forb vegetation	4
Herb Dominated	Herbaceous Vegetation	Hydromorphic rooted vegetation	643
Herb Dominated	Herbaceous Vegetation	Perennial gramimoid vegetation (grasslands)	520
Shrub Dominated	Shrubland (Scrub)	Deciduous shrubland (scrub)	2,032
Tree Dominated	Closed Tree Canopy	Deciduous closed tree canopy	5,939
Tree Dominated	Closed Tree Canopy	Evergreen forest	6,005
Tree Dominated	Closed Tree Canopy	Mixed evergreen-deciduous closed tree canopy	772
Tree Dominated	Open Tree Canopy	Mixed evergreen-deciduous open tree canopy	5,000

Using habitat types and descriptions from the TCAP and EPA ecoregion descriptions, the following are the major habitat types found on USACE lands at Sam Rayburn Reservoir. Species listed are representative of dominant species found in each habitat type but should not be considered a comprehensive listing. A Floristic Survey that categorized and rated the various vegetation types was completed in conjunction with this master plan and can be found in Appendix D.

Pine Forest: Generally on drier sites, this is a dominant habitat type that is represented in Table 2.1 as "Evergreen forest". Pine forests are generally closed tree canopy forests dominated by loblolly pine, shortleaf pine, or a mixture of these two species. Most of the pine forest on USACE land is naturally occurring but there are a few remnant pine plantations that were established prior to Federal ownership. Where these remnant plantations exist, slash pine may be present. These forests will generally have a minor component of deciduous trees including sweetgum, blackgum, post oak, white oak, southern red oak, mockernut hickory, shagbark hickory, American elm, winged elm and eastern redcedar.

Pine-Oak Forest: Typically occurring on more mesic sites, this habitat type is approximately equal in abundance on USACE lands to the pine forests described above. The pine-oak forest is represented in Table 2.1 as "mixed evergreen-deciduous" forest. Dominant and co-dominant tree species include loblolly and shortleaf pine, white oak, southern red oak, cherrybark oak, Shumard oak, hickories, black walnut, sweetgum, magnolia and black gum.

Longleaf Pine Savannah: Typically on dry, sandy upland sites, this is a minor habitat type on USACE land and exists primarily in the vicinity of Ebeneezer Park and a few other isolated locations. The dominant vegetation is a longleaf pine-little bluestem mix.

Bottomland Hardwoods: Located along flat riverine corridors, primarily in the Attoyac River and Ayish Bayou Arms of Sam Rayburn Reservoir, this habitat type is approximately equal in abundance to the pine forest and pine-hardwood forests and is represented in Table 2.1 as "deciduous closed tree canopy". Dominant and co-dominant species include water oak, willow oak, overcup oak, nuttall oak, swamp chestnut oak, red maple, water tupelo, river birch and green ash.

Forested Wetland: Located along flat shoreline areas of the reservoir this habitat type is included in the "deciduous shrubland" listed in Table 2.1. This habitat type is dominated by buttonbush flats with occasional stands of baldcypress.

Perennial Grassland: This minor habitat type is located primarily on the downstream slope of Sam Rayburn dam and in isolated pockets in developed park areas. Grass species in these areas is dominated by exotic bermudagrass with a minor component of native grasses.

Emergent Wetlands: This habitat type consists of rooted aquatic plants in shallow areas of the reservoir that are generally protected from exposure to strong wind and wave action. The dominant native species include American lotus and soft-stem bulrush. Introduced species include cattail.

2.2.1.1 Rare Plants and Plant Communities

The TCAP for the Western Gulf Coastal Plain ecoregion lists rare plants and plant communities known to exist in the region surrounding Sam Rayburn Reservoir. Rare plants, as well as faunal species, are listed in Appendix E, Western Gulf Coastal Plain Ecoregion Rare and Endangered Plant List, and rare plant communities in the region immediately surrounding Sam Rayburn Reservoir are also provided in Appendix E, Species of Greatest Conservation Need.

2.2.1.2 Periodically Flooded Shorelines

Routine flood risk management operations result in many miles of shoreline being frequently flooded up to approximately elevation 170 NGVD. This frequent inundation generally does not persist for long periods of time that would cause significant tree mortality. However, major flood events that reach approximately elevation 175-176 NGVD will result in those areas lying below elevation 168 NGVD being inundated for periods of approximately 60 days or longer. This period of time is of sufficient duration to result in the death of most trees growing at or below the 168 NGVD elevation. Flood events of this magnitude occurred in the early 1990's, 2015, and 2016. When shoreline trees die from flooding some are salvaged as timber where practical. After stored flood water has been released from the reservoir the shorelines where trees were lost will begin to revegetate naturally with tree species that are adapted to the upland soil types that exist along most shorelines. The dominant trees that naturally reseed and begin to grow on these shorelines are typically light-seeded species such as shortleaf and loblolly pine, sweetgums, and elms. Willow and cottonwood will colonize some sites. With few exceptions the trees that naturally colonize these shoreline areas are not tolerant to flooding. This cycle of flooding, followed by natural regeneration can leave shoreline areas somewhat barren, a condition that is not visually appealing and does not provide high quality wildlife habitat. In an effort to reduce the negative effects of this cycle, USACE planted trees with greater flood tolerance on approximately 2,000 acres of narrow shoreline areas after the early 1990's flood events. The planted trees included Nuttall oak, willow oak, water oak, overcup oak, green ash, baldcypress and others that are typically adapted to frequently flooded bottomland sites. These plantings were reasonably successful considering that the soil types where these trees were planted are typically upland soils that do not naturally support flood tolerant tree species. USACE will continue to evaluate reforestation efforts that provide the greatest benefit along shorelines that are periodically inundated for long periods of time. Reforestation efforts are described in more detail in Chapter 5.

2.2.1.3 Habitat Evaluation Study

As part of the Master Plan revision effort USACE determined that a comprehensive habitat evaluation was needed to properly describe the quality of the major habitat types on USACE administered public lands. The study was scheduled for the spring of 2015 but a major flood event delayed the study until August of 2016. A study plan was developed calling for 66 sample points located across all habitat types around the perimeter of the entire reservoir. At each point data was collected following the protocol in the Wildlife Habitat Appraisal Procedure (WHAP) developed by Texas Parks and Wildlife Department (TPWD). All plant species at each data point were identified in order to prepare a Floristic Quality Assessment (FQA). The survey was conducted by a combination of USACE personnel and contractor personnel from the firm Gulf South Research Corporation. WHAP scores can range from a low of 0 to a high of 1.0. In general, an FQI score of 1 through 19 indicates low vegetative quality; 20-35 indicates high vegetative quality, and an FQI above 35 indicates “Natural Area” quality (Wilhelm and Masters 1999). Wetlands with a FQI of 20 or greater are considered high quality aquatic resources (Wilhelm and Masters 1999). Both the WHAP and FQA were conducted in sub-optimum conditions due to the inundation effects from recent flood events. This resulted in scores, particularly the FQA scores, which may not be indicative of the habitat quality that would exist under more stable reservoir conditions. A copy of the report, entitled *Existing Habitat Conditions for the Sam Rayburn Dam and Reservoir Master Plan Revision* is included as Appendix G. A brief summary of WHAP scores and Floristic Quality Index (FQI) scores for each major habitat type is provided as follows:

There were 39 Pine Forest sites assessed. WHAP habitat quality scores ranged from a low of 0.30 to a high of 0.85. The average WHAP habitat quality score for this habitat type was 0.61. Generally, the pine forests observed around Sam Rayburn Reservoir were in fair to good condition with respect to wildlife habitat quality. The dominant woody species were loblolly pine, sweetgum, and southern red oak. The most commonly observed herbaceous species were little bluestem and wiregrass (*Sporobolus junceus*). Floristic quality values ranged from 2.5 to 12.0, with an average FQI of 7.7 for Pine Forest sites.

There were 11 Pine-Oak Forest sites assessed that had WHAP habitat quality scores that ranged from a low of 0.46 to a high of 0.79. The average WHAP score for this habitat type was 0.62. Generally, the pine-oak forests observed around Sam Rayburn Reservoir were in fair to good condition with respect to wildlife habitat quality. The dominant woody species were loblolly pine, American beautyberry (*Callicarpa americana*), sweetgum, cherrybark oak, and white oak. The most commonly observed herbaceous species were little bluestem, longleaf woodoats (*Chasmanthium sessiliflorum*), and slender woodoats (*Chasmanthium laxum*). Floristic quality values ranged from 3.1 to 14.2, with an average FQI of 11.0 for Pine-Oak Forest sites.

Only one Longleaf Pine Savannah site was assessed. The site had a WHAP habitat quality score of 0.68. Longleaf pine savannah habitat is rare and often

degraded in areas around Sam Rayburn Reservoir; however, the area sampled for the WHAP was in very good condition. The dominant woody species were longleaf pine, American beautyberry, common persimmon (*Diospyros virginiana*), and sweetgum. The dominant herbaceous species were little bluestem, wiregrass, and flowering spurge (*Euphorbia corollata*). The floristic quality value for the Longleaf Pine Savannah site was 11.5.

There were nine Bottomland Hardwoods sites assessed that had WHAP habitat quality scores ranging from a low of 0.50 to a high of 0.82. The average WHAP score for this habitat type was 0.69. Generally, the bottomland hardwoods forests observed around Sam Rayburn Reservoir were in good condition. The dominant woody species were water oak, willow oak, buttonbush, baldcypress, black hickory (*Carya texana*), and climbing hemp vine (*Mikania scandens*). The most commonly observed herbaceous species were lizard's tail (*Saururus cernuus*), smartweed (*Polygonum sagittatum*), Scribner's rosette grass (*Dichanthelium oligosanthes*), and longleaf woodoats. Floristic quality values ranged from 5.7 to 13.6, with an average FQI of 10.2 for Bottomland Hardwoods sites.

There were six Forested Wetland sites assessed that had WHAP habitat quality scores that ranged from a low of 0.71 to a high of 0.94. The average WHAP score for this habitat type was 0.78. Generally, forested wetlands observed around Sam Rayburn Reservoir were in good condition. The dominant woody species were planer tree (*Planera aquatica*), baldcypress, and buttonbush. Most Forested Wetland sites lacked an herbaceous vegetation layer with the only herbaceous species observed being torpedograss (*Panicum repens*). Floristic quality values ranged from 4.9 to 11.5, with an average FQI of 8.3 for Forest Wetland sites.

2.2.2 Wetlands

Wetlands and other waters of the U.S. are regulated under Section 404 of the Clean Water Act, as amended, and Executive Order (EO) 11990, Protection of Wetlands. According to USACE regulations, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Table 2.2 lists the acreages of various types of wetlands present at Sam Rayburn Reservoir. Data was retrieved from the FY2015 Wetland Class records reported in OMBIL.

Table 2.2 Wetland Classes

System	Sub-System	Class	Class Acres
Lacustrine	Limnetic	Open Water/Unknown Bottom	4,669.06
Lacustrine	Littoral	Emergent Wetland	8,606.02
Palustrine	No Sub-System	Forested Wetland	2,941.05
Riverine	Lower Perennial	Open Water/Unknown Bottom	115.11
Riverine	Littoral	Open Water/Unknown Bottom	73.37

2.2.3 Wildlife

Fisheries and Aquatic Resources

Sam Rayburn Reservoir is a destination sport fishery with numerous public boat ramps, marinas, and bait and tackle shops. The number one species of interest at the reservoir is largemouth bass (*Micropterus salmoides*). Sam Rayburn Reservoir currently boasts the ninth largest bass taken out of Texas waters at 16.80lbs. The reservoir is featured on most professional & amateur fishing tournament series including but not limited to Bass Masters, B.A.S.S., Fishing League Worldwide (FLW), Bass Fishing League (BFL), Bass Federation, Sealy Outdoors - Big Bass Splash, Southeast Texas High School Fishing Assoc. and numerous local events.

While Sam Rayburn Reservoir is operated by USACE, the Texas Parks and Wildlife Department (TPWD) remains the primary agency responsible for management of fisheries resources. Since 2010, TPWD has stocked over 4.5 million fingerling and fry Florida largemouth bass in Sam Rayburn Reservoir. Photo 2.1 shows the hatchery ponds of TPWD's John D. Parker East Texas State Fish Hatchery. This hatchery is TPWD's newest freshwater fish hatchery located just below the east end of Sam Rayburn Dam. The 200-acre facility opened in 2012 and is a replacement for the 1932 Jasper Fish Hatchery. Up to five million fingerling fish can be produced annually at the hatchery for stocking in the state's public waters. USACE granted an easement to TPWD for a water intake structure located in Twin Dikes Park on Sam Rayburn Reservoir. The water intake supplies water to the hatcheries 64 production ponds dedicated primarily to the production of Florida largemouth bass, channel catfish, blue catfish and sunfish.

Photo 2-1 John D. Parker East Texas State Fish Hatchery near Sam Rayburn Reservoir (USACE Photo)

Most freshwater fish species found in Texas can also be found at Sam Rayburn Reservoir. Fish species present include gizzard shad (Dorosoma cepedianum), threadfin shad (Dorosoma pentenense), bluegill (Lepomis macrochirus), blue catfish (Ictalurus furcatus), channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), white bass (Morone chrysops), yellow bass (Morone mississippiensis), spotted bass (Micropterus punctulatus), largemouth bass (Micropterus salmoides), striped bass (Morone saxatilis), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), common carp (Cyprinus carpio), grass carp (Ctenopharyngodon idella), yellow bullhead (Ameiurus natalis), black bullhead (Ameiurus melas), redbreast sunfish (Lepomis auritus), warmouth (Lepomis gulosus), longear sunfish (Lepomis megalotis), redear sunfish (Lepomis microlophus), redspotted sunfish (Lepomis miniatus), freshwater drum (Aplodinotus grunniens), bowfin (Amia calva), bigmouth buffalo (Ictiobus cyprinellus), smallmouth buffalo (Ictiobus bubalus), alligator gar (Atractosteus spatula), longnose gar (Lepisosteus osseus), and redfin pickerel (Esox americanus).

TPWD began providing fish population and creel survey reports biannually at Sam Rayburn Reservoir in 2004. In 2012 and 2013, TPWD surveyed fish populations at Sam Rayburn Reservoir using a combination of electrofishing and gill

net sampling. Several prey species, catfishes, temperate basses, black basses, and crappie were detected and analyzed for the 2012 report.

The survey revealed that gizzard shad, threadfin shad, and bluegill were the most abundant prey species and provided a sufficient prey base as sport fish weights were within favorable ranges. The 2012-2013 creel surveys indicate anglers did not target sunfish.

Anglers targeting catfish were responsible for 9-12% of all fishing over the last three survey years. Blue and channel catfish relative abundance was stable compared to previous years and an estimated 35,844 catfish, mostly channel catfish, were harvested during the 2012-2013 survey period.

Temperate bass populations continued their recent trend upwards since 2009. Gill net hauls of white bass show increased numbers compared to historical lows. Yellow bass abundance has increased as well. However, since 2008 no fishing effort has been directed at temperate bass. Spotted bass were present, albeit in low abundance compared to Florida largemouth bass. Estimated angler harvest of spotted bass was 3,507 in 2012-2013.

Regarding all the fishing efforts conducted at Sam Rayburn Reservoir, nearly 79% of the annual fishing effort was directed towards black bass. Largemouth bass have continued to increase in abundance over the past three survey years. Size classes and fish condition were noted as favorable as well. Angler catch rates have remained high and steady as well (range = 1.1-1.3 fish per hour). Creel surveys show that while targeted angling efforts were low over the previous three years for crappie (10-13.7%), catch rates remain relatively high at 1.5-2.6 fish per hour during electrofishing efforts. In 2013, TPWD published a report entitled “Bass Tournament Economics at Sam Rayburn Reservoir”. A summary of this report is provided in Chapter 6 and the full report is attached as Appendix H.

2.2.4 Threatened and Endangered Species

Threatened species are those which are likely to become endangered within the foreseeable future. Endangered species are in danger of extinction throughout all or a significant portion of their range. The U.S. Fish & Wildlife Service’s (USFWS) Information for Planning and Conservation (IPaC) states that several species of birds and flowering plants were identified as federally threatened and endangered species that potentially occur within USACE operated property at Sam Rayburn Reservoir. Additionally, one reptile species was listed as a candidate for protection under the Endangered Species Act.

Table 2.3 indicates the various species of birds, flowering plants, and reptiles listed by the USFWS as Threatened, Endangered or Candidate species that could potentially be found at Sam Rayburn Reservoir.

Table 2.3 Federally-Listed Threatened and Endangered Species

Common Name	Scientific Name	Federal Status	Occurrence
Birds			
Least Tern	*Sterna antillarum*	E	Rare
Piping Plover	*Charadrius melodus*	T	Rare
Red Knot	*Calidris canutus rufa*	T	Rare
Red-cockaded Woodpecker	*Picoides borealis*	E	Occasional
Flowering Plants			
Navasota's Ladies-tresses	*Spiranthes parksii*	E	Rare
Texas Golden Gladecress	*Leavenworthia texana*	E	Rare
White Bladderpod	*Lesquerella pallida*	E	Rare
Reptiles			
Louisiana Pine Snake	*Pituophis ruthveni*	C	Occasional

Federal Listings: *E - Endangered, T - Threatened, C - Candidate*
Occasional: Species is present on project site, but seen only a few times or during seasonal events.
Rare: Species is present on project site and seen at intervals of 2 to 5 years, or is present in limited numbers.

Piping plover, least tern, and red knot all potentially utilize the reservoir when favorable open shoreline habitat is available. However, they are only to be considered for environmental impacts in the Sam Rayburn Reservoir area if a project entails wind energy development.

The red-cockaded woodpecker (RCW) is cardinal sized with a wingspan of about 15 inches. The black cap and nape outline large white cheek patches which are more readily visible than the small red cockade displayed by adult males. The relatively small, yet rare, patches of mature longleaf pine within and surrounding USACE property are preferred by RCW for cavity excavation and subsequent nesting but other southern pine species may be used (Photo 2-2).

Photo 2-2 Installation of Red-Cockaded Woodpecker Nesting Box on USACE land (USACE Photo)

Red-cockaded woodpeckers are considered keystone species for southern pine forests. The cavities they create for roosting and nesting, and later abandon for newer cavities, are utilized by various other wildlife including insects, birds, snakes, lizards, squirrels, and frogs.

Additionally, Navasota ladies-tresses, Texas golden gladecress, and white bladderpod, all federally endangered plant species, may also occur within Sam Rayburn Reservoir. Designated critical habitat for the Texas golden gladecress has been established in the general area, none of which is on or adjacent to Sam Rayburn Reservoir. There are no federally listed fish, mammals, or mollusks potentially occurring at Sam Rayburn Reservoir.

Various state-listed threatened and or endangered species, potentially utilize Sam Rayburn Reservoir and associated tracts of land administered by USACE. TPWD describes state-listed species occurrences on a county by county basis. Sam Rayburn Reservoir spans across five Texas counties including Angelina, Jasper,

Nacogdoches, San Augustine, and Sabine. Table 2.4 summarizes TPWD's five county reports for state listed species potentially occurring at Sam Rayburn Reservoir. TPWD also maintains a list of Rare Species by county. The county listings are provided in Appendix E. Additionally, TPWD maintains a list of Species of Greatest Conservation Need (SGCN) for the Pineywoods ecoregion. The listing of these species, many of which occur or potentially occur on USACE administered lands and waters at Sam Rayburn Reservoir, is also provided at Appendix E.

Table 2.4 State Threatened and Endangered Species Potentially Occurring

Species	Habitat	State Status	Occurrence in the Study Area
Birds			
Peregrine Falcon (*Falco peregrinus*)	Year-round resident and local breeder in west Texas, nests on high cliffs, often near water where prey species are most common.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Bachman's Sparrow (*Aimophila aestivalis)*	Open pine woods with scattered bushes and grass understory, overgrown fields, remnant grasslands.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Bald Eagle (*Haliaeetus leucocephalus*)	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; all reservoirs in north Texas are considered potential nesting habitat.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Piping Plover (*Charadrius melodus)*	Wintering migrant along the Texas Gulf Coast; prefers beaches and bayside mud or salt flats. Critical habitat designated outside of USACE property along the Gulf Coast.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.

Species	Habitat	State Status	Occurrence in the Study Area
Red-cockaded Woodpecker (*Picoides borealis*)	Pine forests with mature longleaf and loblolly pine trees.	E	Occasional in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Swallow-tailed Kite (*Elanoides forficatus*)	Lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall trees in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
White-face Ibis (*Plegadis chihi*)	Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.	T	Potential in Jasper County.
Wood Stork (*Mycteria americana)*	Prairie ponds, flooded fields, mud flats, shallow standing water, roosts in tall snags.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Fishes			
Blackside Darter (*Percina maculata)*	Red, Sulfur and Cypress River basins; clear, gravelly streams; prefers pools with some current, or even quiet pools, to swift riffles.	T	Potential in Nacogdoches Counties.
Blue Sucker (*Cycleptus elongatus*)	Larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current;	T	Potential in Jasper and Sabine Counties.

Species	Habitat	State Status	Occurrence in the Study Area
	bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles.		
Creek Chubsucker (*Erimyzon oblongus)*	Tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Paddlefish (*Polyodon spathula)*	Prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Mammals			
Black Bear (*Ursus americanus)*	Bottomland hardwoods and large tracts of inaccessible forested areas; due to field characteristics similar to Louisiana Black Bear, treat all east Texas black bears as state listed threatened.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Louisiana Black Bear (*Ursus americanus luteolus)*	Bottomland hardwoods, large tracts of inaccessible forested areas.	T	Potential as transient in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.

Species	Habitat	State Status	Occurrence in the Study Area
Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii)*	Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Mollusks			
Louisiana Pigtoe (*Pleurobema riddellii)*	Streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River Basins.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Sandbank Pocketbook (*Lampsilis satura*)	Small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; Sulfur south through San Jacinta River Basins; Neches River.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Southern Hickorynut (*Obovaria jacksoniana*)	Medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress River Basins.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Texas Heelspilitter (*Potamilus amphichaenus*)	Quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Texas Pigtoe (*Fusconaia askewi*)	Rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Triangle Pigtoe (*Fusconaia lananensis*)	Mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina	T	Potential in Nacogdoches and

Species	Habitat	State Status	Occurrence in the Study Area
	branch and possibly Village Creek.		San Augustine Counties.
Reptiles			
Alligator Snapping Turtle (*Macrochelys temminckii)*	Perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Northern Scarlet Snake (*Cemophora coccinea copei)*	Mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial.	T	Potential in Jasper, Sabine, and San Augustine Counties.
Texas Horned Lizard (*Phrynosoma cornutum*)	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September.	T	Potential in Nacogdoches County.

Species	Habitat	State Status	Occurrence in the Study Area
Timber Rattlesnake (*Crotalus horridus)*	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone, bluffs, sandy soil, or black clay; prefers dense ground cover, i.e. grapevines or palmetto.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Louisiana Pine Snake (*Pituophis ruthveni*)	Longleaf pine-oak sandhills interspersed with moist bottomlands; also in adjacent blackjack oak and short-leaf pine/post oak forest. Fields, farmland, and second growth timber tracts.	T	Potential in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties.
Plants			
Navasota Ladies'-tresses (*Spiranthes parksii*)	Margins of post oak woodlands in sandy loams along intermittent tributaries.	E	Potential in Jasper County.
Texas Golden Gladecress (*Leavenworthia texana*)	Found only in San Augustine and Sabine County, Texas, on glauconite outcrops of the Weches Formation. Critical habitat designated outside of USACE lands east of Hwy 96 along Hwy 21.	E	Potential in Sabine and San Augustine Counties.
White Bladderpod (*Lesquerella pallida*)	Found only in San Augustine County, Texas, on glauconite outcrops of the Weches glades in the east Texas Pineywoods. Grows in clearings of alkaline soils within oak-hickory-pine forests.	E	Potential in San Augustine County.

Notes: E = Endangered, T = Threatened

TPWD Texas Natural Diversity Database (TXNDD) Information

To better inform master plan decisions, USACE performed an analysis of data stored in the TXNDD and provided by TPWD for the immediate area surrounding Sam Rayburn Reservoir. The analysis revealed that since 1995, approximately 27 sightings of endangered or rare species have been made in the immediate area surrounding USACE lands. Eleven of the sightings were of bald eagles and out of the 27 total sightings only two were recorded as being on USACE land, one for the red-cockaded woodpecker and one for the Louisiana pine snake. The data also revealed rare habitat types that occur on or near USACE lands including sweetbay magnolia, bog coneflower, loblolly pine-white oak-southern red oak series, longleaf Pine-little bluestem series, and incised groovebur. Overall, the data was used by the study team to prepare meaningful natural resources management objectives and to properly classify USACE lands. Maps produced as part of the data search are maintained by USACE but are not included in this Master Plan to protect the specific locations of rare resources.

2.2.5 Invasive Species

Invasive species are defined as exotic species whose introduction into the ecosystem is likely to cause environmental or economic harm or harm human health. Exotic species are those that are not native to the area, and thus have not evolved the natural checks and balances that normally keep population growth in check. These are often difficult and expensive to control. Like almost all ecological systems, Sam Rayburn is experiencing a number of invasive, both on terrestrial and aquatic.

Threats to the Sam Rayburn Reservoir fishery include exotic fish and plant species as well as environmental pollutants. Invasive species, once established, can quickly spread throughout a water body and expand to nearby to adjacent waters, which can be ecologically and economically expensive. As long as Sam Rayburn Reservoir remains a popular angling destination the threat of significant impacts on the fishery resource by invasive species remains as well.

One such species, which currently has not been found at Sam Rayburn but occurs at other Texas lakes, is the zebra mussel. Zebra mussels can multiply rapidly in favorable conditions. They also attach themselves to hard surfaces potentially damaging boats, infrastructure, and degrading habitat and swimming areas. Because zebra mussel colonies create trophic cascades by out competing lower level organisms for food, fish populations can be degraded. Though zebra mussels are currently not found in Sam Rayburn Reservoir, continued vigilance is crucial to keeping them out.

Another example of an invasive species, which has been found at Sam Rayburn is the giant salvinia. Giant salvinia (Salvinia molesta) is a floating fern native to southern Brazil and is currently one of the most problematic aquatic plants found in Texas. Through its ability to quickly expand and grow in large masses, it

damages native habitat by blocking out sunlight and decreasing dissolved oxygen concentrations. In 2008, giant salvinia was identified in Sam Rayburn Reservoir and has since proliferated to most nearby creeks and embayments (Driscoll and Ashe, 2013). Multiple resource agencies have deployed various measures to combat the spread of giant salvinia including herbicide use, biological controls, and public awareness and law enforcement.

Photo 2-3 Giant salvinia infestation on Sam Rayburn Reservoir (USACE Photo)

Table 2.5 lists the invasive species that occur on Sam Rayburn Reservoir fee lands. Data was retrieved from the FY2015 Project Site Invasive Species Records as reported in OMBIL and from the Project Operations Division.

Table 2.5 Invasive Species

Species	Type of Occurrence	Acreage Impacted	Percent Acreage Impacted
Aquatic Plants			
Alligator Weed *Alternanthera philoxeroides*	Minor	1,000	0.87%
*Bladderwort			
*Broadleaf Arrowhead			
*Coontail			
Fragrant Water Lily *Nymphaea odorata*	Minor	500	0.44%
*Frog's Bit			
Giant Salvinia *Salvinia molesta*	Significant/Major	2,750	2.40%
*Hydrilla *Esthwaite Waterweed*	Minor	25	0.02%
*Mosquito Fern			
*Parrot Feather			
*Pennywort			
Water Hyacinth *Eichhornia crassipes*	Significant/Major	5,000	4.36%
*Water Primrose			
Terrestrial Plants			
Chinese Tallow Tree *Triadica sebifera*	Moderate	3,000	2.61%
Japanese Climbing Fern *Lygodium japonicum*	Minor	100	0.09%
Torpedo Grass *Panicum repens*	Minor	5,000	4.36%
*Yaupon Holly *Ilex*	Significant/Major	2,500	2.18%
Animals			
Wild Boar *Sus scrofa*	Moderate	5,000	4.36%
Nutria			
Rasberry Crazy *Ant Nylanderia fulva*	Minor	1	0.00%
Red Imported Fire Ant *Solenopsis invicta*	Minor	350	0.30%

*Denotes Pest Species

Management Strategies by Species of Primary Concern:

Japanese climbing fern (JCF) is becoming more prevalent throughout the forested areas at Sam Rayburn. Foresters and NRM staff have noted the increasing presence of this pest in recent years. . The main concern with JCF is the high rate of spread. Efforts are being made to treat the larger patches via herbicide application, with plans to follow-up with a prescribed burning regimen.

Chinese Tallow continues to be a problem, with no relief to be seen in the future. The more significant effects of tallow are being seen in areas affected by recent hurricanes, where gap succession is taking place. Large areas of forestland that were once dominated by hardwood and wetland communities are now being

invaded by tallow trees. The current plan of attack for tallow follows a consistent regimen of herbicide application and burning where practical, but those management practices have been implemented only on a small portion of the affected area.

Feral hogs are becoming a major issue. Damage to ditches and right-of-ways along park roads are prevalent, in addition to small areas rooted up below the dam. Trapping and harvest by hunters are the primary control techniques.

Rasberry crazy ants were recently discovered in San Augustine Park and Hanks Creek Park. A native of South America, these ants are a recent arrival in southeast Texas. The ants are known to spread by infesting recreation vehicles and, like red imported fire ants, can cause damage to electrical equipment. An insecticide treatment in 2014 appeared to be effective, but re-infestation occurred the following year at San Augustine Park. No major issues with damaged electrical equipment have been encountered to date. Plans to incorporate treatment of park areas as a line item in a multi-year pesticide contract are in motion as well as monitoring all park areas for the presence of these ants.

Lastly, the aquatic invasive plant species management program at Sam Rayburn Project is growing at a rapid rate. Recent high water levels and mild winters have the total acreage of giant salvinia and water hyacinth at record highs. An MOU established in 2008 provides a framework of cooperation between the Lower Neches Valley Authority, TPWD, and USACE working together to address invasive aquatic plants with a coordinated herbicide application. Currently, LNVA provides funding and contractual support for the herbicide application, TPWD provides technical guidance (although in 2015 they began to supplement LNVA with additional funding for herbicide application costs), and USACE provides the necessary herbicide. In late 2016 the state legislature provided a major funding appropriation supporting TPWD and contributing considerably to the program at Sam Rayburn Reservoir. Major areas of infestation are above Marion Ferry boat ramp, above Ralph McAllister boat ramp, and above the Ayish Bayou boat ramp at Hwy 83. Negative impacts from giant salvinia and water hyacinth include severely reduced recreation opportunity, degraded water quality, reduced fishery potential, and possible impact to hydropower generation.

An agreement was reached in 2012 with the USACE Lewisville Aquatic Research Facility for one of their biologists to rear and release giant salvinia weevils on Sam Rayburn. The weevils consume giant salvinia and thus reducing the spread in backwater areas that are not accessible by boat. This effort continues today and shows promise to be a highly effective tool to combat giant salvinia on Sam Rayburn Reservoir. Challenges remain as significant changes in lake elevation, combined with the wrong combination of mild/harsh winters, have caused increases in the acreage of aquatic invasive species higher than ever witnessed before, and have also made establishing a stable weevil population difficult.

2.2.6 Mineral and Timber Resources

Mineral Resources

The Texas Railroad Commission database shows a moderate level of oil and gas exploration and production activity in the counties surrounding Sam Rayburn Reservoir. These oil and gas resources are located in the less productive portion of the Haynesville-Bossier formation that straddles a large segment of the southern boundary between Texas and Louisiana. The formation is within the much larger Texas-Louisiana-Mississippi Salt Basin. The majority of producing wells located on or very near USACE land are located in the counties of San Augustine, Sabine, and Jasper. Another area of moderate drilling and production activity is located west of the town of Etoille in Angelina and Nacogdoches counties, west of FM 226 and north of SH 103. Several plugged and producing oil and gas wells have been directionally drilled into deposits located beneath the reservoir.

Most of the minerals underlying USACE-administered land at Sam Rayburn Reservoir are privately owned with the exception of the immediate area underlying Sam Rayburn Dam and a few other isolated tracts. In general terms, during the land acquisition process for the Sam Rayburn Reservoir, the mineral estate underlying the dam was purchased by the federal government as a precautionary measure to protect the integrity of the dam structure. Should oil and gas exploration occur within this federally-owned mineral estate, the leasing of the minerals would be administered by the Bureau of Land Management, U.S. Department of the Interior. Any leasing of the minerals would be subject to stipulations imposed by USACE. Currently, with few exceptions, the stipulations used in the USACE, Fort Worth District, do not allow surface occupancy of federal lands for the extraction of federally-owned minerals. Exploration and extraction of privately owned minerals may, in some cases, be allowed to occur on USACE-administered federal lands at Sam Rayburn Reservoir. USACE rules require that the integrity of the dam and related facilities are not at risk and every precaution is taken to reduce the risk of pollution and other environmental damage to the lands and waters of the lake.

Another aspect of oil and gas exploration activity near Sam Rayburn Reservoir is geophysical, or seismic surveys. These surveys are typically conducted over moderately large areas that may cover as much or more private land as federal land. These surveys may be permitted on USACE-administered land with conditions that protect and restore natural resources. Oil and gas exploration activity that takes place on National Forest lands adjacent to Sam Rayburn Reservoir is administered by the U.S. Forest Service.

Timber Resources

As described in previous sections of this Plan, the majority of project lands above the conservation pool elevation of 164.4 NGVD are forested with a mix of tree species representative of the Piney Woods ecoregion. This forested land, consisting of approximately 17,700 acres is managed for multiple uses, one of which is a sustainable supply of timber. Management of forests on USACE lands nationwide is

guided, in part, by policy set forth in Public Law 86-717, the Forest Cover Act, which states that "…project lands shall be developed and maintained to assure a future supply of timber through sustained yield programs to the extent that such management is practicable and compatible with other uses of the project." Additional forest management guidance is set forth in USACE regulations ER & EP 1130-2-540 which specifies that stewardship of project land shall be ecosystem based. Meeting the intent of the Forest Cover Act, USACE regulations, and the public interest expressed in the formulation of the Master Plan has resulted in management objectives that are set forth in Chapter 3 of this Plan.

The selective harvest of timber on USACE lands at Sam Rayburn Reservoir has occurred on a routine basis since the late 1970's. In addition to the planned sale of timber, periodic major flood events, such as occurred in 1990 and 2015, as well as storm events such as hurricanes Rita and Ike, result in the salvage of merchantable timber. These past flood events and hurricanes have had a major impact on the forests at Sam Rayburn Reservoir by significantly reducing the density of the forest, particularly along the shoreline in areas lying below elevation 170' NGVD. Flood or storm-killed timber must be harvested quickly to obtain the highest value possible. Timber harvested on USACE lands is sold through a competitive bidding process. In general, timber harvest plans are prepared by project staff and forwarded to the Fort Worth District office where an invitation for bids is prepared and administered.

Photo 2-4 Dead timber due to the effects of long term inundation from the spring floods of 2015. The killed vegetation goes up to elevation 174' NGVD

Revenue generated by the sale of timber on USACE lands is, in most cases, returned to USACE for conducting land management activities on the project area where the revenue was generated. In times of national emergency or urgent, unplanned repair of critical USACE infrastructure, timber sale revenue could be diverted to higher priority needs.

Table 2.6 Volume of Timber Harvest at Sam Rayburn 2001-February 2016

		Marked Timber Sales				Salvaged Timber	
Year		**Acres**	**Sawtimber**	**Pulpwood**		**Sawtimber**	**Pulpwood**
(fiscal)			*(thousand board ft.)*	*(cords)*		*(thousand board ft.)*	*(cords)*
2001		397	848	1108		38	58
2002		273	550	805		327	346
2003		313	463	753		2	4
2004		384	707	1121		5	11
2005		0	0	0		23	60
2006		208	848	953		232	326
2007		0	0	0		72	570
2008		263	773	763		35	215
2009		0	0	0		42	91
2010		0	0	0		9	682
2011		350	884	1703		269	441
2012		0	0	0		75*	350*
2013		330	1057	400		35*	250*
2014		284	539	218		0	0
2015		95	126	60		0	0
2016**		192	387	396		457**	5,262**

* Estimated

** Salvage totals as of March 1, 2016

The volume of timber harvested from project lands through planned sales each year can vary considerably depending on timber and weather conditions, as well as flood risk management operations. Table 2.6 provides a listing of timber volumes sold in recent years. Those volumes that resulted from the unplanned sale of salvage timber are duly noted. Management of the timber resource at Sam Rayburn Reservoir involves numerous tasks and regulatory requirements including, but not limited to, prescription burning, timber cruising and marking, reforestation, road maintenance, preparation of harvest plans, and timber sale oversight. Protection and improvement of wildlife habitat, especially streamside management zones, is given high priority in management decisions. Timber harvests and other forest management activities are planned and scheduled within the 5-year Operational Management Plan, which is updated annually.

Photo 2-5 Timber marked for thinning (USACE Photo)

Photo 2-6 Prescribed fire under RCW cluster near Ebenezer Park (USACE photo)

In summary, the timber resource on USACE lands is managed for multiple purposes including wildlife habitat, recreational activities in parks, landscape aesthetics, and timber. More detailed information on forest management is included in Chapter 5 – Resource Plan.

2.2.7 Water Quality

Existing water quality at Sam Rayburn Reservoir is affected by municipal discharge, rainfall and associated storm water flows originating from natural, agricultural, residential, and commercial runoff, as well as industrial point and nonpoint sources. TCEQ sets and implements standards for surface water quality to improve and maintain the quality of water in the state based on various beneficial use categories for the water body. The Texas Integrated Report of Surface Water Quality, pursuant to the Clean Water Act Sections 305(b) and 303(d), evaluates the quality of surface waters in Texas and identifies those that do not meet uses and criteria defined in the Texas Surface Water Quality Standards (TSWQS). The Texas Integrated Report describes the status of Texas' natural waters based on historical data, and assigns waterways to various categories depending on the extent to which they attain the TSWQS. Furthermore, the EPA must approve the 303(d) list before it can be finalized.

Water bodies are divided into and evaluated by defined, classified segments. Sam Rayburn Reservoir is divided into two classified segments: Sam Rayburn Reservoir (Segment ID: 0610) and Angelina River/Sam Rayburn Reservoir (Segment ID: 0615). According to the 2012 Texas Integrated Report Index of Water Quality Impairments, mercury in fish was identified as the only pollutant parameter not meeting assigned water quality standards in the Sam Rayburn Reservoir segment. In the Angelina River/Sam Rayburn Reservoir segment depressed dissolved oxygen, impaired fish community, and mercury in edible tissue were identified as parameters not meeting water quality standards. When water quality standards are not met, total maximum daily loads (TMDLs) of pollutants for the specific body of water is developed or scheduled for development. Note that the 2014 Texas Integrated Report Index of Water Quality Impairments is in draft and will be used to update this document and on future documents regarding this project when it receives final approval from the EPA.

The Sam Rayburn Reservoir segment is physically described as from the Sam Rayburn Dam in Jasper County to three and a half miles upstream of Marion's Ferry on the Angelina River and two and a half miles downstream of Curry Creek in the Attoyac Bayou. The reservoir is further divided into ten assessment units: Sam Rayburn main pool by the dam to the Bear Creek and Ayish Arms (0610_01), Sam Rayburn lower Angelina River arm (0610_02), Sam Rayburn mid-Angelina River arm area near SH 147 (0610_03), Sam Rayburn upper mid-Angelina River arm

(0610_04), Sam Rayburn lower Attoyac Bayou arm(0610_05), Sam Rayburn upper Attoyac Bayou arm (0610_06), Sam Rayburn upper Angelina arm (0610_07), Sam Rayburn Bear Creek arm (0610_08), Sam Rayburn lower Ayish Bayou arm (0610_09), and the Sam Rayburn upper Ayish Bayou arm (0610_10).

All Sam Rayburn Reservoir assessment units listed above have identified mercury in edible tissue as a parameter not meeting water quality standards. Additionally, they are all also listed in the 2012 Texas Integrated Report—Texas 303(d) List, dating back to the year 1996. Only segments/assessment units identified as requiring restrictions on effluent discharges in order to implement water quality standards based on TMDLs of identified pollutants are listed in the 303(d) document. Currently, all assessment units for this segment are awaiting further data collection/evaluation before a management strategy is selected for addressing the mercury in edible tissues.

The Angelina River/Sam Rayburn Reservoir (segment 0615) also contains pollutant parameters not meeting water quality standards including depressed dissolved oxygen, impaired fish community, and mercury in edible tissue. Furthermore, it was determined that additional information will be collected/evaluated before a management strategy is selected to address the mercury in edible tissue and impaired fish community parameters. A review of the standards for depressed dissolved oxygen will be conducted prior to strategy selection for that particular parameter. This segment is also currently found on the 303(d) list, first listed in 2002.

The 2012 Texas Integrated Report Water Bodies with Concerns for Use Attainment and Screening Levels identifies segments near the study area as having some level of concern for various parameters. Assessment of each beneficial use is accomplished by applying several assessment methods. These methods often have several criteria or screening levels that are used to evaluate assessment parameters. Use attainment assessment methods are used to determine use support and concerns for near-nonattainment. Water quality concerns are determined based on a defined amount exceeding the screening levels and potential lack of information in data sets used to evaluate various parameters.

Due to the presence of pollutants, specifically mercury and dioxins, the Texas Department of State Health Services (TDSHS) issued a fish and shellfish consumption advisory on 24 January 2014 for the Neches River Basin (including B.A. Steinhagen and Sam Rayburn Reservoirs). Consumption advisories do not apply to all species, rather only blue catfish (>30 inches), flathead catfish, gar, largemouth bass (>16 inches), smallmouth buffalo, and spotted bass (>16 inches). Mercury and other pollutants enter the food web via ingestion/absorption by plants, aquatic invertebrates, and other small organisms that make up the prey base. As larger organisms prey on smaller organisms, bioaccumulation occurs such that the larger predators exhibit higher concentrations of pollutants, as reflected in the

consumption advisory's size class specifications. Additionally, the advisory warns that women of childbearing age and children under the age of 12 should not eat the fish listed above as mercury is particularly dangerous to developing nervous systems. For additional detailed information regarding water quality at Sam Rayburn Reservoir please refer to the TCEQ reports.

2.3 SOCIAL AND CULTURAL RESOURCES

2.3.1 Prehistoric

Current research suggests the area around Sam Rayburn Reservoir has been occupied since the Paleo-Indian Period. This period is estimated to have lasted from 12,500-8,000 year before present (B.P.). Broadly, these earliest inhabitants were nomadic hunters and gatherers. Unfortunately, their highly-mobile lifestyle left a relatively sparse archeological record. Much of the evidence for their presence comes from the projectile points they left behind. These finely-crafted points are typically made from high-quality stone from regions outside East Texas-supporting the belief that these Paleo-Indians traveled extensively across the landscape. Often, these projectile points and other Paleo-Indian artifacts are discovered on the surface or mixed with artifacts from later inhabitants. Extensive, intact Paleo-Indian sites are not characteristic of the area.

Over time, the Paleo-Indian Period gave way to the Archaic Period. This vast expanse of prehistory began around 8,000 years B.P. and lasted to about 2200 B.P. in East Texas. As the climate regime shifted away from the cooler climate of the Paleo-Indian Period to one warmer and drier than today, Archaic Period peoples gradually became more sedentary. Populations increased and archeological sites can be found on a wide variety of landforms. The environment of Deep East Texas provided them with a multitude of plant and animal resources. It did not, however, provide them with high-quality materials for stone tool making. During the Archaic Period, we see increasing use of local materials, which around Sam Rayburn Reservoir, consist of pebble cherts and petrified wood. Regardless, Archaic Period inhabitants expanded their toolkit and made other adaptations to the local environment that allowed for population growth over time.

The Woodland Period is generally recognized to have begun by 2200 B.C. and lasted until around 800 A.D. During the Woodland Period, ceramics are first seen in the area. Plainware ceramics of what is known as the Mossy Grove tradition are found in the area around Sam Rayburn Reservoir along with decorated types influenced by the Woodland Period cultures of the Lower Mississippi River valley to the east. Arrow points recovered from many of these sites indicate the adoption of the bow and arrow during this period. While it's generally believed that these Woodland Period cultures were still hunting and foraging, squash and native plant cultivation appears to have begun in earnest during this period. These peoples did settle some sites for long periods of time in the Angelina River basin around present-day Sam Rayburn Reservoir. Some of these sites were quite large, covering several

acres. Additionally, we see the beginnings of mound building, along with complex, intentional burial practices.

The Caddo Period began around 800 A.D. in East Texas and lasted until historic times. It is divided into the Formative, Early, Middle, Late, and Historic Caddo Periods. The Angelina River basin in the area of present Sam Rayburn Reservoir is at the southern edge of what is recognized as the Caddo homeland. These peoples shared many social and political similarities. By the beginning of the Middle Caddo Period in 1200 A.D., the Caddo were successful agriculturalists that came to rely a great deal on cultivation of corn. Permanent settlements with many mounds, elaborate burials, and structures such as grass houses were common. The Caddo produced a wide variety of ceremonial and utilitarian ceramic vessels that are distinctive and impressive. Vast trade networks were established in this time period, with the Caddo trading for items such as salt, bison hides, marine shell, copper, and turquoise. Numerous Caddo occupations are found in the area of Sam Rayburn Reservoir. Late Caddo Period communities in the area are typically classified as belonging to the somewhat vaguely-defined Angelina Phase.

The Historic Caddo Period is defined in Texas as the period that began with sustained European contact during the 1680s and continuing through their removal from East Texas in 1859. Historic Caddo settlements along the Angelina River in the vicinity of modern day Sam Rayburn Reservoir consisted of small farmsteads. The Caddo group closest to Sam Rayburn Reservoir was the Hasinai Confederacy. During the Historic Caddo Period, they ranged from the Angelina and Neches Rivers northward to Big Cypress Bayou in East Texas.

The Caddo were able to use the competing interests of the French and Spanish colonizers of East Texas and Louisiana to their advantage, gaining guns, horses, and previously unavailable metal tools. Recognized as a “friendly tribe,” the Caddo were valued allies that aided their European neighbors in altercations against other, more hostile groups. However, the various interruptions of the traditional Caddo way of life caused by European exploration and settlement caused the Caddo population to dwindle drastically. After the Texas War of Independence, the Caddo, along with many migrant tribes from further east, were forced from East Texas. They ultimately were relocated to Indian Territory in Oklahoma by 1859.

2.3.2 Historic

The period of European exploration and settlement and the subsequent Anglo-American and African-American development of the area of Sam Rayburn Reservoir is briefly covered in the remaining sections. Sam Rayburn Reservoir is spread across the five counties of Angelina, Jasper, Nacogdoches, Sabine, and San Augustine. The counties share similar histories and economies.

Europeans initially entered the area as part of the Spanish de Soto *entrada* in 1542. De Soto, by this point, had perished. Luis de Moscoso de Alvarado led the

remnants in an attempt to reach New Spain. The effort failed, and the party retraced its route, eventually descending the Mississippi River to the Gulf of Mexico. It is believed the expedition crossed the Angelina River somewhere around Nacogdoches, along existing prehistoric trails.

Further attempts at exploration of the region stagnated until 1682, when the French explorer La Salle claimed the Mississippi River and its tributaries for France. This encouraged the Spanish to focus more attention on the region. Father Damian Massanet established Mission San Francisco de los Tejas and Mission Santisimo Nombre de Maria near the Neches River, the first of several missions and presidios to eventually be built in the region. Soon, a royal road, or *Camino Real,* would link the area to San Antonio and, ultimately, Mexico. This road traversed the Pineywoods north of present-day Sam Rayburn Reservoir at Nacogdoches. From there, it continued to San Augustine, and eventually to Nuestra Señora del Pilar de Los Adaes, the eastern-most of the Spanish presidios in a part of Spanish Texas that eventually became western Louisiana. In 1762, the aftermath of the Seven Years War, the French ceded the adjacent Louisiana Territory to the Spanish. This reduced the need for the frontier missions and presidios. As a result, Los Adaes was abandoned and its occupants told to resettle at San Antonio. After a brief stay, Antonio Gil Ibarbo led many of the old presidio's occupants back to East Texas, where they settled at Nacogdoches.

Anglo-American settlement of East Texas increased after Louisiana was sold to the United States in 1803. However, the area adopted a lawless, frontier character due to the fact that the international boundary with the United States was in dispute. From 1803 to 1819, Spain and the United States contested the ownership of the area from the Sabine River, east to the old French settlement at Natchitoches. Some in the United States viewed the Neches River or even the Rio Grande as the true boundary. The area was referred to as the "Neutral Strip" or the "Sabine Free State." The boundary was settled at the Sabine River with the Adams-Onis Treaty in 1819. But the impact of that time without firm government rule would reverberate in western Louisiana and East Texas for many years.

Texas's independence in 1836 and ultimate statehood only increased settlement in the area. Soon, a cotton and corn-based agricultural economy developed. Eventually, the Angelina River saw steamboat traffic carrying crops to the coast and, likewise, ships from further south bringing manufactured wares for sale upstream. Marion, originally called McNeill's Landing, was one of the earliest Euro-American settlements around present-day Sam Rayburn Reservoir. It was settled by 1828 and served as the seat of newly-formed Angelina County from 1846 until 1854. Another nearby settlement was established at Patton's Landing, later called Pattonia. Neither of these settlements survived into the 20th century.

During the Civil War, the area avoided the direct, typically disastrous impacts felt by other parts of the South. Local farmers, ranchers, and merchants profited by

supplying crops, cattle, timber, and other materials to the war effort. But in the immediate aftermath of the war, the addition of the 13th Amendment to the U.S. Constitution and a Radical Republican administration installed in Austin resulted in the loss of the sizeable workforce of enslaved Africans. The local population immediately declined in some of the counties around Sam Rayburn Reservoir. However, economic conditions began to improve and the population increased within the next decade.

By the 1880s, the railroad came to the area. Chiefly, it serviced the rapidly-expanding timber industry. But in Angelina County, it also allowed great access to markets for other crops, as well. Acreage planted in cotton increased in the era of the railroad. Over the next 50 years, multiple rail lines traversed East Texas, ending riverboat traffic on the Angelina River. Sawmills and their associated communities sprang up in numerous locations around the present-day reservoir, with rail lines carrying lumber to cities such as Houston, New Orleans, Shreveport, and Kansas City. Angelina County's population increased five-fold from the post-Civil War period to 1940.

In the mid-1930s, the Angelina and Sabine National Forest were created around present-day Sam Rayburn Reservoir. While the forests were a boon for conservation and the then-new sustainable forestry effort, there was undoubtedly a negative economic impact, as many tens of thousands of acres of land were taken out of private ownership. Post-World War II, the region enjoyed the same boom that much of the United States experienced. Nearby Lufkin developed as a large center of trade in Deep East Texas and, along with Diboll, as a center of a more sustainable timber industry. For many years of the 20th century, increased urbanization saw the population decrease in many of the counties surrounding the reservoir, with the exception of Angelina County.

In 1956, construction began on Sam Rayburn Reservoir. Authorized in 1945 as McGee Bend Reservoir, it was not funded until 10 years later. Originally slated to be one of four reservoirs on the Angelina and Neches Rivers, it was one of two (along with B.A. Steinhagen Lake) ultimately constructed. In 1963, the name was changed to honor the late Sam Rayburn, the Texas politician that served as Speaker of the U.S. House of Representatives for many years. The reservoir reached conservation pool in 1966. Through to the present, the reservoir and adjacent national forests have attracted many to the area in pursuit of fishing and outdoor recreation.

2.3.3 Previous Investigations at Sam Rayburn Reservoir

The earliest archeological studies conducted within the current fee boundary of Sam Rayburn Reservoir were performed with funding of the Depression-era Works Progress Administration (WPA) in the late 1930s. Further work was conducted during the post-World War II River Basin Surveys conducted by the National Park Service and Smithsonian in anticipation of future reservoir

construction. This was followed shortly thereafter by the Texas Archeological Salvage Project. Excavations related to this work were conducted by Edward Jelks. Prominent among sites excavated by Jelks was the Jonas Short site, a mound dating to the Woodland Period. Various sites were recorded through the 1980s either through small-scale efforts or opportunistically by USACE personnel, U.S. Forest Service personnel, volunteers, and avocational archeologists and collectors. The 1990s saw the beginning of current era of larger-scale efforts related to timber management activities by cultural resource management firms contracted by USACE. To date, archeologists have inventoried just over 13,000 acres for cultural resources.

2.3.4 Recorded Cultural Resources

To date, 265 archeological sites have been recorded at Sam Rayburn Reservoir. None have been formally listed on the National Register of Historic Places (NRHP) and none have received the designation of "eligible" for NRHP inclusion. In some cases, this is due to the fact that the site might be inundated by the reservoir at its conservation pool level. In other cases, it's a result of the fact that limited NRHP eligibility testing has been performed at Sam Rayburn Reservoir.

2.3.5 Long-term Objectives for Cultural Resources

An Integrated Cultural Resources Management Plan (ICRMP) was developed and incorporated into the Operational Management Plan in accordance with EP 1130-2-540 in 2005 and will be updated in the near future. Such plans establish standard operating procedures pertaining to both USACE and external activities that might impact cultural resources. Completion of a full inventory of cultural resources at Sam Rayburn Reservoir is a long-term objective noted in Chapter 3 that is needed for compliance with Section 110 of the National Historic Preservation Act (NHPA). Currently, just under 75% of fee owned lands above the conservation pool of the reservoir have been inventoried. Ultimately, all currently known sites, as well as those found in future inventories should be evaluated to determine their eligibility for the NRHP. Sites of currently unknown NRHP eligibility and those found in the future to be eligible for the NRHP must be protected from impacts caused by USACE or those having easements Sam Rayburn Reservoir fee lands. All future cultural resource activities will be coordinated with the State Historic Preservation Officer at the Texas Historical Commission and with the federally-recognized Caddo Nation of Oklahoma, who recognize the area as part of their historic homeland, in order to insure compliance with the National Historic Preservation Act, the Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act.

2.3.6 Current Demographics, Economics, Trends and Analysis

The zone of interest for the socio-economic analysis of the Sam Rayburn Reservoir consists of Angelina, Jasper, Nacogdoches, Newton, Sabine, San Augustine, and Tyler Counties in Texas. The reservoir lies within Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties. Newton and Tyler are surrounding counties of Jasper County.

2.3.7 Population

The total population for the zone of interest is 243,119, as shown in Table 2.7. Approximately 36% of the population is in Angelina County; 27% in Nacogdoches County; 15% in Jasper County; 9% in Tyler County; 6% in Newton County; 4% in Sabine County; and 3% in San Augustine County. The population in the zone of interest makes up approximately 0.9% of the total population of Texas. From 2014 to 2040, the population in the zone of interest is expected to increase to 286,614, an annual growth rate of 0.6% per year, with the only negative growth occurring in Newton and San Augustine Counties. By comparison, the population of Texas is projected to increase at an annual rate of 1.2% per year.

Table 2.7 2013 Population Estimates and 2040 Projections

Geographical Area	2000 Population Estimate	2014 Population Estimate	2040 Population Projection
Texas	20,851,820	26,956,958	36,550,595
Angelina County	80,130	87,750	105,199
Jasper County	35,604	35,552	38,274
Nacogdoches County	59,203	65,301	88,150
Newton County	15,072	14,138	13,972
Sabine County	10,469	10,350	10,980
San Augustine County	8,946	8,610	8,560
Tyler County	20,871	21,418	21,479
Zone of Interest Total	**230,295**	**243,119**	**286,614**

Source: U.S. Bureau of the Census, Population Division (2000 & 2014 Estimates); Texas State Data Center, The University of Texas at San Antonio (2040 Projections)

The distribution of the population among gender, as shown in Table 2.8, is approximately 49.2% male and 50.8% female in the zone of interest, which is very similar to the overall gender distribution in Texas. The female population is slightly higher than the male population in Nacogdoches County at approximately 48% male and 52% female, whereas the male population is slightly higher in Tyler County at approximately 55%.

Table 2.8 2013 Percent of Population Estimate by Gender

Geographical Area	Male	Female
Texas	12,949,685	13,142,348
Angelina County	42,779	44,654
Jasper County	17,592	18,234
Nacogdoches County	31,158	34,164
Newton County	7,233	7,090
Sabine County	5,139	5,412
San Augustine County	4,254	4,523
Tyler County	11,759	9,793
Zone of Interest Total	**119,914**	**123,870**

Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate)

Figure 2.2 and Figure 2.3 show the population by age group. The distribution by age group is similar among the counties, zone of interest, and the state overall in terms of percentage of the population. The largest age group in the zone of interest is the 45 to 54 group, which makes up 13% of the zone of interest population. This group makes up approximately 13% of the state's population as well; however, the largest age group in the state of Texas is the 25 to 34 group which makes up approximately 14% of the population.

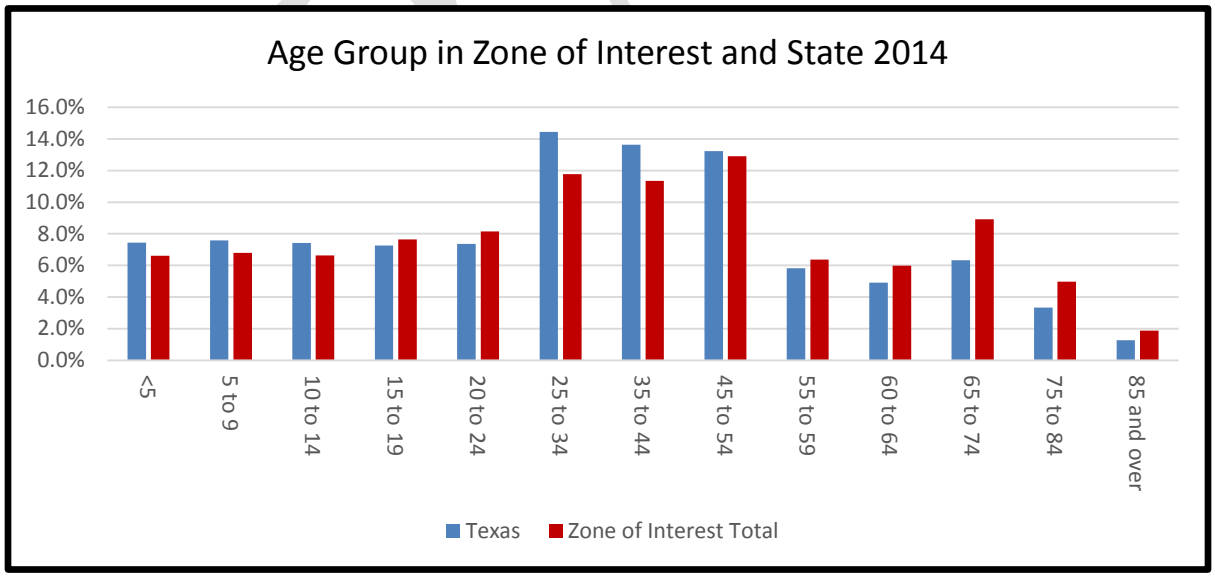

Figure 2-2 Age Group in Zone of Interest and State (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

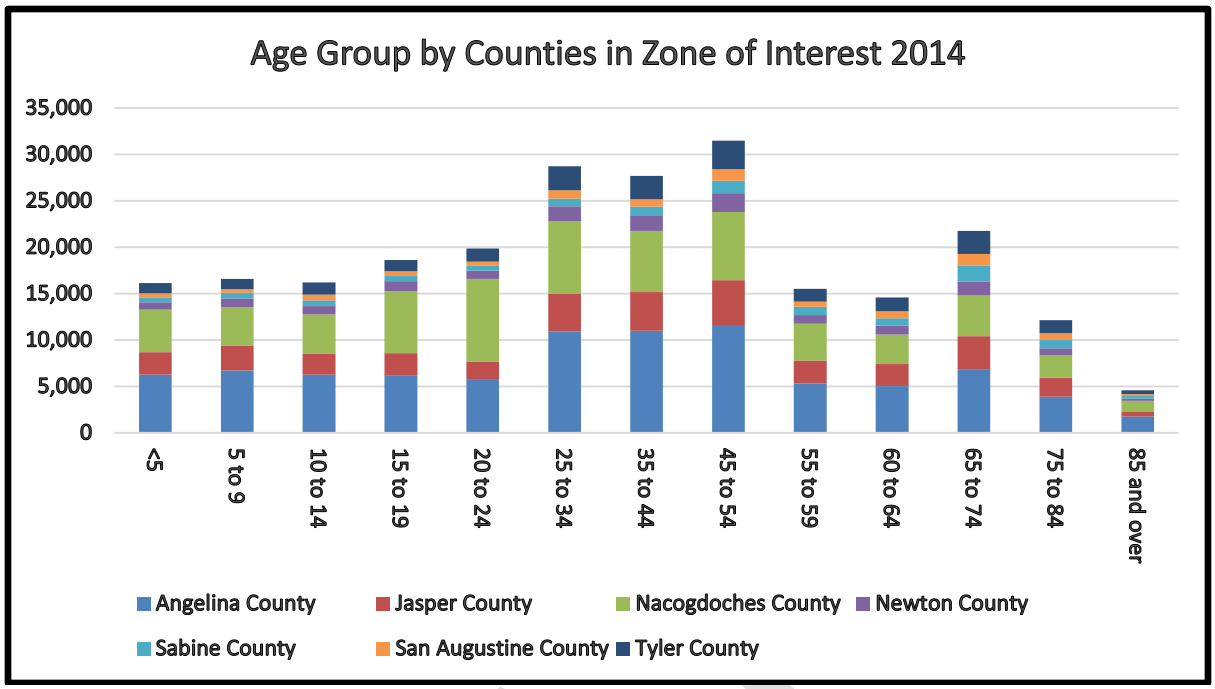

Figure 2-3 Age Group by County in Zone of Interest 2014 (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

Population by race and Hispanic Origin is displayed in Figure 2.4. For the zone of interest, 67% of the population is White, 16% Black, 14% Hispanic, 1% Asian, and 1% two or more races. The remainder of the races each makes up less than 1% of the zone of interest's population. By comparison, for the state of Texas, 44% of the population is White, 38% Hispanic, 12% Black, 4% Asian, and 1% two or more races, with the remaining making up less than 1% each of the state's population.

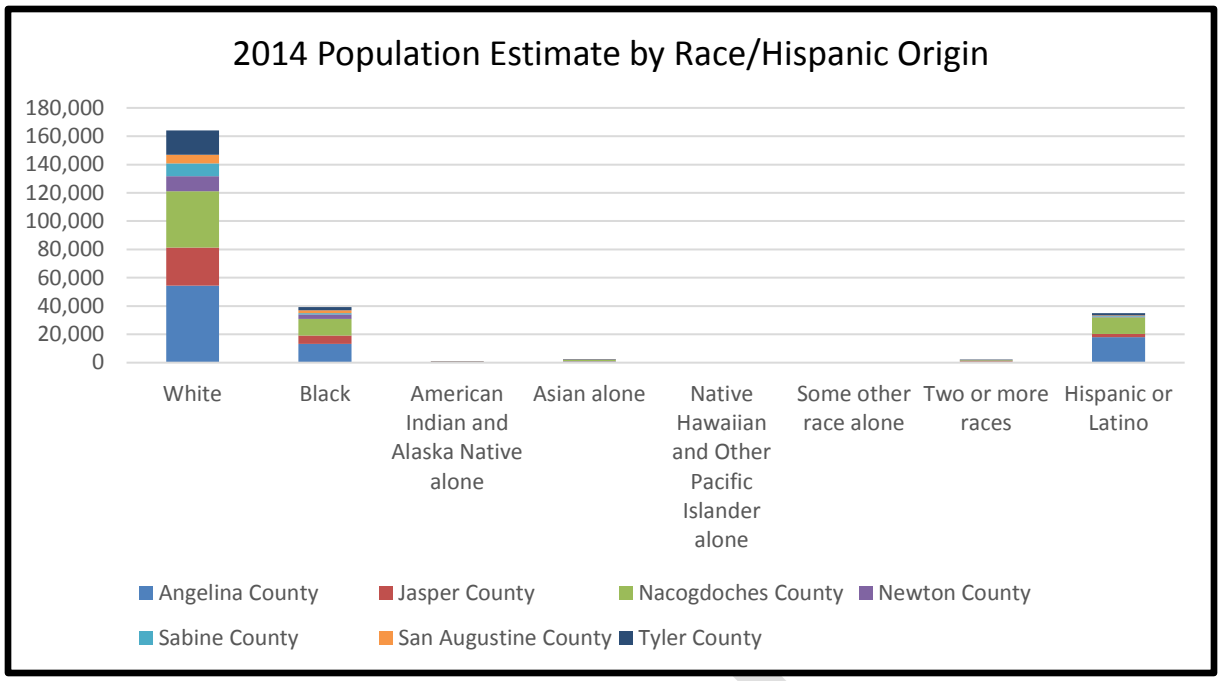

Figure 2-4 2014 Population Estimate by Race/Hispanic Origin (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

2.3.8 Education and Employment

In the zone of interest, for 36% of the population age 25 and older, the highest level of education attained is a high school diploma or equivalent (Figure 2.5). Twenty-four percent have some college, but no degree, 11% have 9th-12th grade education, but no diploma, 10% have a Bachelor's degree, 7% have less than a 9th grade education, 6% have an Associate's degree, and 5% have a graduate or professional degree. For Texas, 25% of the population a high school diploma or equivalent as the highest level of education attained, 23% has some college, but no degree, 18% has a Bachelor's degree; those with 9th-12th grade education, but no diploma, those with a graduate or professional degree, and those with less than a 9th grade education all account for 9% of the population; 7% has an Associate's degree.

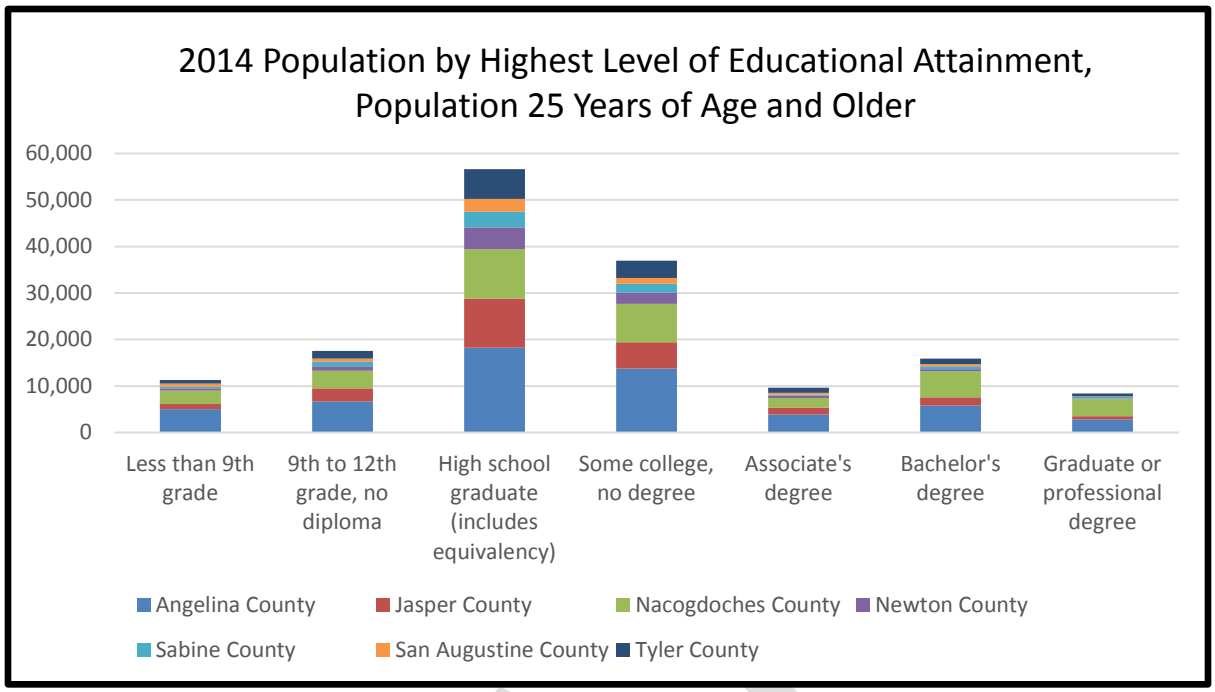

Figure 2-5 2014 Population by Highest Level of Education Attainment, Population 25 Years of Age and Older (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

The majority of the zone of interest is employed in the Educational Services, Health Care and Social Assistance Sector at 27%, followed by 12% in Manufacturing, 11% in Retail Trade; 9% in Construction; 8% in Arts, Entertainment, Recreation and Accommodation; 7% in Professional, Scientific, and Management Services; 6% in Agriculture, Forestry, Fishing and Hunting, and Mining; 5% in Other services, except Public Administration (Figure 2.6). The remaining sectors employed less than 5% each of the zone of interest's civilian workforce. Similarly, the largest employment sector for Texas is also Educational Services, Health Care and Social Assistance, with 22%, of the total employment. While the distribution of civilians employed in each sector are similar between the zone of interest and the state, the largest discrepancy is in the Professional, Scientific, and Management Services sector which employs 4% more of the civilian labor force in the state of Texas as compared to the zone of interest.

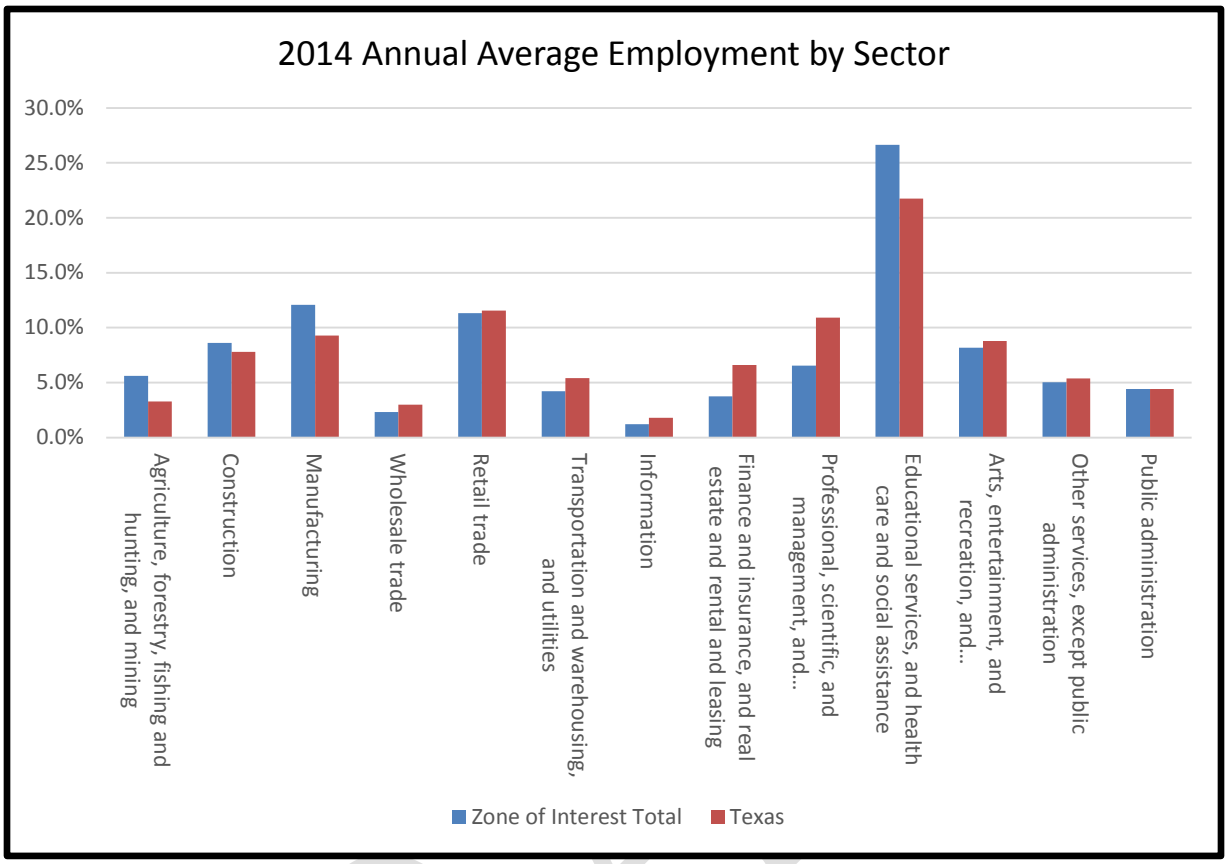

Figure 2-6 2014 Annual Average Employment by Sector (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate)

The civilian labor force in the zone of interest (Figure 2.7) accounts for only 0.8% of the civilian labor force of Texas. The unemployment rate is higher in the zone of interest, at 6.4%, compared to that of Texas, at 5.1%. Angelina and Nacogdoches Counties' unemployment rates are comparable to Texas, at 5.2% and 5.3% respectively, while all other counties in the zone of interest have unemployment rates between 8.0% and 10.6%.

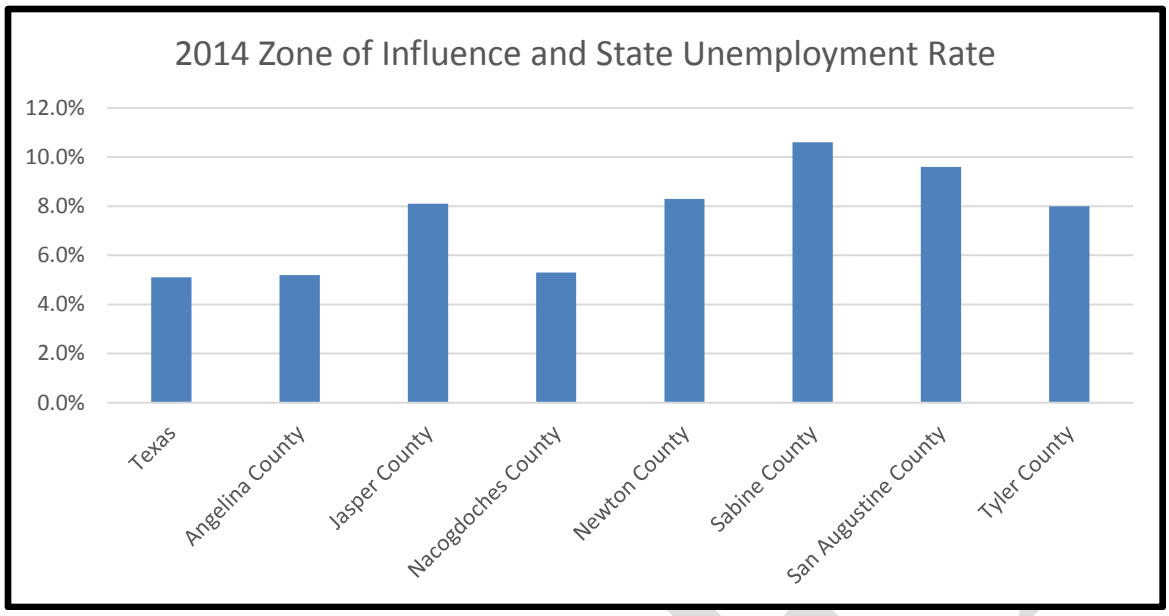

Figure 2-7 2014 Zone of Influence and State Unemployment Rate (Source: Bureau of Labor Statistics, Local Area Unemployment Statistics (2014 Annual Average)

2.3.9 Households and Income

There are approximately 9 million households in the state of Texas, with an average household size of 2.83 persons. There are approximately 87,000 households in the zone of interest with an average household size of 2.8 persons.

The median household income is lower in each of the counties than the State overall (Figure 2.8). The median household income in the zone of interest ranges from $29,293 in San Augustine County to $42,374 in Angelina County, whereas the median household income for the state of Texas is $52,576. The zone of interest per capita income, at $20,586, is also less than Texas at $26,513. Per capita incomes in the zone of interest range from $18,177 in San Augustine to $21,521 in Angelina County (Figure 2.9).

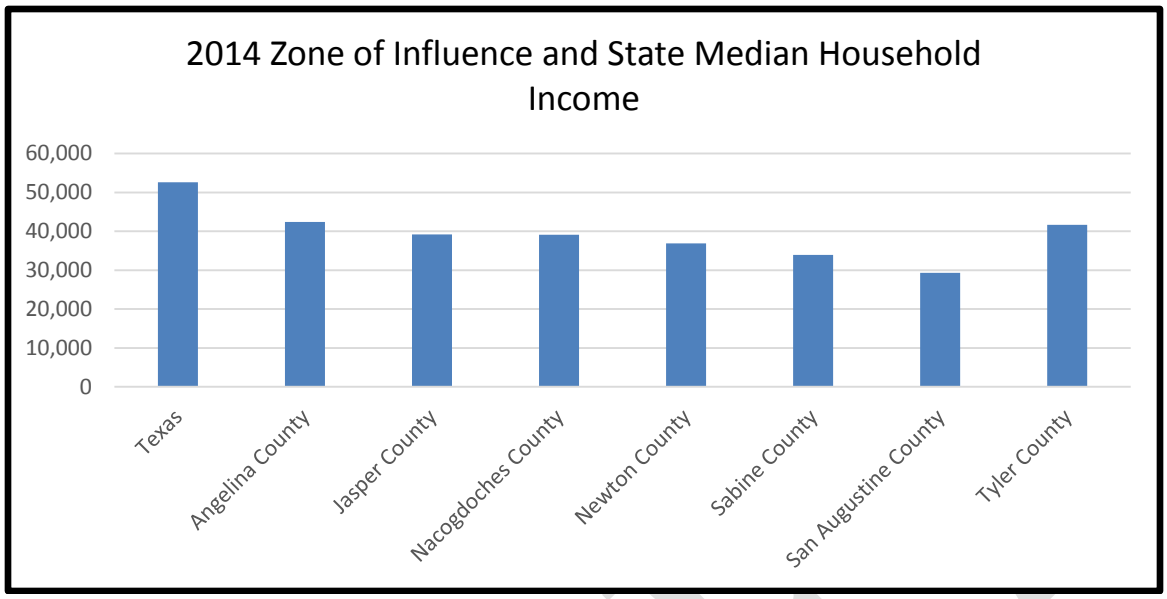

Figure 2-8 2014 Zone of Influence and State Median Household Income (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

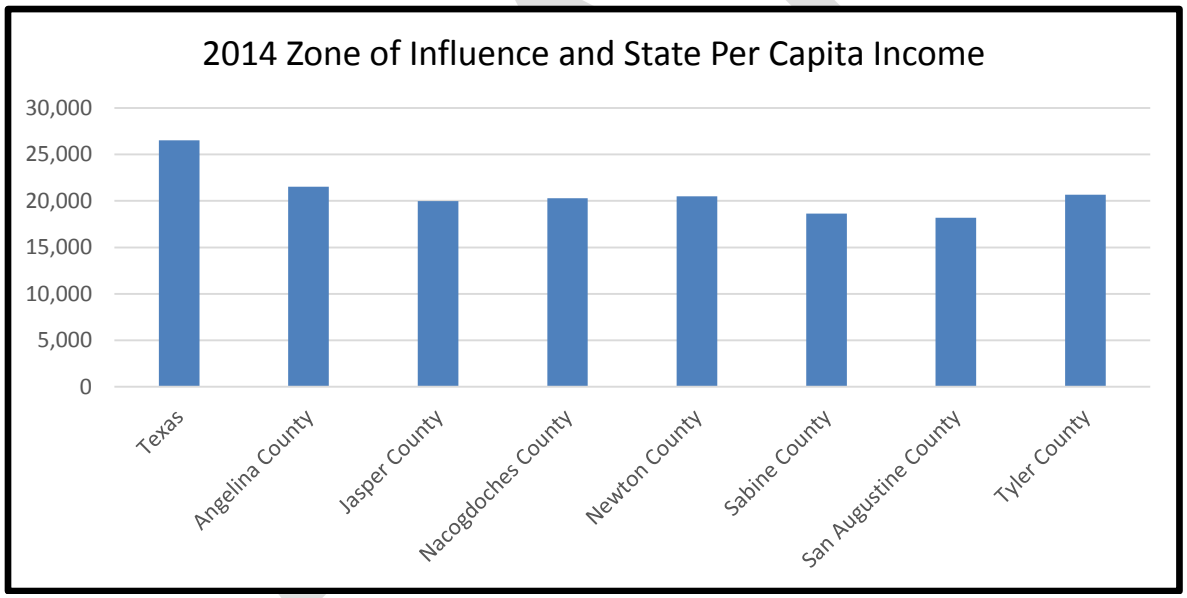

Figure 2-9 2014 Zone of Influence and State Per Capita Income (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate))

The number of persons whose income was below the poverty level is greater in the zone of interest (20.5%) as compared to Texas (17.7%). Newton County had the fewest persons below the poverty level, with 14.9%, followed by Tyler County with 15.8%, Jasper County with 17.9%, Angelina County with 20.0%, Nacogdoches and San Augustine with approximately 24% each, and then Sabine County with 25.4%. (Figure 2.10).

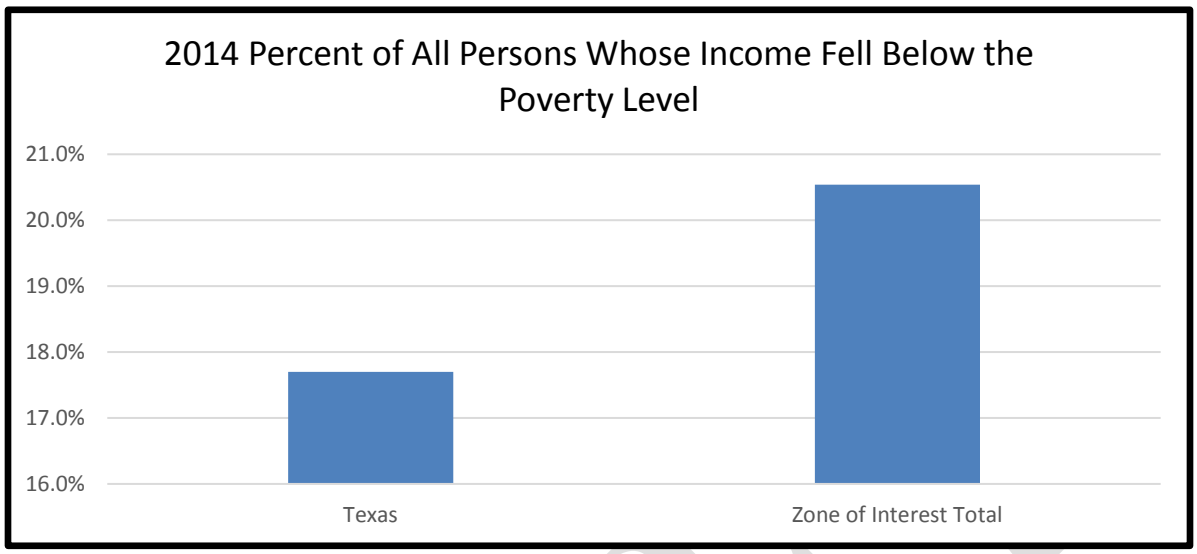

Figure 2-10 2014 Percent of Persons in Poverty – State and Zone of Interest (Source: U.S. Bureau of the Census, 2010-2014 American Community Survey, 5-Year Estimates (2014 Estimate)

2.4 RECREATION FACILITIES, ACTIVITIES, AND NEEDS

2.4.1 Zone of Influence

The primary area of influence for Sam Rayburn Reservoir encompasses portions of Angelina, Jasper, Sabine, San Augustine, and Nacogdoches Counties. Data from this five-county region provides the basis for summarizing the population characteristics of Sam Rayburn Reservoir, and indicate that the area has a modest growth rate of 3.5%, or 4,503 persons, since 2000.

2.4.2 Visitation Profile

The majority of visitors to Sam Rayburn Reservoir come from a 100-mile radius of the reservoir. These visitors are a diverse group of people with a wide variety of interests. Examples of visitors include campers who utilize the campgrounds around the reservoir and in the county and federally operated parks; adjacent residents; hunters and anglers who utilize hunting grounds and participate in fishing tournaments; marina customers who utilize the marinas on the reservoir; and day users who picnic, hike, bird watch, bicycle and ride horses. Sam Rayburn Reservoir is the primary location for water-related recreation, providing the public with a location for boating, sailing, canoeing/kayaking, paddle boarding, and swimming in the area. Sam Rayburn has consistently provided high quality angling opportunities for multiple fish species and is regarded as a premier fishing destination in Texas. On average Sam Rayburn Reservoir entertains approximately 1.5 million visits per year with the peak visitation months running from March through September and consistently generates record user fee collections compared to other USACE lake projects nationwide.

Table 2.9 Location Origin of Campsite Reservations made Through the NRRS

2012			2013		
County	**Reservations**	**Percentage of Total**	**County**	**Reservations**	**Percentage of Total**
Angelina	1,579	15.5%	Angelina	1,582	15.7%
Jasper	1,317	12.9%	Jasper	1,260	12.5%
Orange	1,221	12.0%	Orange	1,084	10.7%
Jefferson	839	8.2%	Jefferson	842	8.3%
Hardin	740	7.2%	Hardin	786	7.8%
Harris	541	5.3%	Harris	543	5.4%
Tyler	378	3.7%	Tyler	388	3.8%
Nacogdoches	293	2.9%	Nacogdoches	341	3.4%
Sabine	238	2.3%	Montgomery	272	2.7%
Montgomery	224	2.2%	Sabine	201	2.0%
TOTAL	**7,370**	**72.2%**	**TOTAL**	**7,299**	**72.3%**
Texas- other	1,879	18.4%	Texas- other	1,828	18.1%
Louisiana	371	3.6%	Louisiana	348	3.4%
other states	591	5.8%	other states	630	6.2%
Total Reservations	**10,211**	**100.0%**	Total Reservations	**10,105**	**100.0%**

2014		
County	**Reservations**	**Percentage of Total**
Angelina	1,399	14.6%
Jasper	1,200	12.5%
Orange	1,039	10.9%
Hardin	741	7.7%
Jefferson	727	7.6%
Harris	561	5.9%
Tyler	409	4.3%
Nacogdoches	323	3.4%
Montgomery	273	2.9%
Newton	200	2.1%
TOTAL	**6,872**	**71.9%**
Texas- other	1,780	18.6%
Louisiana	337	3.5%
other states	579	6.0%
Total Reservations	**9,568**	**100.0%**

Table 2.9 provides a summary of the top ten Texas counties where campsite reservations made through the National Recreation Reservation System (NRRS) originate. These counties are within 100 miles of the lake and it is notable that fully 25% of campsite reservations are made from other locations with approximately 9% coming from out of state each year. The years 2012-2014 were chosen for this table because lake elevations were conducive to recreational use during those years.

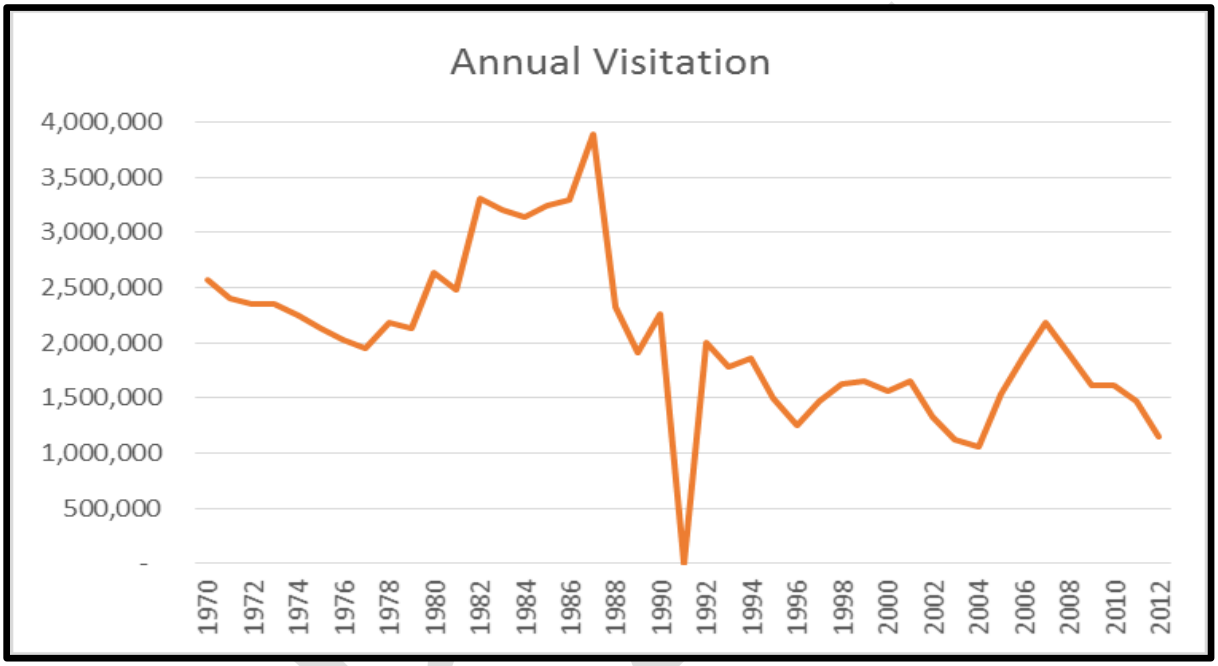

Figure 2-11 Annual Visitation

The annual visitation for Sam Rayburn Reservoir from 1970 to 2012 is shown in Figure 2.11. Information provided by OMBIL and USACE historical records. Information for 1991 was unavailable due to a major flood event that year. Table 2.10 below shows the annual visitation from 2005 to 2015. As shown, Sam Rayburn hosts an average of 1.6 million visitors ever year, with 2015 having a record two million visitors, in spite of historic flooding.

Table 2.10 Annual Project Visitation

Year	Visitation
2005	1,578,714
2006	1,761,650
2007	1,737,637
2008	1,650,879
2009	1,210,998
2010	1,963,702
2011	1,690,741
2012	1,553,221
2013	N/A
2014	1,108,944
2015	2,064,843
Annual Average	**1,632,133**

Source: OMBIL

2.4.3 Recreation Facilities

The existing recreational opportunities and future potential of Sam Rayburn Reservoir is considered to be of great importance within the project's zone of influence. The project offers many recreational activities such as swimming, boating, water skiing, fishing, hunting, picnicking, camping, as well as hiking, and horseback riding. Figure 2.12 below lists the various recreational facilities collectively provided at Sam Rayburn Reservoir through governmental agencies as well as commercial concessions.

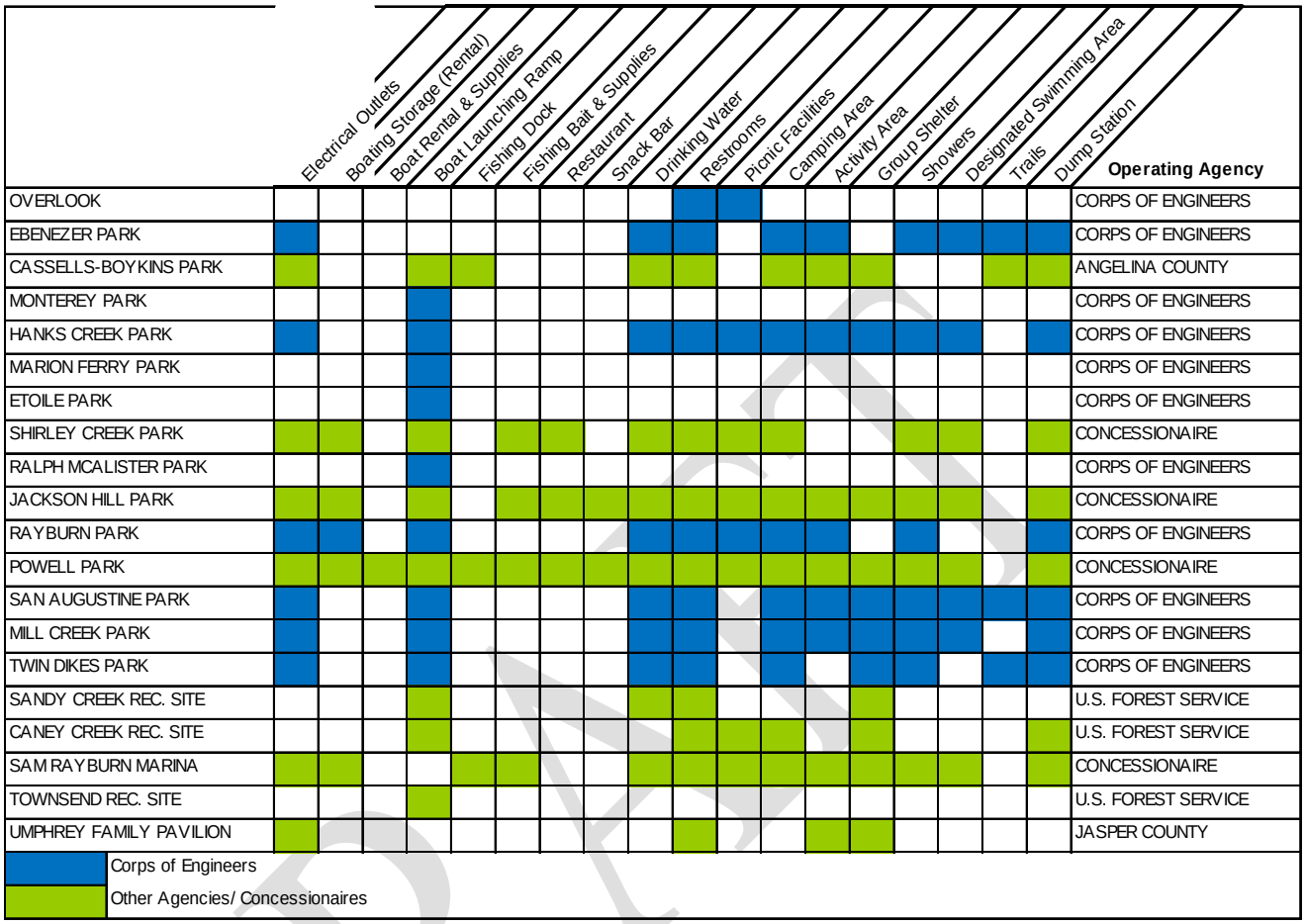

Figure 2-12 Recreation Facilities

2.4.4 Recreation Analysis

Sam Rayburn's recreation areas, natural shoreline, and water add to the attractiveness, vitality, and increased appreciation for the outdoors by users. These areas provide a sense of place and allow a growing urban population to enjoy outdoor recreation opportunities in a rural, natural setting. Outdoor recreation at Sam Rayburn Reservoir generally falls within two broad categories; land-based or water-based recreation. Management objectives for each type vary depending on the location and the intensity of use. Recreation management objectives in this Plan project future direction and actions necessary to meet the public's needs for land and/or water based recreation.

The reservoir provides recreational opportunity for swimming, boating, fishing, and other water sports. The area around the reservoir provide picnicking and camping for the casual, overnight, or vacationing visitors. Additionally, horseback riding is permitted in designated areas, and hiking and bird watching are encouraged

throughout the project lands. Project lands are open for public hunting except in developed recreational area and lands in the vicinity of the dam and other project structures. Increases in these uses are expected, therefore, future development will be directed primarily toward those activities.

Written comments were collected from visitors in USACE parks for the period 2013 -2014 via the USACE- administered Comment Card program. A summary of customer satisfaction comments received is provided below in Figure 2:13. The summary from the Sam Rayburn visitor comment cards shows that visitors are very satisfied with the current facilities.

2013-2014 Recreation Area Submissions

SAM RAYBURN DAM AND RESERVOIR Comment Card Submissions

Camping Survey

Customer Satisfaction Item	No. of Visitor Responses	Response Distribution (Percent) Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)	Total	Mean Response (1-5 Scale)
129 total submitted comment cards								
Facilities:								
Suitability of park facilities for my recreational equipment and activities	127	64%	34%	2%	1%	0%	100%	4.6
Restroom cleanliness and availability of conveniences	125	57%	37%	4%	2%	1%	100%	4.5
Appearance of park grounds	128	54%	41%	5%	1%	0%	100%	4.5
Adequacy of signs providing directions and information	128	64%	33%	2%	1%	0%	100%	4.6
Parking space availability during my visit	128	59%	34%	6%	2%	0%	100%	4.5
Condition of roads and parking areas in the park	127	59%	34%	6%	1%	0%	100%	4.5
Employees:								
Availability of park rangers and staff	126	61%	36%	3%	0%	0%	100%	4.6
Helpfulness of park rangers and staff	125	66%	31%	2%	0%	0%	100%	4.6
Environmental Setting:								
Attractiveness of surrounding scenery and landscape	126	63%	32%	5%	0%	0%	100%	4.6
	125	68%	29%	3%	0%	0%	100%	4.6

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Quality of land and water resources for my activities								
Overall:								
Waiting times needed to access park facilities and services	126	65%	33%	2%	1%	0%	100%	4.6
Feeling of safety and security in the park	128	71%	28%	1%	0%	0%	100%	4.7
Value received for any visitor fees paid	123	63%	35%	2%	0%	0%	100%	4.6
Overall satisfaction with my visit to this area	127	70%	28%	2%	0%	0%	100%	4.7

Day Use Survey

		Response Distribution (Percent)						
Customer Satisfaction Item	**No. of Visitor Responses**	**Very Good (5)**	**Good (4)**	**Neither Good Nor Poor (3)**	**Poor (2)**	**Very Poor (1)**	**Total**	**Mean Response (1-5 Scale)**
143 total submitted comment cards								
Facilities:								
Suitability of park facilities for my recreational equipment and activities	139	63%	36%	1%	0%	0%	100%	4.6
Restroom cleanliness and availability of conveniences	138	57%	37%	4%	1%	0%	100%	4.5
Appearance of park grounds	140	54%	34%	8%	3%	1%	100%	4.4
Adequacy of signs providing directions and information	142	61%	36%	1%	1%	1%	100%	4.5
Parking space availability during my visit	141	60%	36%	3%	1%	1%	100%	4.5
Condition of roads and parking areas in the park	143	63%	33%	3%	1%	0%	100%	4.6
Employees:								
Availability of park rangers and staff	142	58%	39%	2%	0%	0%	100%	4.6

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Helpfulness of park rangers and staff	140	60%	35%	5%	0%	0%	100%	4.6
Environmental Setting:								
Attractiveness of surrounding scenery and landscape	141	68%	25%	5%	1%	1%	100%	4.6
Quality of land and water resources for my activities	139	69%	25%	5%	1%	0%	100%	4.6
Overall:								
Waiting times needed to access park facilities and services	140	71%	29%	0%	0%	0%	100%	4.7
Feeling of safety and security in the park	143	75%	24%	1%	0%	0%	100%	4.7
Value received for any visitor fees paid	132	68%	30%	1%	1%	0%	100%	4.7
Overall satisfaction with my visit to this area	140	71%	27%	2%	0%	0%	100%	4.7

Figure 2-13 Sam Rayburn Comment Card Results 2013-2014

Visitation in recreation areas remains strong, but research shows that there is growing demand for upgraded facilities and non-traditional recreation opportunities. Recreation has evolved since the original construction of the recreation areas. For example, sewer hook-ups, 50 amp electrical hookups, concrete sites, and wireless internet are becoming the new standard for campers. Technology has changed the habits of modern camping, and campgrounds are vital to Sam Rayburn Reservoir.

To help provide Texas communities statewide with resources for recreational needs and trends across the state, the Texas Parks and Wildlife Department (TPWD) released the 2012 Statewide Comprehensive Outdoor Recreation Plan (TORP), which was referred to extensively in the preparation of this Plan. The TORP was developed using results from web surveys to garner public input on the outdoor recreational needs of Texans, and resulted in more than 4,000 public comments. Additionally, TPWD utilized the results from a Hispanic Focus Group for State Parks as well as survey results from the 2009 National Survey on Recreation and the Environment (NSRE) conducted by the U.S. Forest Service. The TORP, coupled with the results of public meetings and recreation area surveys conducted by USACE, were especially useful in identifying outdoor recreation trends and in setting management objectives for the recreation management program at Sam Rayburn Reservoir.

While traditional camping, picnicking and power boating at Sam Rayburn Reservoir continue to be very popular, perhaps in contrast to national trends, the TORP reveals that Texas residents have a strong desire for a broad array of passive use recreation activities that have potential for inclusion or expansion at Sam

Rayburn Reservoir. According to the TORP the following activities show significant participation increases:

- Wildlife watching has showed encouraging gains, while fishing and hunting have stayed about the same since 1996. However, the general population of Texas has increased significantly since 1996 so the percentage of Texans who hunt/fish has declined.
- Boating/water based activities (when grouped) all fared well. Texas ranked number three of the top boating states for 2009, based on annual sales and number 6 in overall number of boats registered.
- Walking, family gatherings, viewing/photographing natural scenery, gardening/landscaping, attending outdoor sports events, visiting nature centers, sightseeing, driving for pleasure, and picnicking dominated the list of outdoor recreation activities that Texans participate in the most.

Two minor trails maintained by USACE include an equestrian trail in Ebeneezer Park and a nature/interpretive trail in San Augustine Park. These trails are well utilized and more trails on USACE land would likely be well received. No public comment was received following the 2015 public meetings, but use of existing trails indicates that demand does exist. Information from the TORP provided in Table 2.11 verifies that hiking and biking trails are in the top 5 recreation facilities that Texas citizens stated they need now in local parks. A copy of the TORP is available on the TPWD website at http://tpwd.texas.gov.

Table 2.11 Top Recreation Facilities Needed by Texas Citizens – TORP 2012

Table 5.19 Top 5 Facilities Needed Now In Local Parks by Texas Citizens	
Unpaved trails for walking and hiking	43.6%
Natural park area/open space	31.8%
Mountain bike trails	31.4%
Paved trails for walking, hiking, biking, skating	30.1%
Wildlife/nature observation sites	27.8%

In accordance with the NSRE, some of the popular recreation activities at Sam Rayburn Reservoir are, on a national basis, either static or declining in participation. For example, camping activity, power boating, hunting and fishing have experienced small to moderate declines in recent years. In contrast to these

declines, significant increases in hiking, walking, sightseeing, wildlife viewing and canoeing/kayaking have occurred in recent years. Refer to Table 2.12 and Table 2.13 for the percent of U.S. population participating in several recreation activities that are common at Sam Rayburn Reservoir.

Table 2.12 Percent of Population Participating in Recreational Boating

Percent of Population Participating in Recreational Boating in the U.S.				
	1982-1983	**1994-1995**	**1999-2001**	**2005-2009**
Boating	28.0%	37.8%	36.3%	35.6%
Canoeing/Kayaking	8.0%	9.5%	11.5%	12.4%

Source: (Cordell & Green, National Survey on Recreation and the Environment, Texas Reports 1994-95, 2000-01 and 2006-09, 2009; TORP – 2012

Table 2.13 Participation in Hunting, Fishing, and Wildlife Watching in Texas

Participation in Hunting, Fishing and Wildlife Watching in Texas (Residents and Non-Residents, 16 years and older)				
Texas	**Fishing**	**Hunting**	**Wildlife Watching**	**Total Participants** (Fishing + Hunting + Wildlife Watching)
1996 Survey	2.5 million	829 thousand	3.6 million	4.7 million
2001 Survey	2.4 million	1.2 million	3.2 million	4.9 million
2006 Survey	2.5 million	1.1 million	4.2 million	6.0 million

Source: 1996, 2001, 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation for Texas, USFWS; TORP 2012

Figure 2-14 below depicts the participation rates in the top 10 outdoor recreation activities by Texas citizens compared to the nation at large.

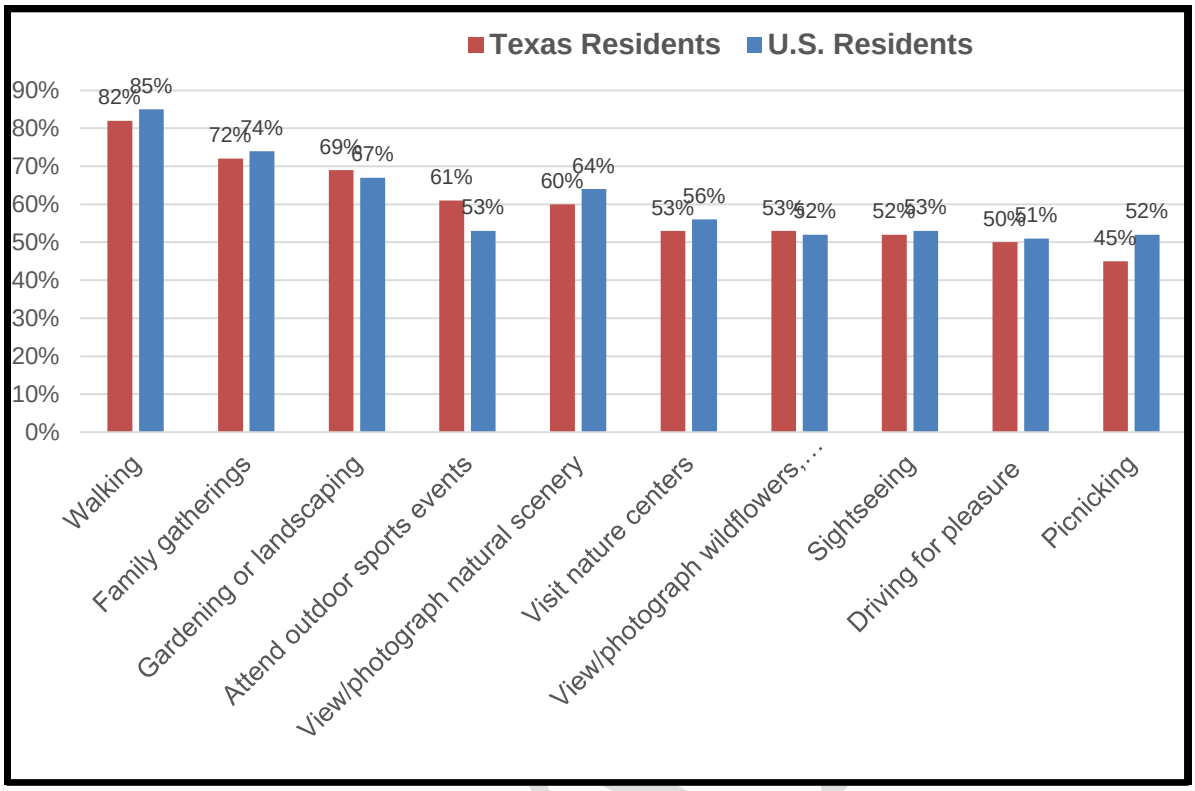

Figure 2-14 Participation Rates of Texas Residents (2006-2009) versus U.S. Residents (2005-2009) in the Top 10 Outdoor Recreation Activities. (Source: NSRE; TORP 2012)

Another finding from the TORP concerns the Hispanic Population related to recreation. Given the growing Hispanic population in Texas and other states, outdoor recreation providers have conducted surveys to determine the level of participation by Hispanic citizens in various outdoor recreation activities. Refer to Table 2.14 for a comparison of the participation rates of White/Non Hispanics versus Hispanics in 10 outdoor recreation activities in Texas.

Most activities addressed above are supported by USACE at Sam Rayburn Reservoir. Boating, fishing, and wildlife based recreation, accounts for a substantial amount of Sam Rayburn Reservoir's outdoor recreation demand, both by adjacent residents and by visitors. Water based recreation is a crucial aspect of outdoor recreation in Texas, making up a substantial core of the visitors to USACE and Outgranted/State managed parks. Recreational boating activities in Texas are expected to increase following 2015 precipitation within the region.

Table 2.14 Comparison of Participation Rates of White/Non Hispanics vs Hispanics in the Top 10 Outdoor Recreation Activities in Texas

Comparison of Top 10 Outdoor Recreation Activities, White/Non-Hispanics and Hispanics in Texas, 2006-2009		
	% Texans Participating 2006-2009	
	White/Non-Hispanics	Hispanics
Walking for Pleasure	81.1%	83.4%
Family Gatherings	66.6%	75.8%
Gardening or Landscaping	66.3%	76.3%
	White/Non-Hispanics	Hispanics
Attend Outdoor Sports Events	57.3%	68.4%
View/Photograph Natural Scenery	63.3%	57.2%
Visit Outdoor Nature Centers	49.8%	58.4%
View/Photograph Wildflowers	59.3%	49.0%
Sightseeing	54.1%	49.6%
Driving for Pleasure	53.6%	49.4%
Picnicking	43.4%	47.7%

Source: TORP 2012

Management of the water surface for recreational purposes rests primarily with USACE, but close coordination is maintained with TPWD and the local law enforcement office with respect to enforcement of rules and regulations that apply to boating. Marina concessionaires are also important stakeholders in water-based recreation management. Water-based outdoor recreation includes, but is not limited to fishing, boating, swimming, water skiing, scuba diving, seaplane operations, and kayaking. This Plan includes a Water Surface Classification Plan (see Chapters 4 and 5) that establishes areas where boating may be restricted or prohibited. The objective of the water surface classification plan is to ensure public safety and protect natural resources while providing recreational opportunities on the water.

2.4.5 Recreation Carrying Capacity

Recreational carrying capacity is considered by USACE to ensure that visitors have a high quality and safe recreational experience, and that natural resources are not irreparably damaged. An example of a carrying capacity consideration at Sam

Rayburn Reservoir is the management of public hunting on USACE lands wherein hunting activity may be restricted by species or by area, depending on population and/or habitat conditions.

The plan formulated herein proposes to provide a variety of activities and to encourage optimal use of present public use areas, where possible, based on the carrying capability of the land. The carrying capability of the land is determined primarily by the distinct characteristics of the site. These characteristics, both natural and manmade, are development constraints that often determine the type of facilities that should be provided.

Having facilities that cater to a variety of tastes and different members of the family will encourage visitors to enjoy the lake. Presently, USACE 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. USACE 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.

2.5 REAL ESTATE

Lands were acquired by USACE for the operation of Sam Rayburn Reservoir based on the 1953 Joint Acquisition Policy. In accordance with this policy and pool elevation-frequency studies, the five-year flood contour was established at 171.0 feet NGVD. Below this guide taking contour, 114,857 (REMIS) acres of land were acquired in fee simple, which includes land for public use areas.

A perpetual flowage easement was acquired on lands for flood control between elevation 171.0 and 179.0 NGVD in the main part of the lake. In the upper reaches of the reservoir, flowage easements were acquired to elevation 189.0 NGVD. In total a flowage easement was acquired on 45,124 (REMIS) acres.

The majority of Sam Rayburn Reservoir is surrounded by the Angelina National Forest and a small section of the Sabine National Forest. Both forests are managed by the U.S. Forest Service which issued a use permit to the USACE for approximately 33,000 acres for the development of Sam Rayburn Reservoir.

Delineation of lands to be administered by the USACE and the U.S. Forest Service at Sam Rayburn Reservoir was coordinated in the initial stages of the project development. The joint land agreement called for the possibility of a future land interchange between the agencies. This interchange was completed on 13 November 1975 which involved 41 tracts containing a total of 17,361 acres of U.S. Forest Service lands that were transferred to the USACE and 17,070 acres of land, as contained in 278 USACE' tracts transferred to the U.S. Forest Service.

Purchase of flowage easement by the Government constitutes payment for the right to flood and for the damage and expense to the landowner resulting from project operation. Construction of buildings for habitation or alteration of the existing terrain will not be permitted in the flowage easement area. Construction of structures and improvements for use other than habitation will require formal authorization and coordination with USACE Operations and Real Estate Divisions.

Federal land is monitored by USACE personnel to identify and correct instances of unauthorized use. When encroachments are discovered, USACE personnel will attempt to resolution as quickly as possible. In cases involving permanent structures, resolution actions will be considered individually and the method of resolution will be determined on a case by case basis through the coordinated efforts of USACE Real Estate Division, Operations Division, and Office of Counsel.

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

Forest products generated through clearing, flood damage and salvage operations, or planned harvests, and not required for USACE use, will be sold. Disposal procedure for standing timber is a real estate function and all proposed sales incorporate a disposal plan. Planning for the sale of forest products is initiated by USACE personnel working at the lake. The disposal plan includes justification for the sale, sale boundaries, volume estimates, and harvest conditions. Timber sales are administered through USACE, Real Estate Division, Fort Worth District.

Sam Rayburn Reservoir is one of the largest USACE reservoirs in the nation and has a correspondingly large number of real estate outgrants. Outgrants include easements, licenses, leases, consents and other formal real estate documents wherein USACE has granted a legal interest in real property. A summary of outgrants at Sam Rayburn Reservoir is provided as follows:

- Total Easements: 104
- Total Licenses: 35
- Consents: 537 (most consents are granted for activities on Flowage Easement)
- Leases: 14
- Total Outgrants: 690

2.6 PERTINENT PUBLIC LAWS

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

- Public Law 59-209, Antiquities Act of 1906. The first Federal law established to protect what are now known as "cultural resources" on public lands. It provides a permit procedure for investigating "antiquities" and consists of two parts: An act for the Preservation of American Antiquities, and Uniform Rules and Regulations.
- Public Law 74-292, Historic Sites Act of 1935. Declares it to be a national policy to preserve for (in contrast to protecting from) the public, historic (including prehistoric) sites, buildings, and objects of national significance. This act provides both authorization and a directive for the Secretary of the Interior, through the National Park Service, to assume a position of national leadership in the area of protecting, recovering, and interpreting national archeological historic resources. It also establishes an "Advisory Board on National Parks; Historic Sites, Buildings, and Monuments, a committee of eleven experts appointed by the Secretary to recommend policies to the Department of the Interior".
- Public Law 75-761, Flood Control Act of 1938. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.
- Title 16 U.S. Code §§ 668-668a-d, 54 Stat. 250, Bald Eagle Protection Act of 1940, as amended. This Act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or any manner, any bald eagle [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The Act defines “take” as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.
- Public Law 78-534, Flood Control Act of 1944. Section 4 of the act as last amended in 1962 by Section 207 of Public Law 87-874 authorizes USACE to construct, maintain, and operate public parks and recreational facilities in reservoir areas and to grant leases and licenses for lands, including facilities, preferably to Federal, State or local governmental agencies.
- Public Law 79-525, River and Harbor Act of 1946. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.
- Public Law 83-780, Flood Control Act of 1954. This act authorizes the construction, maintenance, and operation of public parks and recreational

facilities in reservoir areas under the control of the Department of the Army and authorizes the Secretary of the Army to grant leases of lands in reservoir areas deemed to be in the public interest.

- Public Law 85-624, Fish and Wildlife Coordination Act 1958. This act as amended in 1965 sets down the general policy that fish and wildlife conservation shall receive equal consideration with other project purposes and be coordinated with other features of water resource development programs. Opportunities for improving fish and wildlife resources and adverse effects on these resources shall be examined along with other purposes which might be served by water resources development.
- Public Law 86-523, Reservoir Salvage Act of 1960, as amended. This Act provides for (1) the preservation of historical and archeological data that might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any Federal reservoir construction projects; (2) coordination with the Secretary of the Interior whenever activities may cause loss of scientific, prehistoric, or archeological data; and (3) expenditure of funds for recovery, protection, and data preservation. This Act was amended by Public Law 93-291.
- Public Law 86-717, Forest Conservation. This act provides for the protection of forest cover for reservoir areas under this jurisdiction of the Secretary of the Army and the Chief of Engineers.
- Public Law 87-88, Federal Water Pollution Control Act Amendments of 1961, as amended. Section 2(b)(1) of this Act gives USACE responsibility for water quality management of USACE reservoirs. This law was amended by the Federal Water Pollution Control Act Amendment of 1972, Public Law 92-500.
- Public Law 87-874, Rivers and Harbors Act of 1962. This act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.
- Public Law 88-578, Land and Water Conservation Fund Act of 1965. This act established a fund from which Congress can make –appropriations for outdoor recreation. Section 2(2) makes entrance and user fees at reservoirs possible by deleting the words "without charge" from Section 4 of the 1944 Flood Control Act as amended.
- Public Law 89-72, Federal Water Project Recreation Act of 1965. This act requires that not less than one-half the separable costs of· developing recreational facilities and all operation and maintenance costs at Federal reservoir projects shall be borne by a non-Federal public body. An OCE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.
- Public Law 89-90, Water Resources Planning Act (1965). This act established the Water Resources Council and gives it the responsibility to encourage the

development, conservation, and use of the Nation's water and related land resources on a coordinated and comprehensive basis.

- Public Law 89-272, Solid Waste Disposal Act, as amended by PL 94-580, dated October 21, 1976. This act authorized a research and development program with respect to solid-waste disposal. It proposes (1) to initiate and accelerate a national research and development program for new and improved methods of proper and economic solid-waste disposal, including studies directed toward the conservation of national resources by reducing the amount of waste and unsalvageable materials and by recovery and utilization of potential resources in solid waste; and (2) to provide technical and financial assistance to State and local governments and interstate agencies in the planning, development, and conduct of solid-waste disposal programs.

- Public Law 89-665, Historic Preservation Act of 1966. This act provides for: (1) an expanded National Register of significant sites and objects; (2) matching grants to states undertaking historic and archeological resource inventories; and (3) a program of grants-in aid to the National Trust for Historic Preservation; and (4) the establishment of an Advisory Council on Historic Preservation. Section 106 requires that the President's Advisory Council on Historic Preservation have an opportunity to comment on any undertaking which adversely affects properties listed, nominated, or considered important enough to be included on the National Register of Historic Places.

- Public Law 90-483, River and Harbor and Flood Control Act of 1968, Mitigation of Shore Damages. Section 210 restricted collection of entrance fee at USACE lakes and reservoirs to users of highly developed facilities requiring continuous presence of personnel.

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

- Public Law 91-611, River and Harbor and Flood Control Act of 1970. Section 234 provides that persons designated by the Chief of Engineers shall have authority to issue a citation for violations of regulations and rules of the Secretary of the Army, published in the Code of Federal Regulations.

- Public Law 92-347, Golden Eagle Passbook and Special Recreation User Fees. This act revises Public Law 88-578, the Public Land and Water Conservation Act

of 1965, to require Federal agencies to collect special recreation user fees for the use of specialized sites developed at Federal expense and to prohibit the USACE from collecting entrance fees to projects.

- Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972. The Federal Water Pollution Control Act of 1948 (PL 845, 80th Congress), as amended in 1956, 1961, 1965 and 1970 (PL 91- 224), established the basic tenet of uniform State standards for water quality. Public Law 92-500 strongly affirms the Federal interest in this area. "The objective of this act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters."
- Public Law 92-516, Federal Environmental Pesticide Control Act of 1972. This act completely revises the Federal Insecticide, Fungicide and Rodenticide Act. It provides for complete regulation of pesticides to include regulation, restrictions on use, actions within a single State, and strengthened enforcement.
- Public Law 93-81, Collection of Fees for Use of Certain Outdoor Recreation Facilities. This act amends Section 4 of the Land and Water Conservation Act of 1965, as amended to require each Federal agency to collect special recreation use fees for the use of sites, facilities, equipment, or services furnished at Federal expense.
- Public Law 93-205, Conservation, Protection, and Propagation of Endangered Species Act of 1973, as amended. This law repeals the Endangered Species Conservation Act of 1969. It also directs all Federal departments/agencies to carry out programs to conserve endangered and threatened species of fish, wildlife, and plants and to preserve the habitat of these species in consultation with the Secretary of the Interior. This Act establishes a procedure for coordination, assessment, and consultation. This Act was amended by Public Law 96-159.
- Public Law 93-251, Water Resources Development Act of 1974. Section 107 of this law establishes a broad Federal policy which makes it possible to participate with local governmental entities in the costs of sewage treatment plan installations.
- Public Law 93-291, Archeological Conservation Act of 1974. The Secretary of the Interior shall coordinate all Federal survey and recovery activities authorized under this expansion of the 1960 act. The Federal Construction agency may transfer up to one percent of project funds to the Secretary with such transferred funds considered nonreimbursable project costs.
- Public Law 93-303, Recreation Use Fees. This act amends Section 4 of the Land and Water Conservation Act of 1965, as amended, to establish less restricted criteria under which Federal agencies may charge fees for the use of campgrounds developed and operated at Federal areas under their control.
- Public Law 93-523, Safe Drinking Water Act. The act assures that water supply systems serving the public meet minimum national standards for protection of

public health. The act (1) authorizes the Environmental Protection Agency to establish Federal standards for protection from all harmful contaminants, which standards would be applicable to all public water systems, and (2) establishes a joint Federal-State system for assuring compliance with these standards and for protecting underground sources of drinking water.

- Public Law 94-422, Amendment of the Land and Water Conservation Fund Act of 1965. Expands the role of the Advisory Council. Title 2 - Section 102a amends Section 106 of the Historical Preservation Act of 1966 to say that the Council can comment on activities which will have an adverse effect on sites either included in or eligible for inclusion in the National Register of Historic Places.
- Public Law 95-217, Clean Water Act of 1977, as amended. This Act amends the Federal Water Pollution Control Act of 1970 and extends the appropriations authorization. The Clean Water Act is a comprehensive Federal water pollution control program that has as its primary goal the reduction and control of the discharge of pollutants into the nation's navigable waters. The Clean Water Act of 1977 has been amended by the Water Quality Act of 1987, Public Law 100-4.
- Public Law 95-341, American Indian Religious Freedom Act of 1978. The Act protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objections, and the freedom to worship through ceremonials and traditional rites.
- Public Law 95-632, Endangered Species Act Amendments of 1978. This law amends the Endangered Species Act Amendments of 1973. Section 7 directs agencies to conduct a biological assessment to identify threatened or endangered species that may be present in the area of any proposed project. This assessment is conducted as part of a Federal agency's compliance with the requirements of Section 102 of NEPA.
- Public Law 96-95, Archeological Resources Protection Act of 1979. This Act protects archeological resources and sites that are on public and tribal lands, and fosters increased cooperation and exchange of information between governmental authorities, the professional archeological community, and private individuals. It also establishes requirements for issuance of permits by the Federal land managers to excavate or remove any archeological resource located on public or Indian lands.
- Public Law 98-63, Supplemental Appropriations Act of 1983. This Act authorized the USACE Volunteer Program. The United States Army Chief of Engineers may accept the services of volunteers and provide for their incidental expenses to carry out any activity of the USACE, except policymaking or law or regulatory enforcement.
- Public Law 99-662, The Water Resources Development Act 1986. Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

CHAPTER 3 - RESOURCE OBJECTIVES

3.1 INTRODUCTION

This chapter sets forth goals and objectives necessary to achieve the USACE vision for the future of Sam Rayburn Reservoir. The terms “goals” and “objectives” are often defined as synonymous, but in the context of this Plan, goals express the overall desired end state of the cumulative land and recreation management programs at Sam Rayburn Reservoir. Resource objectives specify task-oriented actions necessary to achieve the master plan goals.

3.2 MANAGEMENT GOALS

The following goals are the priorities for consideration when determining management objectives and development activities. Implementation of these goals 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 goals 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 Sam Rayburn Reservoir staff to provide a realistic approach to the management of all resources.

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

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

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

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

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

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

- Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse and sustainable condition is necessary to support life.

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

3.3 RESOURCE OBJECTIVES

Resource objectives are defined as clearly written statements that respond to identified issues and that specify measurable and attainable activities for resource development and/or management of the lands and waters under USACE jurisdiction. The objectives stated in this master plan support the Plan's goals, USACE EOPs, and applicable national performance measures. They are consistent with authorized project purposes, Federal laws and directives, regional needs, resource capabilities, and they take public input into consideration. Recreational and natural resources carrying capacities are also addressed in the Resource Objectives. Regional and State planning documents including TPWD's TCAP and TORP, DETCOG's publications were considered in developing these objectives. Planning documents from adjacent municipalities were also reviewed.

The objectives in this master plan are intended to provide project benefits, meet public needs, and foster environmental sustainability for Sam Rayburn Reservoir to the greatest extent possible. They include recreational objectives; natural resource management objectives; visitor information; education, and outreach objectives; general management objectives; and cultural objectives.

2419 **Table 3.1** Recreational Objectives

Recreational Objectives	Goal A	Goal B	Goal C	Goal D	Goal E
Evaluate and monitor outdoor recreation trends to identify needs for new or improved recreation facilities and increased public access on USACE-managed public lands and water.	●		●		
Improve and modernize day use and campground facilities through addition and repair of amenities, including, but not limited to: road improvements, sewer hook ups, increased electrical service, concrete or asphalt recreational vehicle pads, picnic sites, wireless internet access, amphitheaters, restrooms, trails, pavilions, and improved park entrances.	●		●		
Evaluate recreational use zoning and regulations for designated quiet water or no-wake areas with emphasis on natural resource protection, passive recreational opportunities, and public safety concerns.	●				
Follow the EOPs associated with recreational use of waterways for all water-based management activities and plans.		●	●		●
Increase universally accessible facilities on Sam Rayburn Reservoir.	●		●		●
Consider flood/conservation pool to address potential impact to recreational facilities (i.e. campsites, boat ramps, courtesy docks, etc.).	●	●	●	●	
Ensure consistency with USACE Recreation Strategic Plan.					●
Optimize resources, labor, funds, volunteer services, and partnerships for management, protection and restoration of recreational facilities and parks assuring public access to the reservoir.	●		●		●
Monitor the TCAP, the TORP, USFS-National Forest and Grasslands in Texas – Forest Plan, relevant county and DETCOG plans, and area municipality plans to insure that USACE is responsive to outdoor recreation trends, public needs and resource protection within a regional framework. All plans by others will be evaluated in light of USACE policy and operational aspects of Sam Rayburn Reservoir.					●

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Photo 3-1 Resource Objectives include maintaining and improving campsites and other facilities for se visitor enjoyment and safety (USACE photo)

Photo 3-2 Increased trail opportunities is a Resource Objective at Sam Rayburn Reservoir

2431 **Table 3.2** Natural Resource Management Objectives

Natural Resource Management Objectives	Goals				
	A	B	C	D	E
Consider flood/conservation pool levels to ensure that natural resources are managed in ways that are compatible with primary project purposes of flood risk management, hydropower generation and water supply.	●	●		●	
Ensure project lands are managed with preservation and conservation of natural habitat, natural esthetics and recreational open space values as primary objectives.	●			●	
Actively manage and conserve fish and wildlife resources, especially special status species, by implementing ecosystem management principles. Key among these principles is the use of native species adapted to the Pinewood's Ecoregion in restoration and mitigation plans.	●	●		●	●
Conduct forest management activities to produce a sustained yield of timber to the extent compatible with ecosystem management principles and public recreational use.	●	●		●	●
Consider watershed approach during decision-making process.					●
Optimize resources, labor, funds, and partnerships for protection and restoration of fish and wildlife habitats.		●			●
Minimize activities which disturb the scenic beauty and aesthetics of the lake.	●	●	●	●	
Continually evaluate erosion control and sedimentation issues at Sam Rayburn Reservoir and develop alternatives to resolve the issues.	●	●			●
Stop unauthorized uses of public lands such as off-road vehicle (ORV) use, trash dumping, unauthorized fires, fireworks, poaching, clearing of vegetation, agricultural trespass, timber theft, unauthorized trails and paths, and placement of advertising signs that create negative environmental impacts.	●	●	●	●	●
Monitor lands and waters for invasive, non-native and aggressively spreading native species and take action to prevent and/or reduce the spread of these species. Potential invasive species of great concern are giant salvinia, water hyacinth and Emerald Ash borer.	●	●		●	●
Evaluate established permits/outgrants to determine impacts on public lands and waters. Administer the Shoreline Management Program to balance private shoreline uses (such as mowing or vegetation removal requests along the Federal property boundary, or paths to the shoreline) with habitat management and impacts to the general public.	●		●		

Natural Resource Management Objectives	Goals A	B	C	D	E
Sustain the Sam Rayburn Reservoir public hunting program as a habitat and species management tool that maintains sustainable game populations, reduces invasive species such as feral hogs, improves habitat conditions and carrying capacity, maintains project lands and waters as a wildlife travel corridor and resting location, and considers public safety relative to proximity and density of adjacent development.	●	●	●	●	●
Protect and/or restore important native habitats such as, bottomland hardwoods, riparian zones, and wetlands, where they occur, or historically occurred on project lands. Special emphasis should be taken to protect and/or restore special or rare plant communities, to include actions that promote butterfly and/or pollinator habitat, migratory bird habitat, and habitat for birds listed by USFWS as Birds of Conservation Concerns. Some of these habitats may be designated as Environmentally Sensitive Areas.	●	●	●	●	●

Photo 3-3 Resource objectives call for protecting the scenic quality of shorelines at Sam Rayburn Reservoir (USACE Photo)

Table 3.3 Visitor Information, Education, and Outreach Objectives

Visitor Information, Education and Outreach Objectives	Goals A	B	C	C	E
Provide more opportunities for communication with agencies, special interest groups, and the general public (i.e. comment cards, updates to county and municipal officials, web page).	●			●	●
Implement more educational, interpretive, and outreach programs at the lake office and around the lake. Topics to include: history, lake operations (flood risk management, hydroelectric generation and water supply), water safety, recreation, natural and cultural resources, ecology, and USACE missions.	●	●	●	●	●
Establish a network among local, state, and federal agencies, to include Homeowners Associations, in order to exchange lake-related information for public education and management purposes.	●			●	●
Increase public awareness of special use permits or other authorizations required for special activities, organized special events, and commercial activities on public lands and waters of the lake.	●	●	●		
Capture trends concerning boating accidents and other incidents on public lands and waters and coordinate data collection with other public safety officials.	●		●	●	●
Promote USACE Water Safety message.	●		●	●	●
Educate adjacent landowners on shoreline management policies and permit processes in order to reduce encroachment actions.	●	●	●	●	●

Photo 3-4 Increased water safety outreach programs is a Resource Objective for Sam Rayburn Reservoir. (USACE photo)

Table 3.4 General Management Objectives

General Management Objectives	Goals				
	A	B	C	D	E
Resurvey and maintain the public lands boundary line to ensure it is clearly marked and recognizable in all areas to reduce habitat degradation and encroachment actions.	●	●		●	
Ensure Recreation and Natural Resource Management activities are sustainable and consistent with the reservoir's authorized project purposes.	●	●	●	●	●
Secure sustainable funding for the shoreline management program.	●	●	●	●	●
Ensure consistency with USACE Campaign Plan (national level), IPlan (regional level), OPlan (District level).					●
Reference Recreation Infrastructure Investment Strategy (RIIS) if funding levels change in future years.					●
Ensure green design, construction, and operation practices, such as the Leadership in Energy and Environmental Design (LEED) criteria for government facilities, are considered as well as applicable Executive Orders.					●
Carefully manage non-recreation outgrants such as utility and road easements in accordance with national guidance set forth in ER 1130-2-550 and applicable chapters in ER 405-1-	●	●			●

	A	B	C	D	E
12. Designate and manage utility corridors as a management tool to reduce habitat fragmentation.					
Manage project lands and recreational programs to advance broad national climate change mitigation goals, including but not limited to climate change resilience and carbon sequestration, as set forth in Executive Order 13653, Executive Order 13693 and related USACE policy.					●

Photo 3-5 Resource objectives specify that management of natural resources and recreation facilities take into account the effects of water level fluctuations associated with primary project purposes (USACE Photo)

2460 **Table 3.5** Cultural Resources Management Objectives

Cultural Resources Management Objectives	Goals				
	A	B	C	D	E
Monitor and better coordinate lake development and the protection of cultural resources with State Historic Preservation Offices and federally recognized Tribes.	●	●		●	●
Complete an inventory of cultural resources.	●	●		●	●
Increase public awareness and education of regional history.		●		●	●
Ensure historical preservation is fully integrated into the Sam Rayburn Reservoir Master Plan and future planning decision making process (Section 106 and 110 of the National Historic Preservation Act; the Archeological Resources Protection Act; and the Native American Graves Protection and Repatriation Act on public lands surrounding the lake).		●		●	●
Stop unauthorized use of public lands as it pertains to the illegal excavation and removal of cultural resources.		●		●	●

2461 ●Denotes that the objective helps to meet the specified goal.

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

4.1 LAND ALLOCATION

All project lands at USACE water resource development projects are allocated by USACE into one of four categories in accordance with the congressionally authorized purpose for which the project lands were acquired. There are four possible categories of allocation identified in USACE regulations including Operations, Recreation, Fish and Wildlife, and Mitigation. At Sam Rayburn Reservoir, the only land allocation category that applies is Operations which is defined as those lands that are required to operate the project for the primary authorized purpose of flood control. The remaining allocations of Recreation, Fish and Wildlife, and Mitigation would apply only if lands had been acquired specifically for these purposes.

USACE recognizes that some lands were acquired that lie above the elevation required for operation of the project for flood control. These lands are located in recreation areas, but under the rules in place at the time of acquisition, these lands are not considered “separable” lands in that the acquisition of separable lands normally requires a cost sharing sponsor, a non-federal operator, or were acquired by separate congressional authorization. The entire fee simple federal estate at Sam Rayburn Reservoir is 114,857 acres (REMIS), all of which is allocated to Operations.

4.2 LAND CLASSIFICATION

The objective of classifying project lands is to identify how a given parcel of land shall be used now and in the foreseeable future. Land classification is a central component of this plan, and once a particular classification is established any significant change to that classification would require a formal process including public review and comment. Ongoing and planned management practices for each classification are set forth in Chapter 5 – Resource Plan.

4.2.1 Prior Land Classifications

Previous versions of the Sam Rayburn Reservoir Master Plan included land classification criteria that were similar to the current criteria. These prior land classifications were based more on projected need than on actual experience which resulted in some areas being classified for a type of use that has not, or is not likely to occur. Additionally, in the 45 years since the previous Master Plan was published, wildlife habitat values, surrounding land use, and regional recreation trends have changed significantly giving rise to the need for revised classifications. Refer to Table 8.1 in Chapter 8 for a summary of land classification changes from the prior classifications to the current classifications.

4.2.2 Current Land Classifications

Land Classification indicates the primary use for which project lands are managed. There are six categories of classification identified in USACE regulation EP 1130-2-550, Chapter 3, including: Project Operations, High Density Recreation, Mitigation, Environmentally Sensitive Areas, Multiple Resource Management Lands, and Water Surface. Maps showing the various land classification can be found in Appendix A.

4.2.2.1 Project Operations. This classification includes the lands managed for the dam, project office, spillway, switchyard, powerhouse, maintenance yards, and roads accessing these areas all of which must be maintained to carry out the authorized purpose of flood risk management hydroelectric power generation and water conservation. In addition to the operational activities taking place on these lands, limited recreational use may be allowed for activities such as fishing in specific shoreline areas or trails.. Regardless of any limited recreation use allowed on these lands, the primary classification of Project Operations will take precedent over other uses. There are 370 acres of Project Operations land specifically managed for project operational purposes.

4.2.2.2 High Density Recreation. These are lands developed for intensive recreational activities for the visiting public including day use areas, campgrounds, marinas and related concession areas. Recreation development by lessees operating on USACE lands must follow policy guidance contained in USACE regulations at ER 1130-2-550, Chapter 16, approved March 30, 2009. Any approved development plans included in lease agreements as of that date are grandfathered in accordance with this policy guidance. The policy guidance includes the following statement:

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

Lands classified for High Density Recreation are suitable for the development of comprehensive resorts. The regulation cited above defines Comprehensive Resort as follows:

"*Typically, multi-faceted developments with facilities such as marinas, lodging, conference centers, golf courses, tennis courts, restaurants, and other similar facilities.*"

At Sam Rayburn Reservoir, prior land classifications included an excessive number of areas under the high density recreation classification. Several of these areas were never developed and/or were determined by the study team to be unsuitable for development resulting in a change to another, more suitable land classification. There are 1,598 acres of land classified for high density recreation.

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

4.2.2.4 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 for the protection of sensitive resources. Passive public use activities such as public hunting, natural surface pedestrian trails, and wildlife watching are examples of public use that are, in most situations, compatible with this classification. There are 9 distinct ESA areas designated at Sam Rayburn Reservoir totaling 1,809 acres. These areas include one site where high quality longleaf pine savannah is the dominant vegetation and 8 sites dominated by good quality bottomland hardwood or forested wetland habitat. One site is high quality mixed pine-hardwood habitat that also need special protection due to the presence of important cultural resources or the known use of the area by the southern bald eagle or other species of conservation concern. The ESA areas are numbered and are depicted on the land classification maps in Appendix A.

4.2.2.5 Multiple Resource Management Lands. This classification identifies the predominate use of an area with the understanding that other compatible uses can occur within the area. This classification is divided into four sub-classifications identified as: Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. A given tract of land may be classified using one or more of these sub-classifications. There are 14,159 acres of land that are under this

classification. The following identifies the amount contained in each sub-classification of Multiple Resource Management Lands.

- Low Density Recreation. These are lands with minimal development or infrastructure that support passive public recreational use (e.g., fishing, hunting, wildlife viewing, shoreline use, hiking, etc…). This classification is, in most instances, suitable for relatively narrow strips of public land that front private residential developments. The dominant use of these lands is typically by adjacent landowners for passive recreation activities such as hiking, fishing, and general pedestrian access to the shoreline. There are 2,249 acres under this classification at Sam Rayburn Reservoir.

- Wildlife Management. This land classification applies to those lands managed primarily for the conservation of fish and wildlife habitat. These lands generally include comparatively large contiguous parcels, most of which are located within the flood pool of the lake. Passive recreation uses such as natural surface trails, fishing, hunting, and wildlife observation are compatible with this classification unless restrictions are necessary to protect sensitive species or to promote public safety. There are 896 acreages under this classification at Sam Rayburn Reservoir.

- Vegetative Management. These are lands designated for stewardship of forest, prairie, and other native vegetative cover. At Sam Rayburn Reservoir, these lands consist primarily of relatively narrow strips of public land located in areas adjacent to lightly developed or undeveloped private lands. The primary objective for these lands is to manage the forest to ensure a healthy, diverse, and visually aesthetic continuous forest canopy along the shorelines of Sam Rayburn Reservoir. Sustained yield of timber, the provision of wildlife habitat, and the availability of these land for passive recreation activities are all important objectives. There are 10,296 acres under this classification at Sam Rayburn Reservoir.

- Future or Inactive Recreation. These are lands with site characteristics compatible with potential future recreation development. Some of these areas may have never been developed or were developed and subsequently closed, or remain open but are no longer maintained. These areas will be managed as MRML – Wildlife Management until there is a need or opportunity to develop or reopen these areas. There are 718 acres under this classification at Sam Rayburn Reservoir.

4.2.3 Water Surface

In accordance with national USACE guidance set forth in EP 1130-2-550, the water surface of the lake at the conservation pool elevation may be classified using the following four classifications:

- Restricted

- Designated No-Wake
- Fish and Wildlife Sanctuary
- Open Recreation

At the conservation pool elevation of 164.4 NGVD, Sam Rayburn Reservoir has a water surface of 112,590 acres. The following water surface classifications are designated at Sam Rayburn Reservoir.

4.2.3.1 Restricted

Restricted water surface includes those areas where recreational boating is prohibited or restricted for project operations, safety and security purposes. The Restricted water surface at Sam Rayburn Reservoir includes a designated strip of water surface along the north side of the gate control structure and spillway area of Sam Rayburn Dam and small restricted areas near (any major water intake structures). Designated swimming beaches are also classified as Restricted water surface. The total acreage of Restricted water surface is approximately 40 acres. These areas are normally marked with standard United States Coast Guard (USCG) regulatory buoys stating that boats are excluded from the area. In some instances, physical barriers may be in place on the water.

4.2.3.2 Designated No-Wake

Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve boating safety near key recreational water access areas such as boat ramps. Designated No-Wake areas at Sam Rayburn Reservoir include several acres at the entry point to the four marinas, and acreage of variable size at each of the 31 boat ramps. These Designated No Wake areas encompass approximately 190 water surface acres. These areas are typically marked with standard USCG regulatory buoys.

4.2.3.3 Open Recreation

Open Recreation includes all water surface areas available for year round or seasonal water-based recreational use. With the exception of the Restricted and Designated No-Wake areas described in the above paragraphs, the remaining water surface of approximately 112,360 acres at Sam Rayburn Reservoir water surface is designated as Open Recreation.

4.2.3.4 Fish and Wildlife Sanctuary

This water surface classification applies to areas with annual or seasonal restrictions to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning. Large areas of surface water were designated for wildlife management in the 1970 Master Plan, but no direct management has occurred on these areas since that designation was made. Furthermore, neither TPWD or USFWS has published any special waterfowl hunting restrictions/conditions for any part of Sam Rayburn Reservoir and a review of early, pre-construction planning documents indicated no recommendations by TPWD or USFWS to designate any portion of the water surface as a fish and wildlife

sanctuary. In view of this history, no fish and wildlife sanctuary areas are designated at Sam Rayburn Reservoir.

Future management of the water surface includes the maintenance of warning, information, and regulatory buoys as well as routine water safety patrols during peak use periods.

4.2.4 Recreational Seaplane Operations

Many USACE-administered reservoirs, including Sam Rayburn Reservoir, have areas where recreational seaplane operations are allowed. Areas where recreational landings and takeoffs are prohibited are determined by USACE through a public process separate from the Master Plan process and the information is furnished to the Federal Aviation Administration for publication as a Notice to Airmen. Appendix F is a USACE, Fort Worth District, publication listing District-wide prohibitions and restrictions on seaplane operations as well as a description of areas at each lake where recreational seaplane landings and takeoffs are prohibited. Once a seaplane has landed it is considered a vessel and may taxi in locations where boating traffic is allowed.

Table 4.1 provides a summary of land classifications at Sam Rayburn Reservoir. Acreages were calculated by historical and GIS data. A map representing these areas can be found in Appendix A.

Table 4.1 Acreage by Land Use Classification

Classification	Acres
Project Operations	370
High Density Recreation	1,598
Environmental Sensitive Areas	1,809
Multiple Resource Managed Lands:	
Low Density Recreation	2,249
Wildlife Management	896
Vegetative Management	10,296
Future/Inactive Recreation Areas	718
Water Surface:	
Restricted	40
Designated No-wake [(1)]	190
Fish and Wildlife Sanctuary	0
Open Recreation	112,360[(2)]
Total	**130,526**

[(1)] No-wake areas located at boat ramps and marinas

[(2)] Includes approximately 17,055 acres of water surface over land owned in fee by USFS

Note: Acreages were measured using GIS technology and may vary from official land acquisition records. Acreage varies depending on changes in lake levels, sedimentation and shoreline erosion.

4.3 PROJECT EASEMENT LANDS

These are lands on which easement interests were acquired. Fee title was not acquired on these lands but the easement interests convey to the Federal government certain rights to use and/or restrict the use of the land for specific purposes. Easement lands are typically classified as Operations Easement, Flowage Easement, and/or Conservation Easement. At Sam Rayburn Reservoir the only easement lands are those lands where a flowage easement was acquired. A flowage easement, in general, grants to the government the perpetual right to temporarily flood/inundate private land during flood risk management operations and to prohibit activities on the flowage easement that would interfere with flood risk management operations such as placement of fill material or construction of habitable structures Reservoir. There are 45,124 acres (REMIS) of flowage easement at Sam Rayburn Reservoir which includes approximately 17,055 acres of flowage easement located on USFS land (OMBIL).

CHAPTER 5 - RESOURCE PLAN

5.1 RESOURCE PLAN OVERVIEW

This chapter sets forth a resource plan describing, in broad terms, how each land classification within the Master Plan will be managed. All management goals described in Section 3.2 apply to each land classification but the primary goal(s) for each classification is listed below for emphasis. Refer to Section 3.2 for a listing of management objectives applicable to each management goal. Refer to Appendix A for maps showing the various land classifications.

Management of all lands, recreation facilities and related infrastructure must take into consideration the effects of pool fluctuations associated with authorized flood risk management, hydroelectric power generation and water conservation purposes. Management actions are dependent on congressional appropriations, the financial capability of lessees and other key stakeholders, and the contributions of labor and other resources by volunteers. The land classifications and applicable management goals for each classification for Sam Rayburn Reservoir include the following:

- Project Operations……..Goal A, E
- High Density Recreation……Goal C, E
- Environmentally Sensitive Areas……..Goal B, D, E
- Multiple Resource Management Lands for:
  - Low Density Recreation……Goal C, E
  - Wildlife Management……Goal B, E
  - Vegetation Management……Goal B, E

A more descriptive and detailed plan for managing project lands can be found in the Sam Rayburn Reservoir – Operations Management Plan (OMP) which is an annually-updated, task and budget oriented plan identifying tasks necessary to implement the Resource Plan and achieve the goals and objectives of the Master Plan.

5.2 PROJECT OPERATIONS

This land is associated with the dam and spillway structures that are operated and maintained for the purpose of fulfilling the flood risk management, hydroelectric power generation, and water conservation missions of Sam Rayburn Reservoir. There are 370 acres of lands under this classification all of which are managed by USACE. The management plan for the land included in this classification is to continue providing physical security necessary to ensure continued operation of the critical operational structures. Public access to this land is generally restricted with the exception of the Sam Rayburn Dam and Reservoir Office area and parking area located on the south side of the dam. Long term plans envision a boat ramp complex on the Angelina River below the dam in an area that is just outside of the Project

Operations area on a parcel classified as Multiple Resource Management Land – Vegetation Management.

Regardless of any authorized public recreational use of lands that are classified as Project Operations, these uses are subservient to the operation and maintenance requirements of Sam Rayburn Dam, spillway, powerhouse and associated lands and infrastructure.

5.3 HIGH DENSITY RECREATION

Lands classified for High Density Recreation (HDR) are currently developed for intensive recreational activities. Sam Rayburn Reservoir has 11 distinct parcels included in this classification with each area having a unique name. These areas are generally referred to as “Parks”. Depending on available space, funding, and public demand, lands classified for HDR may support additional outdoor recreation development in the future. These areas include access points, day use areas, and campgrounds. Commercial concession areas such as marinas and comprehensive resorts also fall into this classification. These areas have been developed to support concentrated visitation to the extent that an atmosphere of open space compatible with the natural resources of Sam Rayburn Reservoir is maintained.

Six parcels of land that are included in the 11 HDR areas are leased to non-federal partners referred to as grantees, and five areas are listed here that are owned and fully operated by the U.S. Forest Service. USACE operates and manages all park areas that are not leased. Each grantee is responsible for the operation and maintenance of their leased area; USACE does not provide direct maintenance within any of the leased locations, but may occasionally lend support where appropriate. USACE reviews requests and ensures compliance with applicable laws and regulations for proposed activities in all leased and USACE-operated HDR areas. USACE works with partners to ensure that recreation areas are managed and operated in accordance with the objectives prescribed in Chapter 3. A description of each HDR area, including existing and proposed facilities, is provided below. A description of Etoile, Marion Ferry, Monterey, and Ralph MacAllister Parks is included in the descriptions below although the study team determined that the facilities and public use of these two parks indicated a need to classify the area as a MRML- Low Density Recreation area and/or MRML-Vegetation Management. The study team also changed a portion of Powell Park from HDR to MRML-LDR based on past and projected use.

USACE Managed Parks

5.3.1 Ebenezer Park. Ebenezer Park is 93-acre park located on the north side of the spillway and is accessible by a paved road from Recreation Route 255. The campground offers 13 Equestrian sites with water and electric hookups and 17 sites without water and electric hookups. Additional amenities include one Equestrian Day Use area, Equestrian riding trails, community building ‘Ebenezer Hall’ that includes a full kitchen and A/C & heating for rent by the public, and a

swimming beach. Future plans include maintaining existing infrastructure, upgrading facilities to current standards, increasing the number of equestrian sites and full service RV sites, and construction of a new boat ramp facility south of the spillway and sustaining operations.

5.3.2 Etoille Park. This park contains 95-acres and is located on the north side of SH 103 and the east shore of the lake. The area primarily serves as a water access area with a boat ramp and parking. It is a popular boat ramp on the lake because of the excellent fishing available nearby and the close proximity to Lufkin. Future plans include maintaining existing infrastructure and sustaining operations.

5.3.3 Hanks Creek. This park is a 155-acre park located about twelve miles east of Huntington. It is accessible by paved FM 2109 and FM 2801. The site is appealing because of large trees, sandy shoreline and rolling terrain. The campground offers 47 RV sites and 8 Screen Shelter RV sites with water and electric hookups. Additional amenities include a group shelter with 5 campsites for group camping, boat ramp, courtesy dock, hot showers, and a dump station. The Day-Use Area is separate from the camping area and includes a restroom, boat ramp, group shelter, volleyball court, picnic area, swimming beach and playground. Future plans include maintaining existing infrastructure and sustaining operations.

5.3.4 Marion Ferry Park. Marion Ferry Park is a 17-acre park and serves as a boat ramp access area on the river section of the Angelina arm of the reservoir. Originally, Marion Ferry Park contained 131 acres, but the study team determined that the majority of the park should be reclassified from HDR to MRML-Vegetation Management. The present boat ramp and parking area t is popular with the fishermen and primarily serves a water access area with a boat ramp and parking. The state has paved an access road, Marion Ferry Road, to the park from SH 103. The large stand of pine and hardwoods along the shoreline make for a scenic backdrop for this recreation area. The site also features a monument to the town of Marion. Future plans include maintaining existing infrastructure and sustaining operations.

5.3.5 Mill Creek Park. Mill Creek Park is an 81-acre park is located on the edge of the small community of Brookeland. Paved road access is provided by Spur 149 and U.S. Highway 96. The campground offers 110 RV sites with water and electric hookups. Additional amenities include a group shelter, swimming beach, playground, volleyball court, boat launch, hot showers, and 2 dump stations. Nearby private land in Brookeland has been subdivided into home sites, RV parks, and commercial use. The park provides an important boat ramp access point for a large sector of the reservoir. The park area is relatively small but extremely popular and is the highest utilized campground managed by USACE on Sam Rayburn Reservoir. Future plans include maintaining existing infrastructure, upgrading facilities to current standards, renovation of RV sites to offer improved utilities, and sustaining operations. Due to limited land area and visitation demands on infrastructure it

would be beneficial to establish community sewer utilities and services that would support the parks operations.

5.3.6 Monterey Park. Monterey Park is a 34-acre park located on the north shore of Monterey Bay, about eight miles north and east of Zavalla. The state has paved an access road to the site from FM 2193. The area primarily serves a water access area with a boat ramp and parking. Improved roads and the increase in development of private lands for homesites in this area of the lake has resulted in increased general recreation use of Monterey Park and has become a popular boat ramp access to the reservoir. The area is capable of expansion along the shoreline, with camping and fishing event facilities the most apparent need. Future plans include maintaining existing infrastructure and sustaining ramp operations and access.

5.3.7 Overlook Park. Overlook Park is a 29-acre park located adjacent to the intake channel where visitors can see the project structures and have a panoramic view of the reservoir. Originally, the park contained only 10 acres but was expanded by the study team to include 29 acres. An overlook shelter provides a covered viewing area and vista of the reservoir. The park also features a commemorative monument in recognition of Congressman Sam Rayburn of Texas and former longtime Speaker of the House of Representatives. A tree planting program post construction off the dam has modified the construction scars and created a park appearance for the visitor. Future plans include maintaining and renovation of existing infrastructure and expansion of park facilities east of the Reservoir Project Office to include an additional day-use area providing recreational opportunities to the southern portion of the reservoir offering swimming, picnic, play structures, and park facilities.

5.3.8 Ralph McAlister Park. This 32-acre park located on the south side of State 103 and on the west shore of the Attoyac arm of the lake and primarily serves a water access area with a boat ramp and parking. The upper reaches of this arm are quite shallow and have extensive areas of uncleared timber and secondary growth. The park is essentially an access area to the lake and is used primarily by fishermen because of the convenient highway access. Future plans include maintaining existing infrastructure and sustaining operations.

5.3.9 Rayburn Park. This 121-acre park is located at the end of the long peninsula between the Ayish Bayou arm and the main part of the lake. It is accessible from SH 83 by FM 705 and FM 3127. The long undeveloped peninsula provides a natural area for visitors and by remaining undisturbed the old agricultural fields are reverting to forest and adding to the esthetics of the park. Future plans include maintaining existing infrastructure, revitalizing closed campsites offering boat up shoreline access, upgrading facilities to current standards, further development of RV sites to offer utilities, and sustaining operations.

5.3.10 San Augustine Park. This 168-acre park is located on the east shore of Ayish Bayou and about six miles from SH 83. Access to the park is by FM 1751 which also provides access to a number of homesite developments on Ayish Bayou. The campground offers 100 RV sites with water and electric hookups. Additional amenities include a group shelter, swimming beach, volleyball court, basketball court, playground, interpretive trail, boat launch, hot showers, and dump station. Future plans include maintaining existing infrastructure, revitalizing campsites offering boat up shoreline access, upgrading facilities to current standards, renovation of RV sites to offer improved utilities, and sustaining operations.

5.3.11 Twin Dikes Park. Twin Dikes Park includes 247-acres and is located at the east end of the dam and adjoins Recreation Route 255, the east access road crossing the dam approximately 20 miles north of Jasper, Texas. The campground offers 43 campsites, 24 of them without water and electric hookups. Additional amenities include a group shelter, interpretive trail, two 4-lane boat launch areas, hot showers, and a dump station. The park is a popular day-use area providing boat ramp access to the reservoir, and also receives heavy camping use. Also within this park is the Sam Rayburn Marina and Resort (described in concessionaires section below). Significant development of housing subdivisions on the south end of the reservoir and special events such as fishing tournaments contribute to the high utilization of the park facilities to the extent that use sometimes exceeds park capacity. Future plans include maintaining existing infrastructure, upgrading facilities to current standards, renovation of RV sites to offer improved utilities, and sustaining operations. Development of additional boat ramp facilities at nearby Ebenezer Park would aid in offsetting the demand for access that often exceeds the boat ramp capacity at Twin Dikes Park.

County Managed Parks

5.3.12 Cassels-Boykins Park. This 283-acre park is located at the mouth of Monterey Bay and north of State 147. Access is by a paved county road that connects the highway to the park road system. USACE has leased the park to Angelina County which is responsible for maintenance and further development of the site. The site is important for access to this portion of the reservoir since it is convenient for the main flow of traffic crossing the reservoir. The site is capable of further expansion. The site warrants the establishment of a concession area to provide waterfront facilities at a portion of the reservoir that is rapidly developing in services along the highway but has no development of services on the shoreline. Angelina County recognizes this need and proposes a third party operation. Future plans include maintaining existing infrastructure, upgrade of camping facilities, shoreline protection, and development of a trail system.

5.3.13 Umphery Family Pavilion. The Umphrey Family Pavilion is a 22- acre recreation site located on the southern shore of Lake Sam Rayburn right next to the dam and is leased to Jasper County. Located next to the public boat ramp at Twin Dikes Park, the Pavilion offers a large parking area, two outdoor pavilions, restroom

facilities, and courtesy dock. There are two pavilions available for use, a larger one hosts tournaments and major events, and a smaller one supports events such as weddings or family reunions. Future plans include maintaining existing infrastructure and further development of the event venue and facilities.

Concessionaire Managed Parks

5.3.14 Jackson Hill Park. This 170-acre park is located west of the community of Broaddus and north of State 147. Paved access via FM 2851, provides access to the park road system. The park area and marina are currently operated as a commercial lease and offer a variety of facilities, and convenience of access to the reservoir. This Park is a lease concession and provides a full range of waterfront facilities, floating boat slips, camping, RV sites, cabins, swim beach, picnic area, pavilion, and store and restaurant. Future plans of the lessee include maintaining existing infrastructure, upgrade of facilities, and further development of the marina area and lodging facilities.

5.3.15 Powell Park. Powell Park is a fully outgranted, 109-acre park and marina located on the same peninsula as Rayburn Park but fronts on Ayish Bayou. The area is nicely forested with large trees and dense undercover. The developed park area and marina are currently operated as a commercial lease and includes waterfront concessions, floating boat slips, boat ramp, campsites, RV sites, cabins and lodging facilities, swim beach with floating play structure, park store and restaurant. Future plans of the lessee include maintaining existing infrastructure, upgrade of facilities, and further development of the marina area and lodging facilities.

The south area was previously developed and operated by USACE as South Powell and is more forested than northern portions of the park. Much of the shoreline is exposed to prevailing winds and suffers from beach erosion. The area was previously developed as a park and has since closed due to reduced operating budgets. The area would benefit from reversion to forest and wildlife habitat removing existing recreation infrastructure (campsite, roadways, boat ramps, and facilities). Future plans include site remediation and restoration.

5.3.16 Sam Rayburn Marina and Resort. This marina is a 42-acre resort and marina is located within the boundaries of Twin Dikes Park and is currently operated through a commercial lease. The concession provides dockage and other waterfront services, camping areas, RV sites, cabins, trailer rental, playground, swimming area, and marina store. Future plans of the lessee include maintaining existing infrastructure, upgrade of facilities, and further development of the marina area and lodging facilities.

5.3.17 Shirley Creek Park. Shirley Creek Park includes 41acres and is located at the mouth of Shirley Creek and the Angelina arm of the lake. The area is accessible FM 226 from SH 103. The area is currently leased as a commercial

marina concession. The area is developed and fully utilized by the lessee and provides waterfront facilities, floating boat slips, boat ramp, trailer/tent camping, swim beach, and picnicking. Future plans of the lessee include maintaining existing infrastructure, upgrade of facilities, and development of a marina store and restaurant.

US Forest Service Owned and Managed Parks at Sam Rayburn

The following parks are operated by the US Forest Service but are not located on USACE lands, the areas are adjacent to the lake on US Forest Service lands.

5.3.18 Bayou Recreation Site. Located off FM 3127, 2 miles west of FM 705. The site offers a one-lane ramp and small parking area providing access to the reservoir. The park is open all year. Bayou Recreation Site is owned and operated by US Forest Service.

5.3.19 Caney Creek Recreation Site. This park is located off FM 2743, 6 miles east of SH 63. The site offers a two-lane ramp and a small parking area providing access to the reservoir; may not be usable at low lake levels. Camping facilities are available for primitive camping. Caney Creek Recreation Site is owned and operated by the US Forest Service.

5.3.20 Harvey Creek Recreation Site. Located off FM 2390, 5 miles south of SH 83. The site offers a two-lane ramp and small parking area providing access to the reservoir. The park is open all year. Harvey Creek Recreation Site is owned and operated by US Forest Service.

5.3.21 Sandy Creek Recreation Site. This park is located off FM 3333, 5 miles east of SH 63. The site offers a two-lane ramp and small parking area providing access to the reservoir. Campground facilities are closed for repairs until further notice. Sandy Creek Recreation Site is owned and operated by the US Forest Service.

5.3.22 Townsend Recreation Site. This park is located off FM 2923, two miles west of the junction with FM 1277, and three miles south of SH 103. The four-lane boat ramp handles all boat types, but may not be usable at low lake levels. The park is currently open all year and provides primitive camping facilities and is owned and operated by US Forest Service.

5.4 ENVIRONMENTALLY SENSITIVE AREAS

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the Endangered Species Act, the National Historic Preservation Act (NHPA), or applicable Texas 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. Forest management practices and timber harvest should be consistent with management goals related to these areas and determined to be beneficial to achieve a prescribed outcome for the site. The results of the Wildlife Habitat Appraisal Procedure and Floristic Quality Assessment conducted in the late summer of 2016 were used, in part, to assist in determining which areas should be classified as ESA. Other factors, including the presence of cultural resources, species of conservation concern, and visual esthetics were also included in the selection of ESA areas. There are 11 areas totaling approximately 1,809 acres at Sam Rayburn Reservoir that are classified as ESA. Each of these areas are numbered on the land classification maps in Appendix A. Table 5.1 provides a listing of the ESA areas, including habitat type, acreage and both WHAP and FQI scores.

Table 5.1 ESA Listing

ESA Area Number[1]	Acres	WHAP Scores Per Sample Point Number	FQI Score
1 – LPS	123	Point 2 & 3 (.69); (.68)	Point 2 (10.0); Point 3 (10.7)
2 - FW	80	Point 31 (.94)	Point 31 (8.9)
3 - BLH	482	Point 18 (.61)	Point 18 (12.2)
4 - BLH	135	Point 23 (.78)	Point 23 (11.5)
5 - PO	406	Point 25 (.66)	Point 25 (14.7)
6 - BLH	179	Point 26 (.82)	Point 26 (9.8)
7 - BLH	140	Point 28 (.60)	Point 28 (8.0)
8 - FW	87	Point 31 (.94)	Point 31 (8.9)
9 - BLH	81	Point 34 (.75)	Point 34 (11.9)
10 - SS	45	No data collected	No data collected
11 - SS	49	No data collected	No data collected

1. Denotes area number shown on land classification maps in Appendix A as well as habitat types as follows: LPS (Longleaf Pine Savannah), FW (Forested Wetland), BLH (Bottomland Hardwood, PO (Pine-Oak), SS (Steep Slopes)

Future management of ESA areas will be designed to protect and improve the resources that qualify these areas for ESA classification. All of these areas are suitable for development of natural surface pedestrian trails unless the areas are critically important as habitat for sensitive species. Specific management measures may include but are not limited to the following:

- Longleaf Pine Savannah Sites: Management measures include perpetuation of the longleaf pine-bluestem grass complex that exists on these sites. Periodic prescription burns will be done as well as selective thinning. Part of this site is managed as a recruitment stand for RCW.
- Bottomland Hardwood Sites: Selective thinning will be done periodically to favor dominant and desirable mast producers. Supplemental tree and shrub

plantings will be done to increase forest diversity. A mature, older timber component will be maintained on all sites.

- Pine - Oak Sites: Selective thinning will be accomplished to maintain forest vigor and a desirable mix of pine and oak. Prescription burning and tree and shrub plantings will be done to improve stand diversity. A mature, older timber component will be maintained on all sites.
- Cultural Resource Sites: Known sites will be protected from vandalism and/or erosion. Additional reconnaissance surveys will be conducted as needed to determine the extent of cultural resource sites. Tribal coordination will continue to insure proper management and/or protection of known sites.
- Sites supporting Species of Conservation Concern: The site characteristics that cause these areas to be favored by individual species will be protected and improved. Perch and/or nesting sites for the southern bald eagle are examples of site characteristics that need protection.
- Steep Slope Sites: These areas will be monitored to protect their scenic value, wildlife habitat value, and to reduce shoreline erosion.

5.5 MULTIPLE RESOURCE MANAGEMENT LANDS

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

5.5.1 MRML - Low Density Recreation

These lands are generally narrow parcels of land that are adjacent to private residential developments. Future management of these lands calls for maintaining a healthy, ecologically adapted vegetative cover to reduce erosion and improve aesthetics. Prevention of unauthorized use such as trespass or encroachments is an important management objective for all USACE lands, but is especially important for those lands in close proximity to private development. These lands are typically open to the public, including adjacent landowners, for pedestrian traffic and are frequently used by adjacent landowners for access to the shoreline near their homes. Adjacent landowners may apply for a permit to mow a meandering path to the shoreline, and if conditions warrant, may apply for a permit to mow a narrow strip along the USACE boundary line as a precaution against wildfire. Mowing activity by adjacent landowners is addressed in more detail in Chapter 6 of this Plan. The general public may use these lands for bank fishing, hiking, and for access to the shoreline. Hunting may be allowed in select areas that are a reasonable and safe distance from adjacent residential properties. Future uses may include additional designated natural surface hike/bike/equestrian trails. There are 2,249 acres of MRML – Low Density Recreation at Sam Rayburn Reservoir.

5.5.2 MRML - Wildlife Management

These lands are generally medium to large parcels that are located in the upper reaches of the major tributaries to Sam Rayburn Reservoir as well as a few other smaller parcels. Typically, these areas are adjacent to, or completely surround,

one of the designated Environmentally Sensitive Areas. Future management of these lands calls for managing the habitat to support native, ecologically adapted vegetation which in turn supports native wildlife species. Specific management techniques including, but not limited to placement of nesting structures, construction of water features or brush piles, fencing, and planting of specific food producing plants may be necessary to support the needs of rare wildlife species or Species of Greatest Conservation Need (see Appendix F for a listing of rare species by county and Species of Greatest Conservation Need). Additional wildlife management practices include use of erosion control blankets that do not pose entrapment hazards to wildlife; elimination of open-top vertical pipes that pose an entrapment hazard to wildlife; minimize nighttime lighting and only use down-shielded lighting to prevent disorientation of night-migrating birds; follow USFWS guidelines for building glass to prevent bird collisions; preserve and restore wildlife habitat in high density recreation areas; ensure that mowing practices provide standing tallgrass over winter to provide essential cover for wintering birds; and report state-listed species and rare vegetative communities to the Texas Natural Resources Diversity Database.

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

Current public use of these lands includes hiking and horseback riding on existing trails, bank fishing, canoeing and kayaking, and hunting. Future public use includes all existing uses and expansion of trail opportunities where feasible. Some MRML – Wildlife Management may support the establishment of nature centers or environmental learning areas. There are 896 acres of MRML – Wildlife Management at Sam Rayburn Reservoir.

5.5.3 MRML - Vegetative Management

In general, vegetative resources on USACE lands are managed for multiple purposes including wildlife habitat, recreational activities in parks, landscape aesthetics, and timber. Management of forest on USACE lands nationwide is guided, in part, by policy set forth in Public Law 86-717, the Forest Cover Act, which states that "…project lands shall be developed and maintained to assure a future supply of timber through sustained yield programs to the extent that such management is practicable and compatible with other uses of the project." Additional forest management guidance is set forth in USACE regulations ER & EP 1130-2-540 which specifies that stewardship of project land shall be ecosystem based. Meeting the intent of the Forest Cover Act, USACE regulations, and the public interest

expressed in the formulation of the Master Plan has resulted in management objectives that are set forth in Chapter 3 of this Plan. Key among these objectives are:

- Perpetuation of forest types reflective of the Pineywoods Ecoregion. The primary forest types include: pine; pine-hardwood uplands; longleaf pine/little bluestem savannah; bottomland hardwoods.
- Implementation of selective harvest systems in pine-hardwood and bottomland hardwood forest types that result in a mix of species and ages as well as a diverse understory.
- Maintenance of a mature, older timber component in all forest types.
- Maintenance of a fully forested, continuous canopy shoreline having a mixture of tree species, ages, and diverse understory.
- Establishing flood tolerant trees, to the extent practicable, in areas that are frequently inundated by stored flood water.
- Maintaining forest vigor to prevent loss of timber to disease and insect infestation, and to reduce the occurrence of hazardous trees in public use areas and along boundary lines in populated areas.

Current recreational use of these lands includes bank fishing and pedestrian access by adjoining landowners. Future uses include all existing uses with the possibility of creating multiuse trail opportunities. There are 10,296 acres of MRML – Vegetation Management at Sam Rayburn Reservoir.

Photo 5-1 Prescribed fire is a useful forest management tool that helps control invasive species and improve forest vigor and health (USACE Photo)

5.6 WATER SURFACE

In accordance with national USACE policy set forth in EP 1130-2-550, the water surface of the lake at the conservation pool elevation may be classified using the following four classifications:

- Restricted
- Designated No-Wake
- Open Recreation

At the conservation pool elevation of 164.4 msl, Sam Rayburn Reservoir has a water surface of 112,590 acres. The following water surface classifications are designated at Sam Rayburn Reservoir.

5.6.1 Restricted

Restricted water surface includes those areas where recreational boating is prohibited or restricted for project operations, safety and security purposes. The Restricted water surface at Sam Rayburn Reservoir includes a designated strip of water surface along the north side of the Sam Rayburn Dam and on the south side of dam near the Sam Rayburn Powerhouse. Designated swimming beaches are also classified as Restricted water surface. The total acreage of Restricted water surface is approximately 40 acres. These areas are normally marked with standard United States Coast Guard (USCG) regulatory buoys stating that boats are excluded from the area. In some instances, physical barriers may be in place on the water.

5.6.2 Designated No-Wake

Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve boating safety near key recreational water access areas such as designated boat ramps and within marina coves. Designated No-Wake areas at Sam Rayburn Reservoir include entry points for each of the four existing marinas, and an area of approximately ten acres at each of the 31 public boat ramps on Sam Rayburn Reservoir. These areas are typically, but not always marked with standard USCG regulatory buoys. Sam Rayburn Reservoir has approximately 190 acres of surface water designated for this purpose.

5.6.3 Open Recreation

Open Recreation includes all water surface areas available for year round or seasonal water-based recreational use. With the exception to the Restricted and Designated No-Wake areas described in the above paragraphs, the remaining water surface of approximately 112,360 acres at Sam Rayburn Reservoir water surface is designated as Open Recreation.

Future management of the water surface includes the maintenance of warning, information, and regulatory buoys as well as routine water safety patrols during peak use periods.

5.6.4 Recreational Seaplane Operations

Many USACE-administered reservoirs, including Sam Rayburn Reservoir, have areas where recreational seaplane operations are allowed. Areas where recreational landings and takeoffs are prohibited are determined by USACE through a public process separate from the Master Plan process and the information is furnished to the Federal Aviation Administration for publication in their Notice to Airmen. Appendix F is a USACE, Fort Worth District, publication listing District-wide prohibitions and restrictions as well as a description of areas at each lake where recreational seaplane landings and takeoffs are prohibited. Once a seaplane has landed it is considered a vessel and may taxi in locations where boating traffic is allowed.

5.7 PROJECT EASEMENT LANDS

Future management of the 45,124 acres of Flowage Easement Lands at Sam Rayburn Reservoir includes routine inspection of these areas to insure that the Government's rights specified in the easement deeds are protected. In almost all cases, the Government acquired the right to prevent placement of fill material or habitable structures on the easement area. Placement of any structure that may interfere with USACE flood risk management and water conservation missions may also be prohibited.

CHAPTER 6 - SPECIAL TOPICS/ISSUES/CONSIDERATIONS

6.1 COMPETING INTERESTS ON THE NATURAL RESOUCES

Sam Rayburn Reservoir is a large 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. As a result competing interests for the utilization of federal lands, impacts, and the way natural resources are managed can be influenced. Balancing these interests so the customer can benefit while ensuring their adverse impacts are minimized per USACE environmental stewardship mission can be challenging. The intention of this document is to outline a plan, which when executed, provides customer service and appropriate natural resource management.

6.2 HYDROPOWER

Authorization of the Sam Rayburn Power House came from the River and Harbor Act of March 2, 1945 (Public Law 79-14) (SD 98/76/1), modified be the River and Harbor Act of June 30, 1948 (Public Law 80-858). Public Law 88-123 approved September 11, 1963 changed name of project from McGee Bend to Sam Rayburn Reservoir. Construction of project initiated September 7, 1956. Deliberate impoundment began March 29, 1965. Power generation began September 23, 1965. Commercial power generation began July 1, 1966 (unit 1) and May 1, 1968 (2 units). The water storage reallocations at Sam Rayburn Reservoir have adjusted over the life of the reservoir due to demand on water and loss of storage due to sedimentation. Each reallocation was deemed feasible from a technical and economic perspective.

The Sam Rayburn Hydroelectric Power Plant is made up of two generators capable of generating 26,000 kilowatts each. The plant generates electricity through two power intakes, with two water passages each, located within the concrete portion of the dam. During generation the plant carries water stored in the reservoir to two hydraulic turbines connected to the generators. The power plant serves as a peaking plant to supplement power to the grid during peak utilization times. The power is marketed by the Southwestern Power Administration, an agency of the U.S. Department of Energy. The reservoir stores 1,452,000 acre feet of water dedicated to support the power head and production of hydroelectric power. The plant is scheduled for a major renovation and generator rehabilitation in 2020, upgrading the plant and the associated facilities.

6.3 WATER SUPPLY

The Lower Neches Valley Authority and the city of Lufkin, Texas have contracts for storage at Sam Rayburn Reservoir.

The 2,898,509 acre-feet of storage space below elevation 164.4 msl is controlled and managed by the USACE to satisfy the requirements of stream flow

and hydropower generation demand. In order to supply water for municipal, industrial, and agricultural uses, it is necessary to release water into B.A. Steinhagen Lake. Some of the released waters will be allowed to flow down the lower Neches River to prevent salt water intrusion.

The contract with Lower Neches Valley Authority of Texas is for water releases by the Government for the purposes of hydropower generation; not water supply. The city of Lufkin, Texas, has a contract for 18,000 acre-feet for initial storage and 25,000 acre-feet for future use. As the pool elevation recedes below elevation 164.4 msl, the city of Lufkin accounts for its share by multiplying the percentage of its contracted water by the remaining storage above elevation 149.0 msl. Each user will get his percent of the inflow, which is added to its share of the remaining storage. Each user will get his percent of the losses and discharges which will be subtracted from its remaining storage. This procedure is repeated as the pool level rises and drops, and each users shares increases and decreases accordingly

The Sam Rayburn Dam Electric Cooperative, Inc. (referred to as the Sam Dam Co-op) has a contract with the Lower Neches Valley Authority for 1,403,489 acre-feet or 97.03% of the conservation pool between elevation 164.4 and 149.0 feet NGVD, for the generation of hydropower. The procedure for accounting for its share of the conservation water is to multiply the percent of its contracted water by the remaining storage above elevation 149.0. Each user will get its percent of the inflow, which is added to its share of the remaining storage. Each user will get a percentage of the losses and discharges which will be subtracted from its remaining storage. The operating rule curve divides the conservation pool into zones reflecting pool levels for making power releases at different times of the year.

In 1998, meetings began between the USACE and SWPA concerning water use below elevation 149'. In 1999, USACE Counsel indicated that Section 6 of P.L. 78-534 would be the basis for releasing water below 149 feet. At that time there was some question as to whether SWPA could generate power below 149. Now the turbines have been modified so that the angle of the blades can be adjusted to make power efficiently for several feet below 149.

6.4 SHORELINE MANAGEMENT POLICY

Construction for Sam Rayburn Reservoir began in 1956 and impoundment of water began in March 1965. On December 13, 1974 the USACE published a new regulation, ER 1130-2-406, in the Federal Register entitled “Civil Works Projects: Lakeshore Management.” This regulation was published as Part 327.30 of Chapter III, Title 36 of the Code of Federal Regulations. A subsequent change to the regulation was published in the Federal Register on October 31, 1990, incorporating the results of recent legislation and changing the name to “Shoreline Management at Civil Works Projects.” The focus of this regulation is to establish national policy, guidelines, and administrative procedures for management of certain private uses of Federal lands administered by USACE. A key requirement in the regulation is that private shoreline uses, as defined in the regulation, are not allowed at lakes where

no such private uses existed as of December 13, 1974. At Sam Rayburn Reservoir no such private uses existed as of that date and therefore private shoreline uses are not allowed.

The private uses described in the regulation primarily include privately-owned floating facilities such as floating boat docks, fixed or movable piers, and vegetation modification activities such as plantings, mowing, and selective removal of shrubs and trees to the extent that exclusive benefits accrue to an individual or group and the general public is denied use of public lands or waters. Not included in the above definition are certain limited private activities that do not provide exclusive benefits to an individual or group, nor preclude general public use. These limited private activities may be allowed by written shoreline use permit for reasons of public safety, erosion control, benefits to wildlife, or to provide reasonable pedestrian access to the shoreline. A key requirement of the regulation is stated as follows: “Except to honor written commitments made prior to publication of this regulation, private shoreline uses are not allowed on water resources projects where construction was initiated after December 13, 1974, or on water resources projects where no private shoreline uses existed as of that date.” The regulation requires USACE to prepare a Shoreline Management Plan for those projects where private uses existed as of December 13, 1974, and a Shoreline Management Policy Statement (SMPS) for all other projects. In response to this requirement a SMPS was prepared for Sam Rayburn Reservoir in 1975. The SMPS was administratively updated in January 2012

The purpose of the SMPS is to set forth the policy and procedures by which USACE manages certain private uses of public lands at Sam Rayburn Reservoir. Private uses that accrue exclusive benefits to an individual are not allowed at Sam Rayburn Reservoir. The non-exclusive private uses that may be authorized by written permit from USACE include mowing and removal of underbrush to the extent needed for protection from wildfire and limited clearing to provide a pedestrian access path from private property to the shoreline. These non-exclusive uses may not be authorized in all areas and are subject to restrictions set forth in the SMPS. To further inquire about the SMPS at Sam Rayburn Reservoir please contact the lake office.

6.5 TREE RISK MANAGEMENT GUIDANCE

Beginning March 2013 USACE, Fort Worth District developed Tree Risk Management Guidance. This guidance is applicable at all Fort Worth District lakes and was needed following widespread tree mortality resulting from the drought conditions that persisted through 2011 and 2012. The entire guidance document, available at the lake office, must be consulted to understand how the guidance is fully implemented. A brief summary of the three tree risk management zones, and related management guidelines is provided as follows in order of descending priority.

- Public Use Areas: These are areas classified in project Master Plans as High Density Recreation areas such as campgrounds, day use areas, and concession/resort areas, and include the public roadways, parking lots and

designated trails within these areas. Within constraints imposed by available manpower and funds, these areas have the highest priority for tree inspection and remedial action. Tree inspection in these areas shall be a continuous process of visual inspection conducted during other routine activities such as ranger patrols and facility maintenance activities. Visual inspections shall also be conducted following storm events. At a minimum, personnel who are best qualified to perform visual tree inspections shall inspect all USACE-administered public use areas at least one time annually. Lessees are responsible for maintaining safe conditions in their respective areas, although Corps personnel should perform visual, drive-by tree inspections during other routine compliance inspections. There are many undeveloped acres in some public use areas that have virtually no targets, are rarely used by the visiting public, and are therefore a low priority area for conducting tree inspections. When the project determines that a tree is a moderate to high risk, the area surrounding the tree, to include all targets shall be cordoned off from public use as soon as possible until remedial action can be taken.

- Boundary Line Zone Adjacent to Private Development: This is a strip of federal land of variable width lying parallel to USACE property boundary line where the boundary line is adjacent to private development such as homes and businesses. The width of this zone is limited to the height of the tallest trees within the zone that could hit a target on private land if a given tree failed. These areas are not inspected on a routine basis, but when notified of a perceived hazardous tree by an adjacent landowner, or when hazardous trees in the boundary line zone are discovered by the Corps ancillary to other boundary work, the Corps shall follow specific steps prescribed in the Tree Risk Management Guidance document. If the tree is deemed a moderate to high risk, USACE will follow removal options specified in the Tree Management Guidance. Suspect trees that USACE determines to be a low risk shall not be removed if the tree contributes to the wildlife habitat or aesthetic value of the area. If a suspect tree is of low habitat or aesthetic value removal may be authorized.

- All Other Areas: This includes all areas not described above these areas are classified in the project Master Plan as Project Operations (dam, spillway, and other prime facilities), Environmentally Sensitive Areas, and Multiple Resource Management Lands (Low Density Recreation Areas, Wildlife Management Areas, Vegetation Management Areas, Future/Inactive Recreation Areas). These areas shall not be inspected for hazardous trees with the following exceptions:
    - Boundary Line Zone described above
    - Designated primitive campsites
    - Designated Parking Lots
    - Designated Trailheads and Trails

The area traversed by permitted pedestrian paths (via ENG FORM 4264-R) shall not be inspected for the presence of hazardous trees with the exception of that portion of the area that may fall within the Boundary Line Zone.

To further inquire about the Tree Risk Management Guidance at Sam Rayburn Reservoir please contact the lake office.

6.6 ECONOMIC BENEFITS OF BASS FISHING TOURNAMENTS

In 2013 M. Todd Driscoll and Randall A. Meyers, both employees of TPWD, co-authored a report entitled *Black Bass Tournament Economics at Sam Rayburn Reservoir*. A copy of the complete report is available on request from TPWD's Regional Fisheries Office in Tyler, Texas, (phone: 903-566-1615). The year-long study included extensive, in-person, creel surveys conducted at random times and locations on 36 different days as well as 3,107 questionnaires mailed to a representative sample of both tournament and non-tournament fishermen. Using numerous available records, including USACE special event records, it was determined that 25,396 fishermen participated in 405 separate tournaments on Sam Rayburn Reservoir during the study period. The data resulting from the surveys and questionnaires was used to determine that total angling expenses of both tournament and non-tournament fishermen was approximately $31.9 million during the study period. Tournament angling accounted for $23.7 million of the total. In addition, the study determined the annual total economic value of the Sam Rayburn fishery to be $46.7 million of which 66% was attributed to tournament fishing. This figure was derived by summing direct angler expense and consumer surplus (the amount fishermen would be willing to pay over and above their direct angling expense during a typical fishing trip). In summary, the study noted that more than 75% of total annual direct angling expenditures were made by non-local and out-of-state fishermen. These expenditures represent "new" money to the Sam Rayburn Reservoir area thus indicating a great economic benefit to area businesses, some of which are not directly related to Sam Rayburn Reservoir.

Photo 6-1 Typical turnout for a major bass tournament at Sam Rayburn Reservoir (USACE Photo)

CHAPTER 7 - PUBLIC AND AGENCY COORDINATION

7.1 PUBLIC AND AGENCY COORDINATION OVERVIEW

USACE policy guidance in ER 1130-2-550, Change 7, January 30, 2013 and EP 1130-2-550, Change 5, January 30, 2013 requires thorough public involvement and agency coordination throughout the master plan revision process including any associated environmental assessment process. Public involvement is especially important at Sam Rayburn Reservoir to ensure that future management actions are both environmentally sustainable and responsive to public outdoor recreation needs within the region. The following milestones provide a brief look at the overall process of revising the Sam Rayburn Reservoir Master Plan.

- October 2014 - USACE began planning to revise the Sam Rayburn Reservoir Project Master Plan
- April 2015 – Public Scoping Meeting
- Spring-Summer 2015 – Work delayed due to flooding
- 2015 – Preliminary work continues (team assembled, gather data, research files). Lake Manager and project staff continue meeting with key stakeholders to personally inform them of the master plan process.
- March 2016 – Draft document preparation begins. Public Involvement plan is drafted
- March 2016 – Master Plan and Environmental Assessment Public Meeting
- March – August 2016 - Public comment analyzed. WHAP and FQA completed. Work continues on draft Master Plan and Environment Assessment.
- November 2016 - Final draft Master Plan and Environmental Assessment Completed
- (enter new dates here as public meetings are held to review draft master plan)

7.2 INITIAL STAKEHOLDER AND PUBLIC MEETINGS

The first action was a scheduled public scoping meeting providing an avenue for public and agency stakeholders to ask questions and provide comments. Due to the size of Sam Rayburn Reservoir, USACE choose to hold the public scoping meeting in two separate locations on separate days to maximize the public participation. The public scoping meetings were held on April 28, 2015 in Lufkin, Texas at the Ellen Trout Zoo and April 29, 2015 in Brookeland, Texas at the Rayburn Country Resort Clubhouse. The Fort Worth District placed commercial advertisements on the USACE webpage, social media, and ads published in area newspapers on multiple dates during the two weeks prior to the public scoping meeting. In addition, a comprehensive list of key stakeholders was developed and each person, agency or entity on the list was contacted to provide advance notice of the public meetings.

USACE employees hosted the workshop, which was conducted in an open format. Participants were asked to sign-in at a table where staff provided the participants with information regarding the structure of the scoping meeting, comment forms, and postage paid envelopes to return comment forms. After signing in, participants were given an informational presentation regarding why a revision was needed, the process of a master plan revision, and how their input would help develop the revised Sam Rayburn Dam and Reservoir Master Plan. After the presentation visitors were directed to an area where topic-specific information tables were set up. Large-scale boards were displayed at each table to convey maps 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
- Submitting a comment and mailing it in on letterhead or choice of paper

In total 170 individuals, not including USACE personnel, attended the April 28, 2015 and 258 individuals attended the April 29, 2015 public scoping meetings for the public at large, interest groups, partner agencies, other government agencies, and businesses. Thirty-six written comments were received following the public scoping meeting. The USACE response to comments received are provided in Appendix H.

The various comments were helpful in determining the type and degree of land reclassifications and development of management objectives. Although, a majority of the comments did not directly propose a change to land classifications and management of resources all comments from the public were considered by in a preparation of the master plan.

7.3 PUBLIC AND AGENCY REVIEW

Remainder to be completed following Public and Agency review of the draft MP and EA/draft FONSI.

CHAPTER 8 - SUMMARY OF RECOMMENDATIONS

8.1 SUMMARY OVERVIEW

The preparation of the Sam Rayburn Reservoir Master Plan followed the new USACE master planning guidance in ER 1130-2-550 and EP 1130-2-550, both dated 13 January 2013. Three major requirements set forth in the new guidance include (1) the preparation of contemporary Resource Objectives, (2) Classification of project lands using the newly approved classification standards, and (3) the preparation of a Resource Plan describing in broad terms how the land in each of the land classifications will be managed into the foreseeable future. Additional important requirements include rigorous public involvement throughout the process, and consideration of regional recreation and natural resource management priorities identified by other federal, state, and municipal authorities. The study team endeavored to follow this guidance to prepare a master plan that will provide for enhanced recreational opportunities for the public, improve environmental quality, and foster a management philosophy conducive to existing and projected staff levels at Sam Rayburn Reservoir. Factors considered in the Plan were identified through public involvement and review of statewide planning documents including TPWD's 2012 Texas Outdoor Recreation Plan (synonymous with SCORP) and the Texas Conservation Action Plan-Pineywoods ecoregion. This Master Plan will ensure the long term sustainability of the USEACE managed recreation program and natural resources associated with Sam Rayburn Reservoir.

8.2 LAND RECLASSIFICATION PROPOSALS

A key component in preparing this Master Plan was examining prior land classifications and addressing the needed transition to the new land classification standards. During the public involvement process USACE sought public input into whether, besides the simple change in nomenclature, a shift in land classification was desired (for example, should lands with a recreation classification be reclassified to a wildlife classification or vice versa.). Chapter 7 of the Plan describes the public input process.

A total of 36 comments were received by the public or agencies in the initial public input sessions. Several of the comments directly and indirectly addressed changes in land classification or resource management. Additional reclassification proposals assessed during this process were formulated by Sam Rayburn Reservoir Project staff, Regional Planning and Environmental Center (RPEC) staff and Fort Worth District Office staff assigned to the Project Delivery Team (PDT). There were 47 actions to reclassify existing uses, which reflect historic and projected public use and new guidance from ER 1130-2-550 and EP 1130-2-550. A summary of land classifications is presented in Table 8.1. Reclassification proposals that are not supported by the developed resource objectives are presented in Table 8.2.

Table 8.1 Change in Land Classification from Prior Classifications to New Classifications

Prior (1976) Land Classifications	Acres	New Land Classifications	Acres	Net Difference
Dam and Operational Structures	1,000	Project Operations	370	(630)
Recreation – Intensive Use	3,861	High Density Recreation (HDR)	1,598	(2,263)
		Environmentally Sensitive Areas (ESA)	1,809	1,809
Recreation – Low Intensity	8,862	Multiple Resource Management – Low Density Recreation (MRML-LDR)	2,249	(6,613)
Wildlife and Natural Use	8,379(1)	Multiple Resource Management – Wildlife Management (MRML-WM)	896	(7,483)
		Multiple Resource Management – Vegetation Management (MRML-VM)	10,296	10,296
		Future/Inactive Recreation Areas	718	718

(1) Acres included water surface acres

Note: These acreage figures were measured using GIS technology and may vary slightly from official land acquisition records.

Table 8.2 Land Classification Changes and Justifications for New Land Classifications

Land Classification	Description of Changes	Justification
Project Operations	The decrease of Project Operations lands from 1,000 acres to 370 acres resulted from the reclassification of 630 acres of prior Project Operations land to MRML-VM, ESA and a small parcel of HDR lands.	All lands classified as Project Operations are managed and used primarily in support of critical operational requirements related to the primary missions of flood risk management, hydropower and water conservation. The 370 acres that are now classified as Project Operations is sufficient for current and future operational requirements The classification of 370 acres of Project Operations land will have no effect on current or projected public use.

Land Classification	Description of Changes	Justification
High Density Recreation	Approximately 3,861 acres was classified under the prior classification of Recreation -Intensive Use and included public use areas, commercial concession areas, use areas and private recreation lease areas. Approximately 2,263 of these acres were reclassified leaving 1,598 acres under the new, but similar classification of High Density Recreation (HDR). The reclassification of the 2,263 acres was accomplished as follows: • Prior Recreation – High Intensive Use areas including the former Needmore, Massey-Good, and McElroy Parks were reclassified to MRML-VM or MRML-WM. • Undeveloped portions of several actively managed HDR areas were reclassified as Future/Inactive Recreation Areas. Included was Tiger Creek Park and portions of Jackson Hill and Powell Parks.	In general terms, the amount of land classified for Recreation – Intensive Use in the 1970 Master Plan was excessive and was based on projected needs at the time. Management experience since 1970 has clearly revealed that numerous reclassifications were needed to reflect actual use, evolving trends and regional priorities. The reclassification of former Recreation-Intensive Use areas and portions of actively managed HDR areas will not affect current or projected public use.
Environmentally Sensitive Areas	The classification of 1,809 acres as ESA resulted from the reclassification of several parcels of land under the prior classification of Recreation - Low Intensity.	Reclassification of the 1,809 acres was determined by the study team to be necessary to provide a high level of protection for those areas supporting bottomland hardwood forests, longleaf pine savannah and areas with steep, aesthetic bluffs and

Land Classification	Description of Changes	Justification
		ravines. Habitat studies conducted as part of the master plan revision effort support the classification of these lands as ESA. Protection of cultural resources also justifies the classification of some areas as ESA. The ESA areas also provide good to excellent habitat for endangered species and numerous Species of Conservation Concern. Classifying these acres as ESA will afford these areas the highest level of protection from disturbance. The reclassification of 1,809 acres to ESA will have no effect on current or projected public use.
MRML – Low Density Recreation	The definition of the prior classification of Recreation - Low Intensity is very comparable to the definition of the current classification of MRML – Low Density Recreation (LDR). Land classification changes resulted in a reduction of these acres from 8,862 acres to the current 2,248 acres into the two classifications of MRML – Vegetation Management (VM) and Wildlife Management (WM) and ESA.	The net reduction in LDR lands was necessary to recognize high ecological and aesthetic value of those areas reclassified to VM, WM and ESA. The largest portion of the reduction was a reclassification of lands to MRML-Vegetation Management to recognize that this large area of land has been historically managed to insure healthy, productive forests, and aesthetically pleasing shorelines than for recreational purposes. Those lands remaining as LDR are located primarily in shoreline areas where vegetation modification (mowing) permits occur in accordance with the Shoreline Policy. Current LDR lands are also located adjacent to dense residential development. These changes support management actions and

Land Classification	Description of Changes	Justification
		recreational trends identified in the TORP. Public use of all areas that were reclassified will not be affected now or in the foreseeable future. Public access in the form of natural surface hiking and biking trails is compatible with these classifications.
MRML – Wildlife Management	8,379 acres of primarily water surface under the prior classification of Wildlife Management was reclassified as Open Recreation Water Surface. In addition, the former Needmore Park area and approximately one-half of Rayburn Park were reclassified as MRML – WM These reclassifications resulted in 896 acres remaining under the MRML-WM classification.	As set forth in Chapter 5, Section 4.2.3.4, there is no justification for any water surface areas to be classified as Fish & Wildlife Sanctuary. The water surface areas in question have never been specifically managed for wildlife and neither TPWD nor USFWS have published special waterfowl restrictions for the areas. The former undeveloped park areas that are now classified as MRML-WM have historically been managed for wildlife purposes. These reclassifications will have no effect on current or projected public use.
MRML – Vegetation Management	The classification of 10,296 acres to MRML –Vegetation Management resulted from • Reclassification of 630 acres from Project Operations • Reclassification of approximately 10,666 acres of prior Recreation - Low Intensity and Recreation – Intensive Use lands. The majority of the reclassified acreage was under the prior classification of Recreation - Low Intensity.	All parcels that were reclassified to MRML – VM were reclassified to recognize the long term historic management of these lands to provide healthy and productive forests in accordance with directives specified in Public Law 86-717, the Forest Cover Act and to maintain an aesthetically pleasing, fully forested shoreline.. This reclassification will have no effect on current or projected public use.

Land Classification	Description of Changes	Justification
Future/Inactive Recreation Areas	The classification of 718 acres to Future/Inactive Recreation Areas resulted from the following changes: • 718 acres of former Recreation – Intensive Use was reclassified to Future/Inactive Recreation Area the areas include Tiger Creek Park and portions of Powell Park.	The parcels classified as Future/Inactive Recreation are undeveloped. Until there is a need to develop these lands, they will be managed as Multiple Resource Management lands. These reclassifications will have no effect on current or projected public use.

Note: The land classification changes described in this table are the result of changes to more than 60 individual parcels of land ranging from a few acres to several hundred acres. Acreages were measured using GIS technology. The acreage numbers provided are approximate.

CHAPTER 9 - REFERENCES

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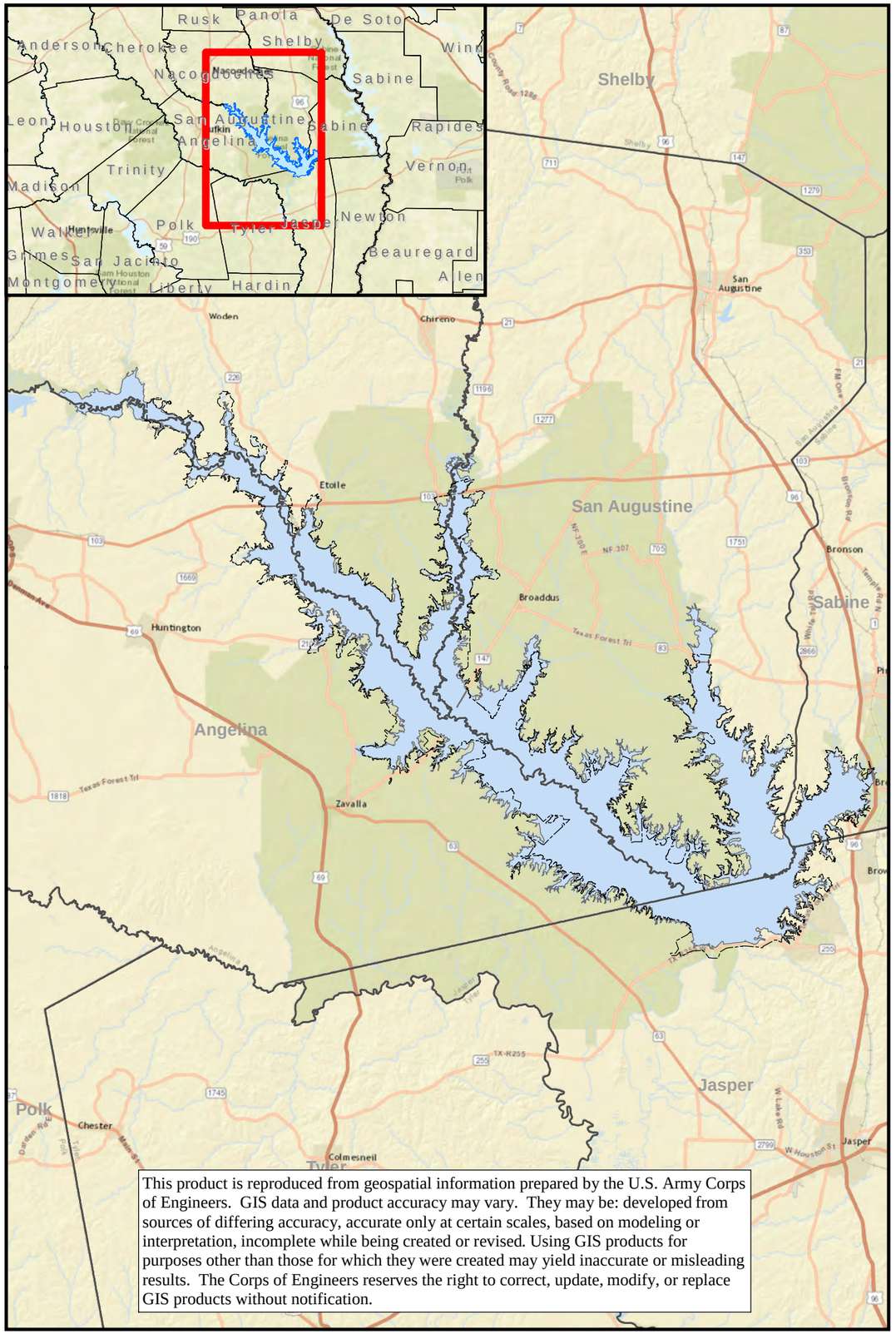
APPENDIX A - MAPS



Index To Master Plan Maps

General

Map No.	Title
SR17MP-OI-00	Project Location & Index Map
SR17MP-OM-01	Agency Land Management

Land Use and Water Surface Classification

SR17MP-OC-00	Classification Sheet (00)
SR17MP-OC-01	Classification Sheet (01)
SR17MP-OC-02	Classification Sheet (02)
SR17MP-OC-03	Classification Sheet (03)
SR17MP-OC-04	Classification Sheet (04)
SR17MP-OC-05	Classification Sheet (05)
SR17MP-OC-06	Classification Sheet (06)
SR17MP-OC-07	Classification Sheet (07)
SR17MP-OC-08	Classification Sheet (08)
SR17MP-OC-09	Classification Sheet (09)
SR17MP-OC-10	Classification Sheet (10)
SR17MP-OC-11	Classification Sheet (11)
SR17MP-OC-12	Classification Sheet (12)
SR17MP-OC-13	Classification Sheet (13)
SR17MP-OC-14	Classification Sheet (14)
SR17MP-OC-15	Classification Sheet (15)
SR17MP-OC-16	Classification Sheet (16)
SR17MP-OC-17	Classification Sheet (17)
SR17MP-OC-18	Classification Sheet (18)
SR17MP-OC-19	Classification Sheet (19)
SR17MP-OC-20	Classification Sheet (20)
SR17MP-OC-21	Classification Sheet (21)
SR17MP-OC-22	Classification Sheet (22)
SR17MP-OC-23	Classification Sheet (23)
SR17MP-OC-24	Classification Sheet (24)
SR17MP-OC-25	Classification Sheet (25)
SR17MP-OC-26	Classification Sheet (26)
SR17MP-OC-27	Classification Sheet (27)
SR17MP-OC-28	Classification Sheet (28)
SR17MP-OC-29	Classification Sheet (29)
SR17MP-OC-30	Classification Sheet (30)

Recreational Areas

SR17MP-OR-01	Ebeneezer Park Expansion
SR17MP-OR-02	Ebenezer Park
SR17MP-OR-03	USFS Sandy Creek Park
SR17MP-OR-04	USFS Caney Creek Park
SR17MP-OR-05	Cassels-Boykin Park
SR17MP-OR-06	Monterey Park
SR17MP-OR-07	Hanks Creek Park
SR17MP-OR-08	Ewing Park
SR17MP-OR-09	Marion Ferry Park
SR17MP-OR-10	Shirley Creek Park
SR17MP-OR-11	Shirley Creek Park - Marina
SR17MP-OR-12	Ralph McAlister Park
SR17MP-OR-13	USFS Townsend Park
SR17MP-OR-14	Jackson Hill Park - Marina
SR17MP-OR-15	USFS Harvey Creek Park
SR17MP-OR-16	USFS Bayou Park
SR17MP-OR-17	Rayburn Park
SR17MP-OR-18	Powell Park - South
SR17MP-OR-19	Powell Park - North
SR17MP-OR-20	Powell Park - Marina
SR17MP-OR-21	San Augustine Park
SR17MP-OR-22	Mill Creek Park
SR17MP-OR-23	Twin Dikes Park
SR17MP-OR-24	Sam Rayburn Marina Resort
SR17MP-OR-25	Twin Dikes - Jasper County
SR17MP-OR-26	Overlook Park - Expansion
SR17MP-OR-27	Overlook Park

Fee Boundary

Water Surface

U.S. Army Corps of Engineers
Fort Worth District

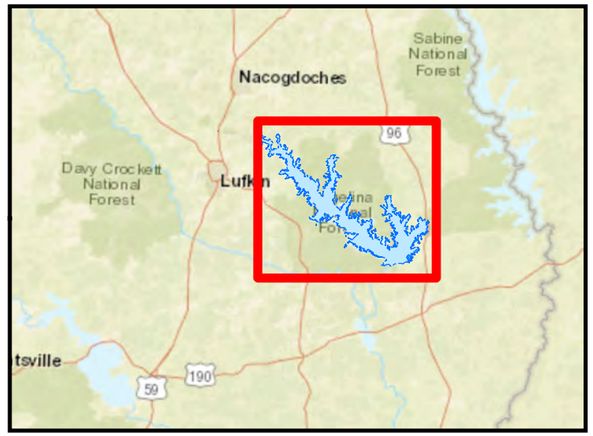
Sam Rayburn Reservoir Master Plan

Map Index

0 4 8 12 16 Miles

N

Date:	Map No.
January 2017	SR17MP-OI-00



Legend

- Fee Boundary
- U.S. Army Corps of Engineers
- U.S. Forest Service
- Other/ Private

U.S. Army Corps of Engineers

Sam Rayburn Reservoir Master Plan

Agency Land Management Map

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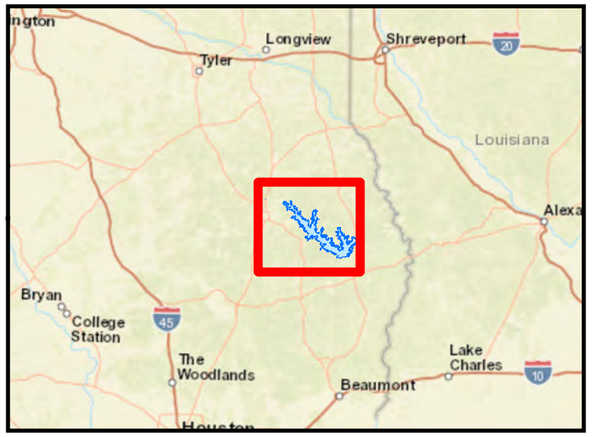
January 2017	SR17MP-OM-01



- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

U.S. Army Corps of Engineers
Fort Worth District

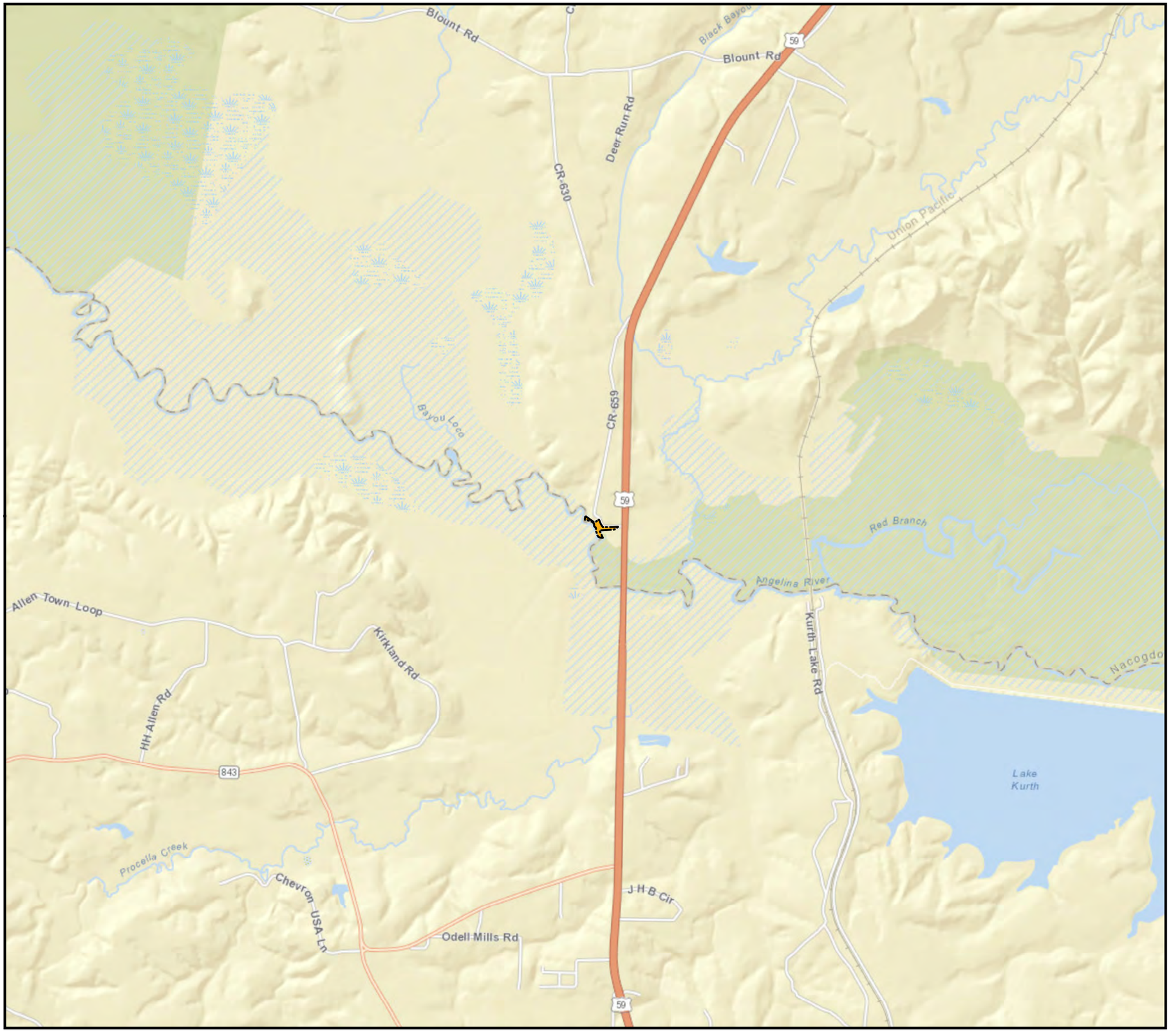
Sam Rayburn Reservoir Master Plan

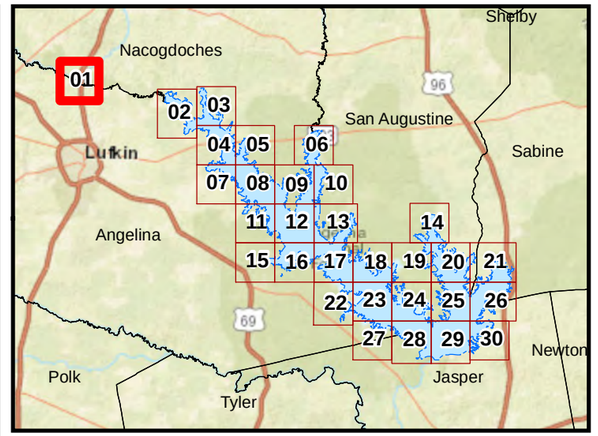
Land Use and Water Surface Classification

Page - 00

0 2.5 5 7.5 10 Miles

Date:	Map No.
January 2017	SR17MP-OC-00





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
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Fort Worth District

Sam Rayburn Reservoir Master Plan

Land Use and Water Surface Classification

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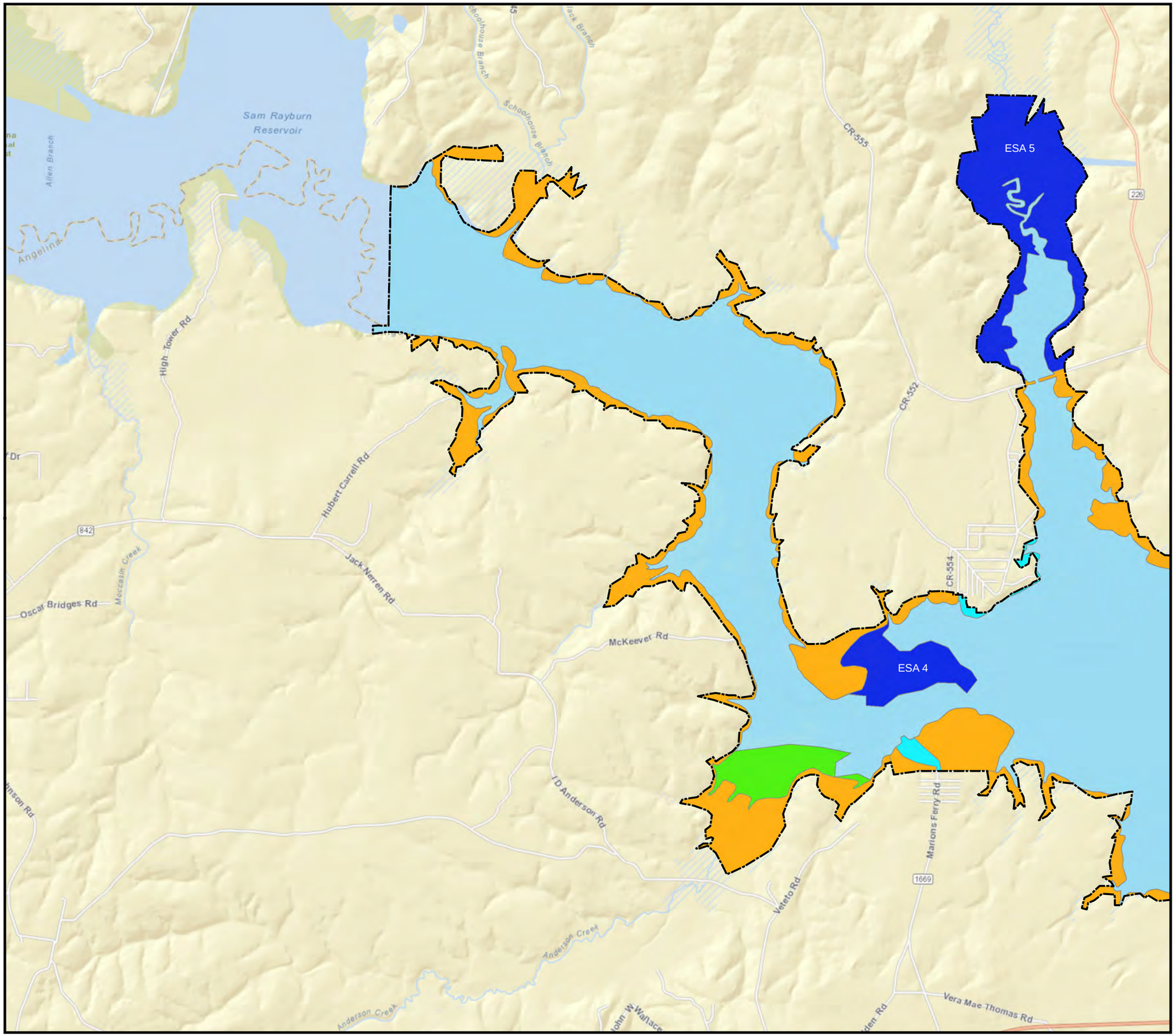
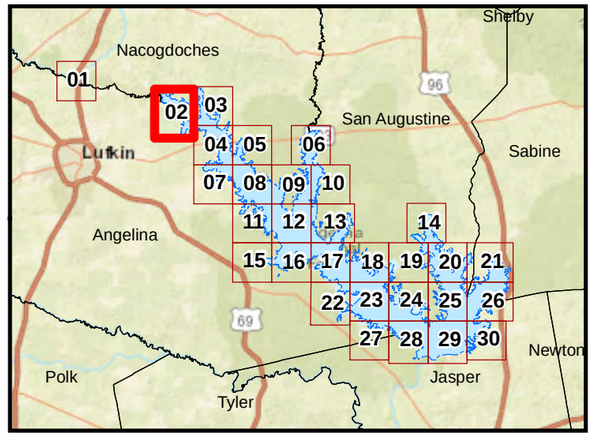
N

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-01





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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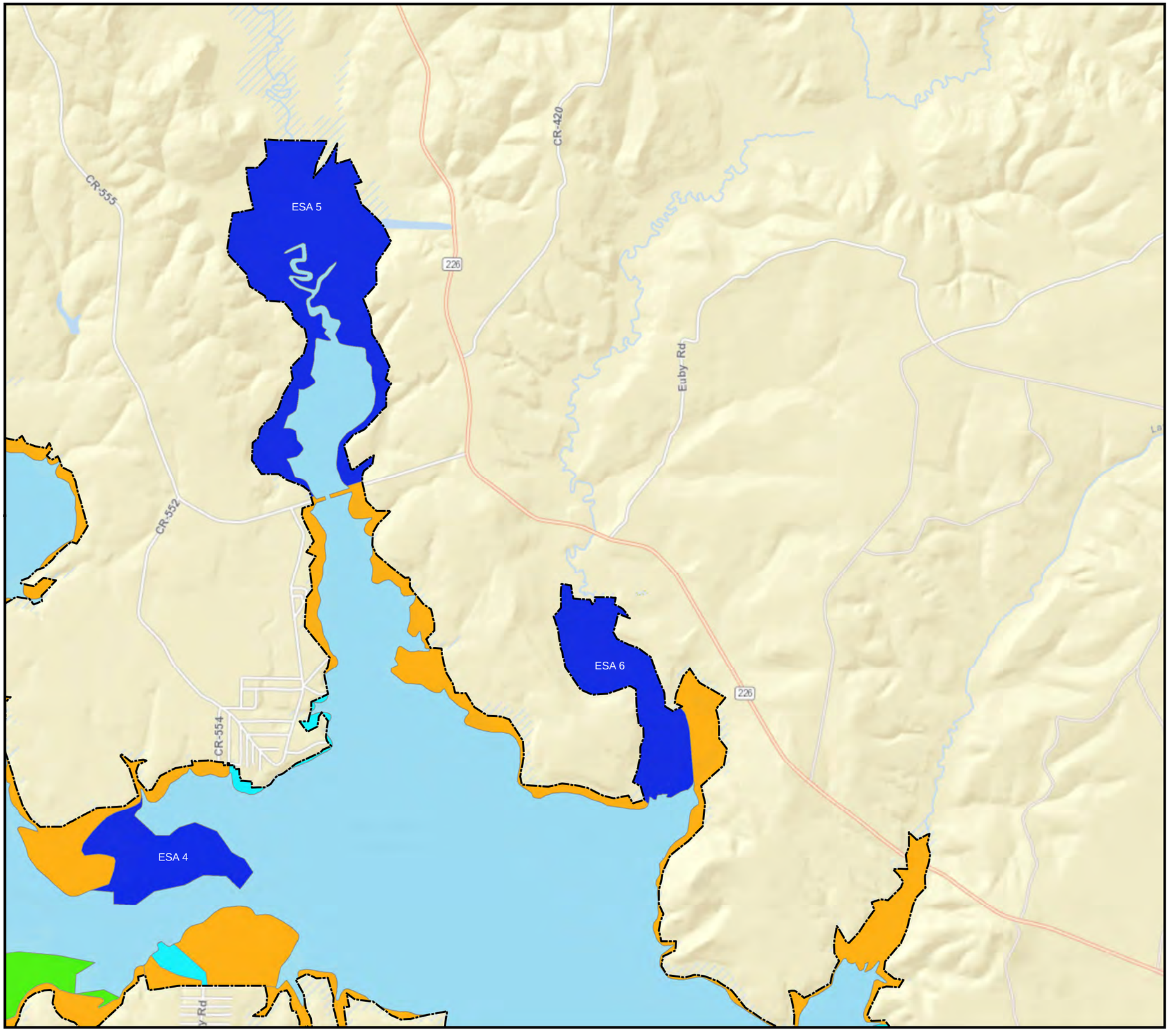
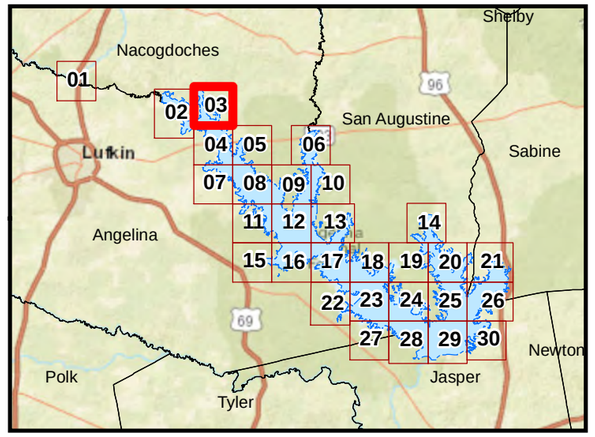
0 0.35 0.7 1.05 1.4 Miles

Date:	Map No.
January 2017	SR17MP-OC-02





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
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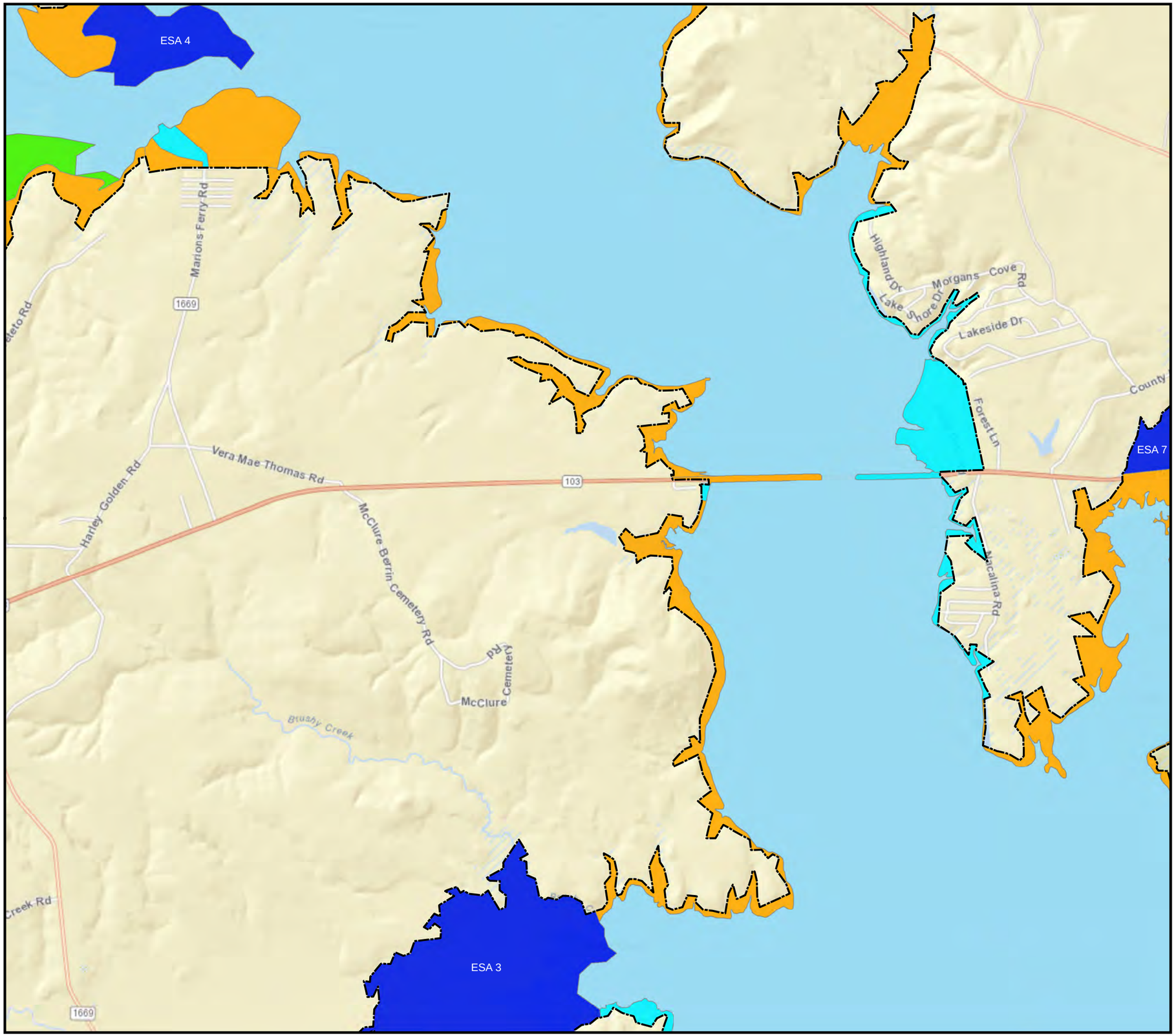
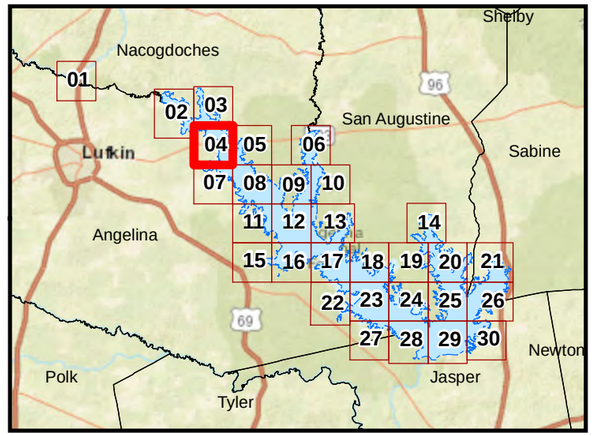
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-03





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
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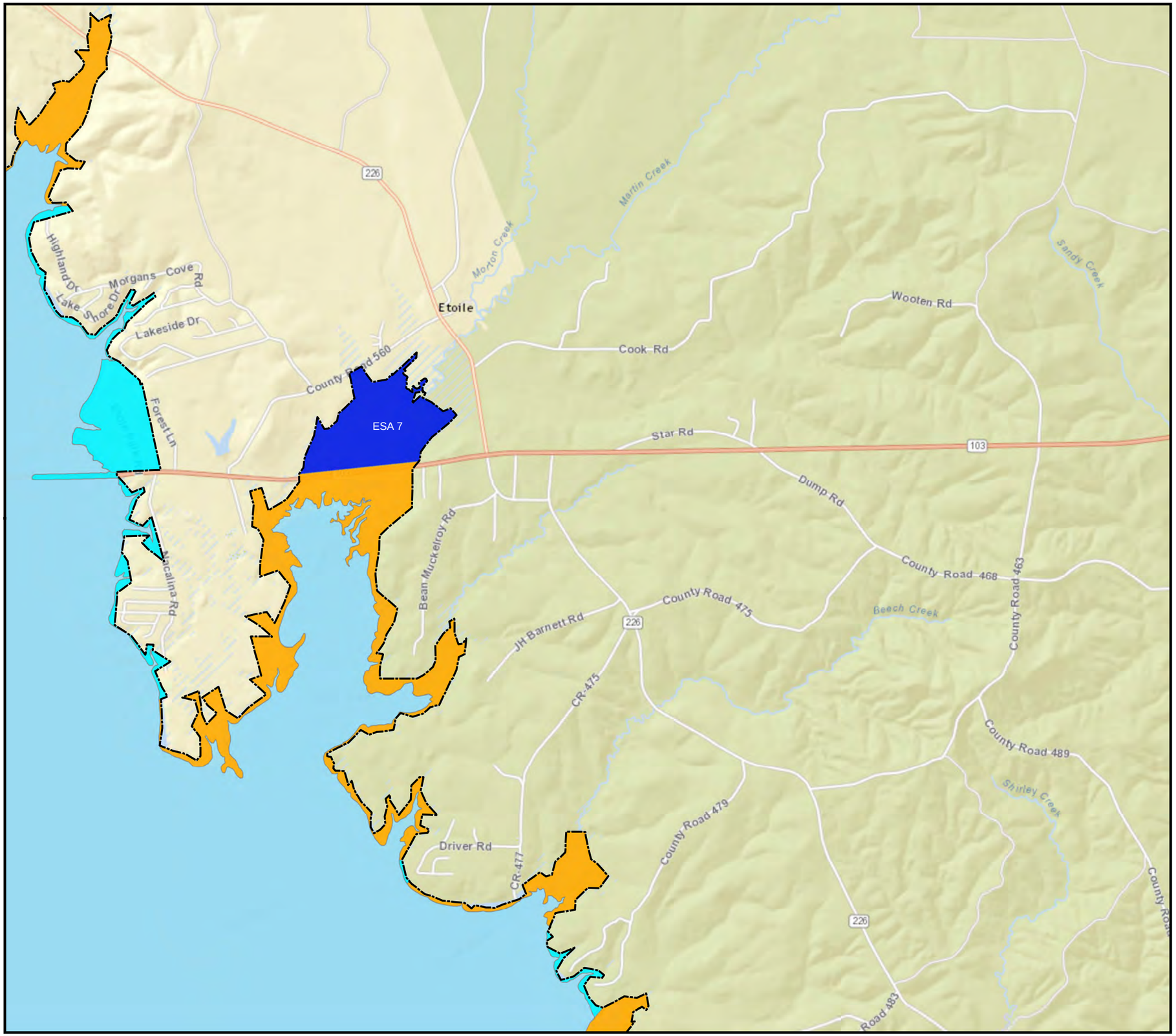
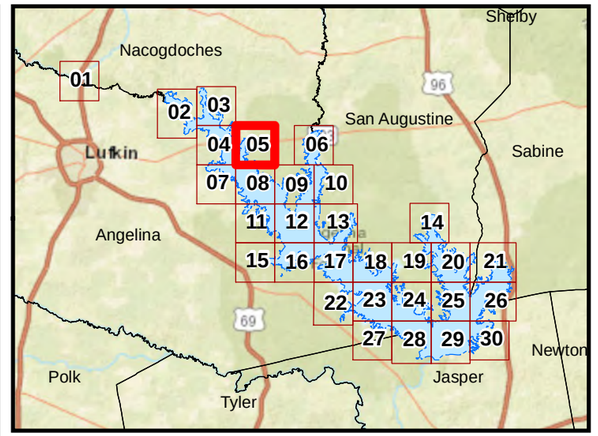
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-04





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
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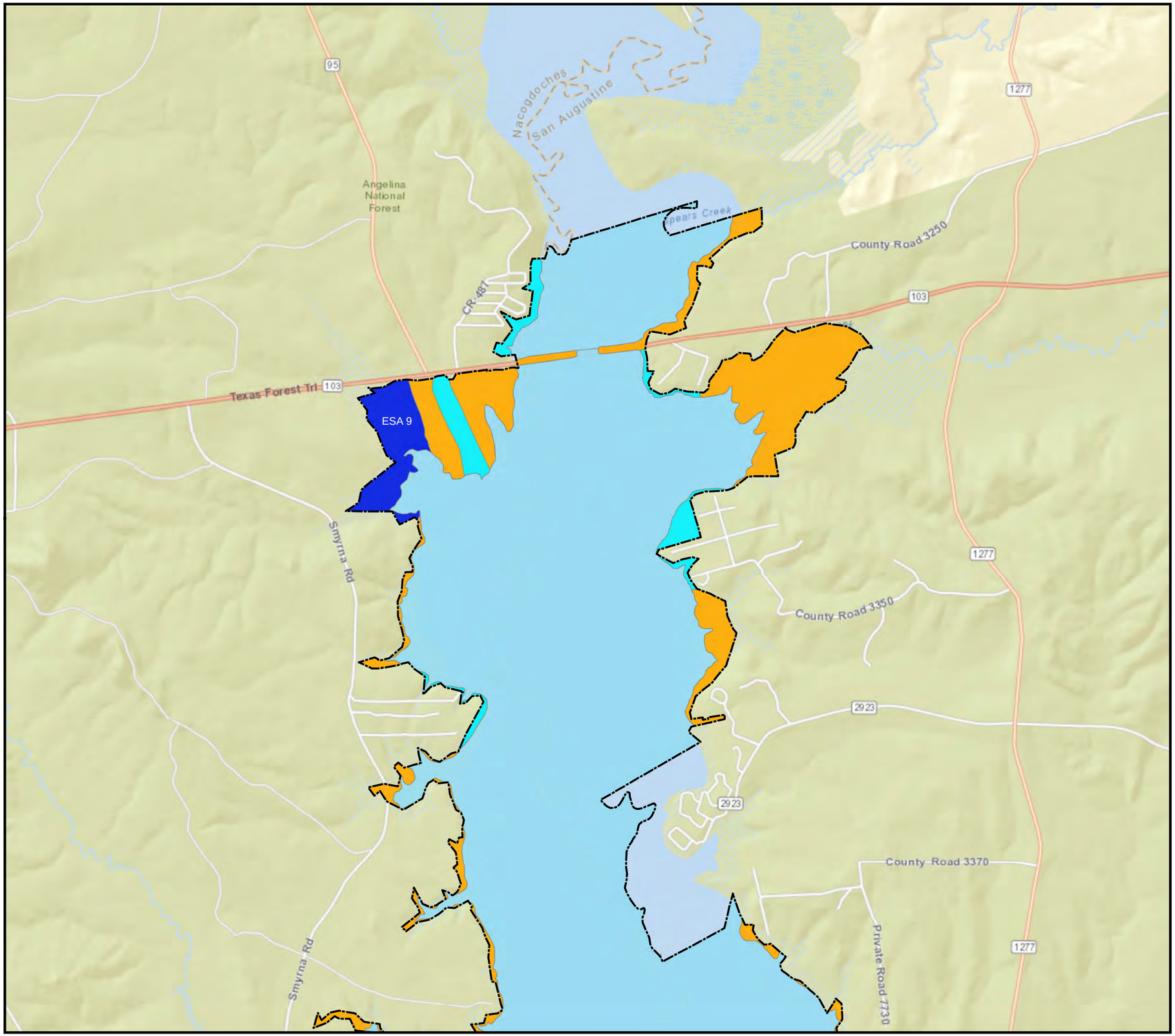
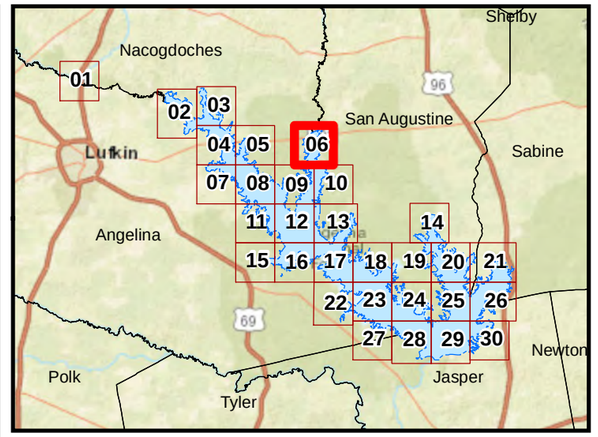
Page - 05

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-05





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
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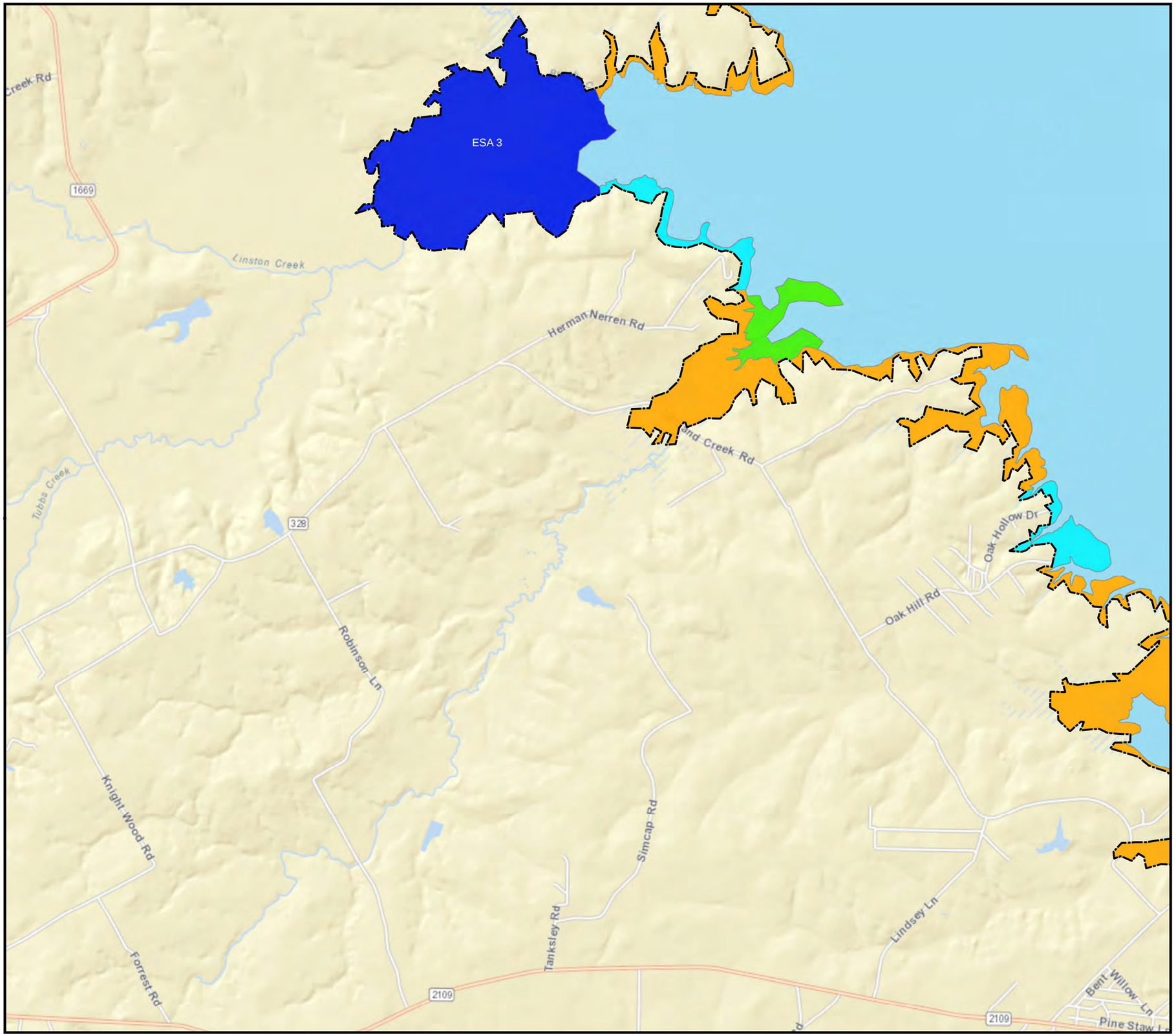
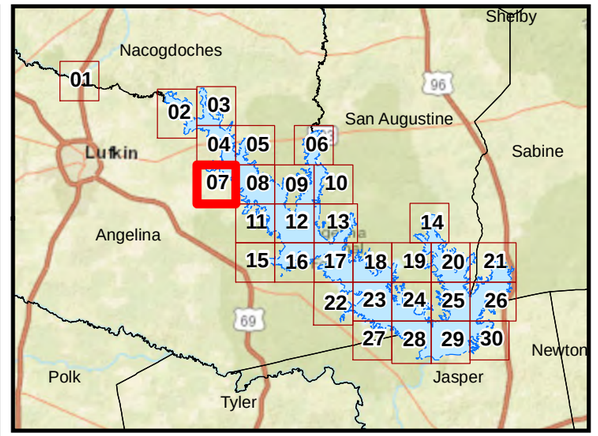
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-06





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
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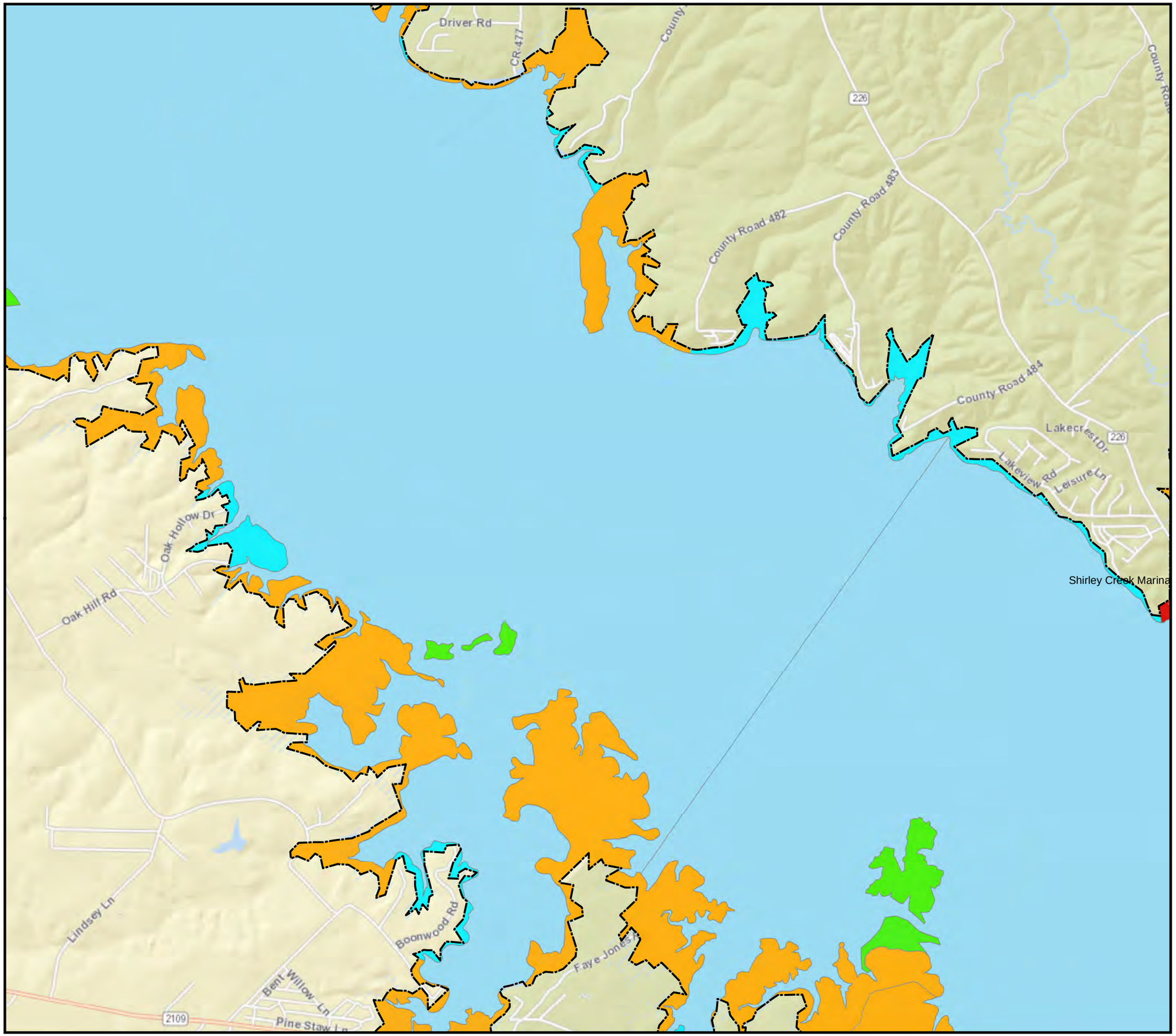
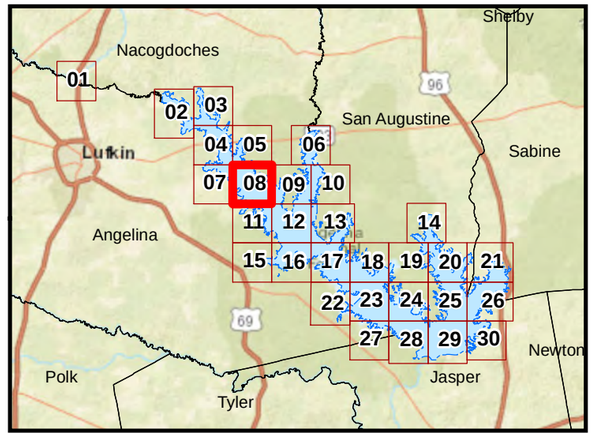
Page - 07

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-07





- Fee Boundary
- Project Operations
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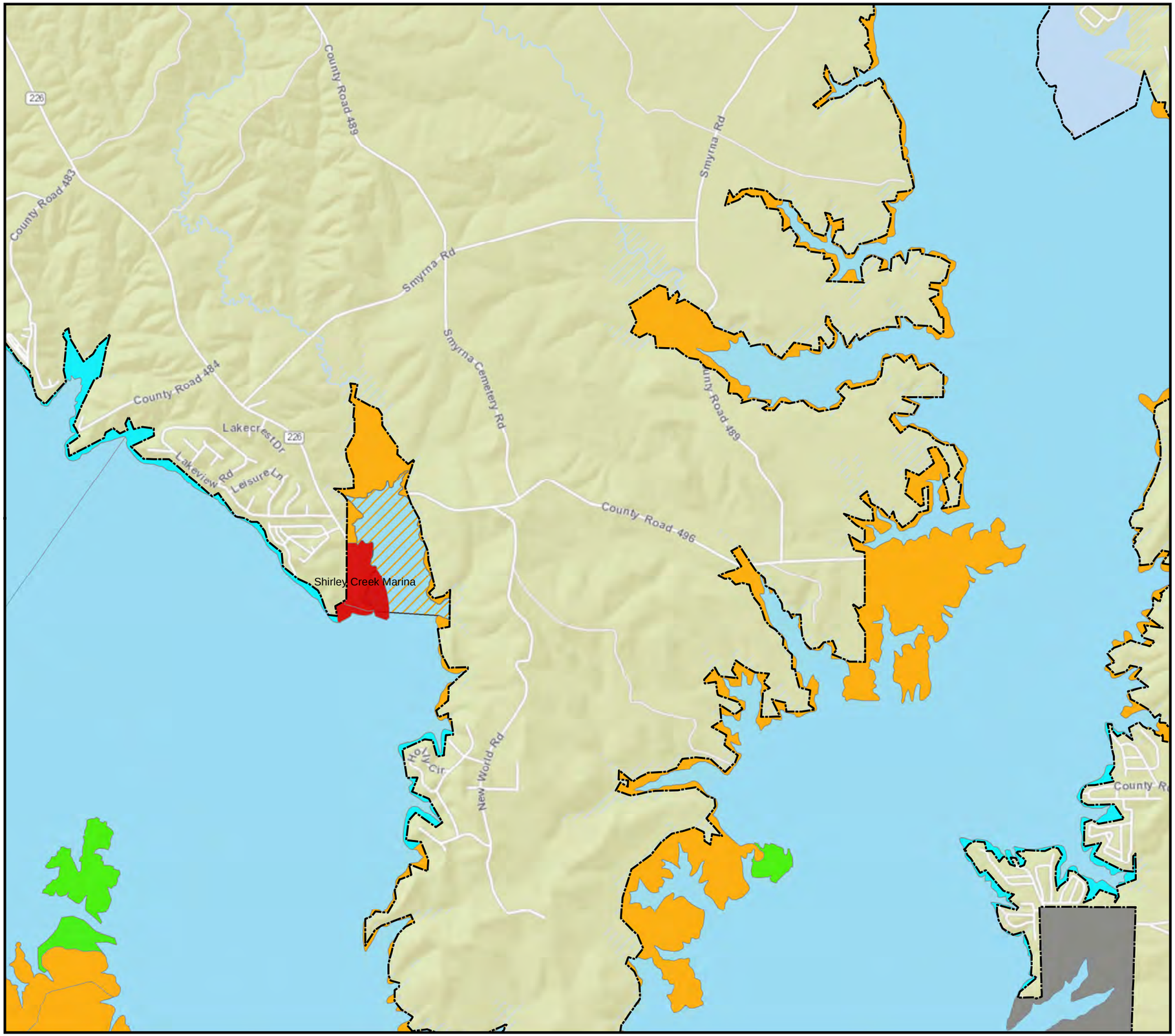
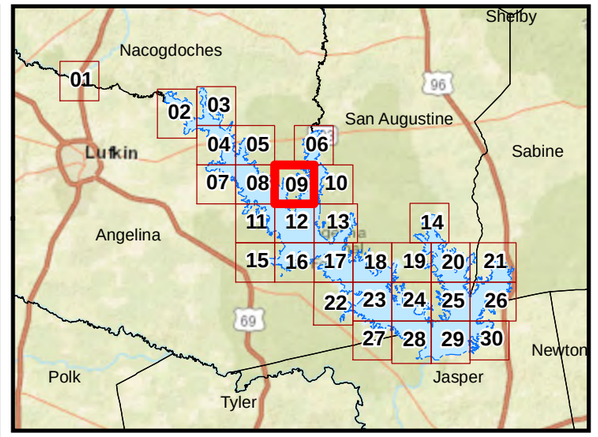
Page - 08

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-08





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- Project Operations
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- Wildlife Management
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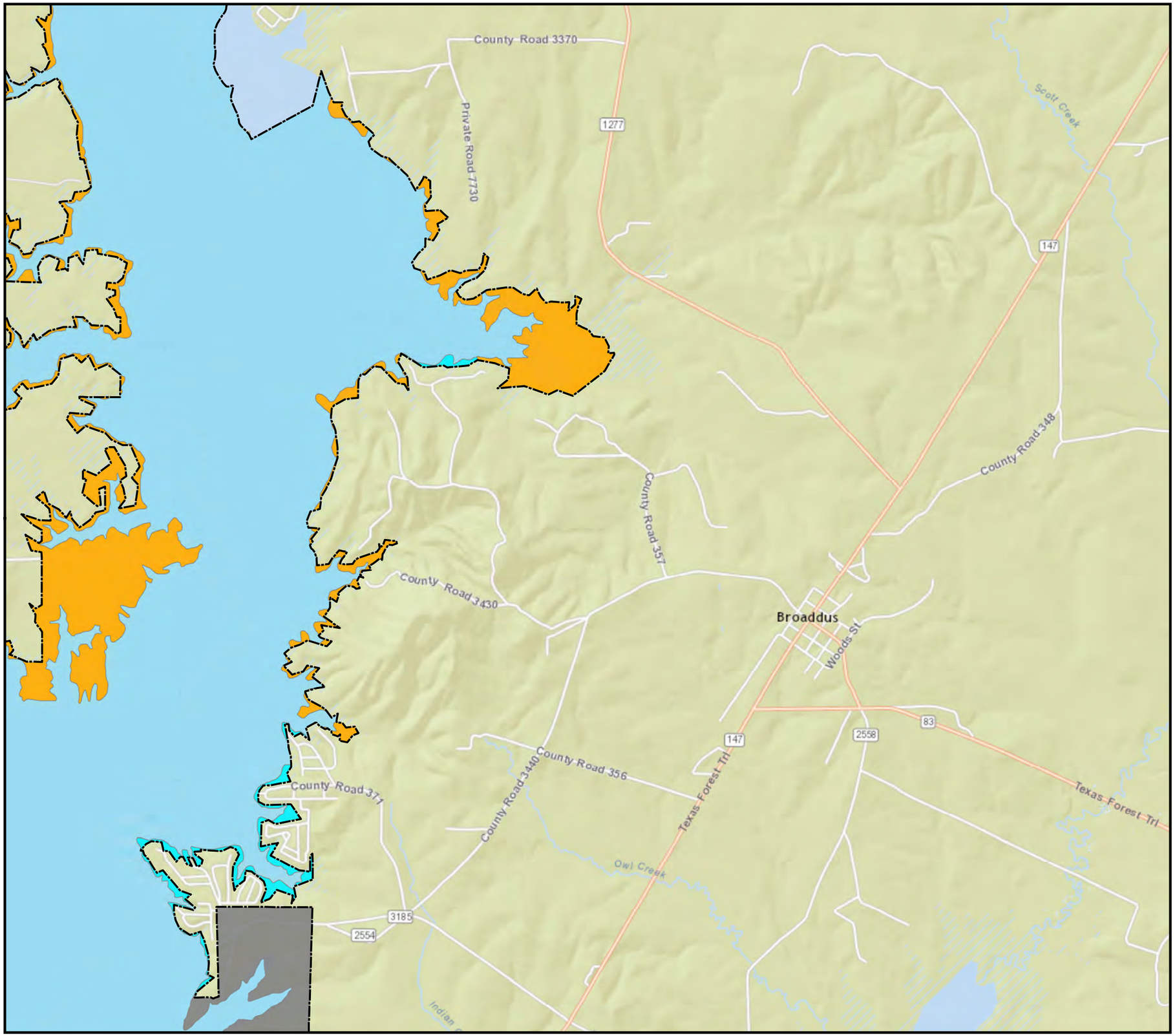
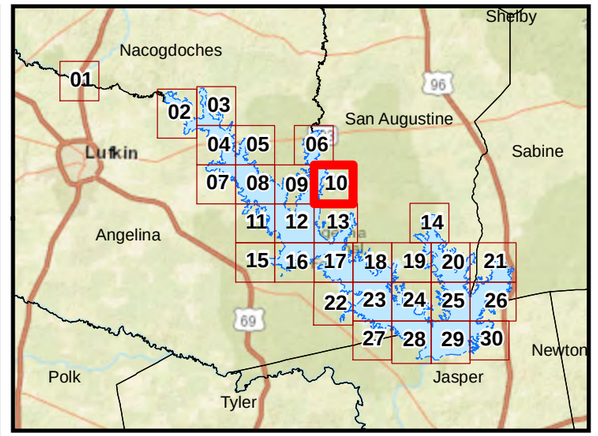
Page - 09

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-09





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- Project Operations
- High Density Recreation
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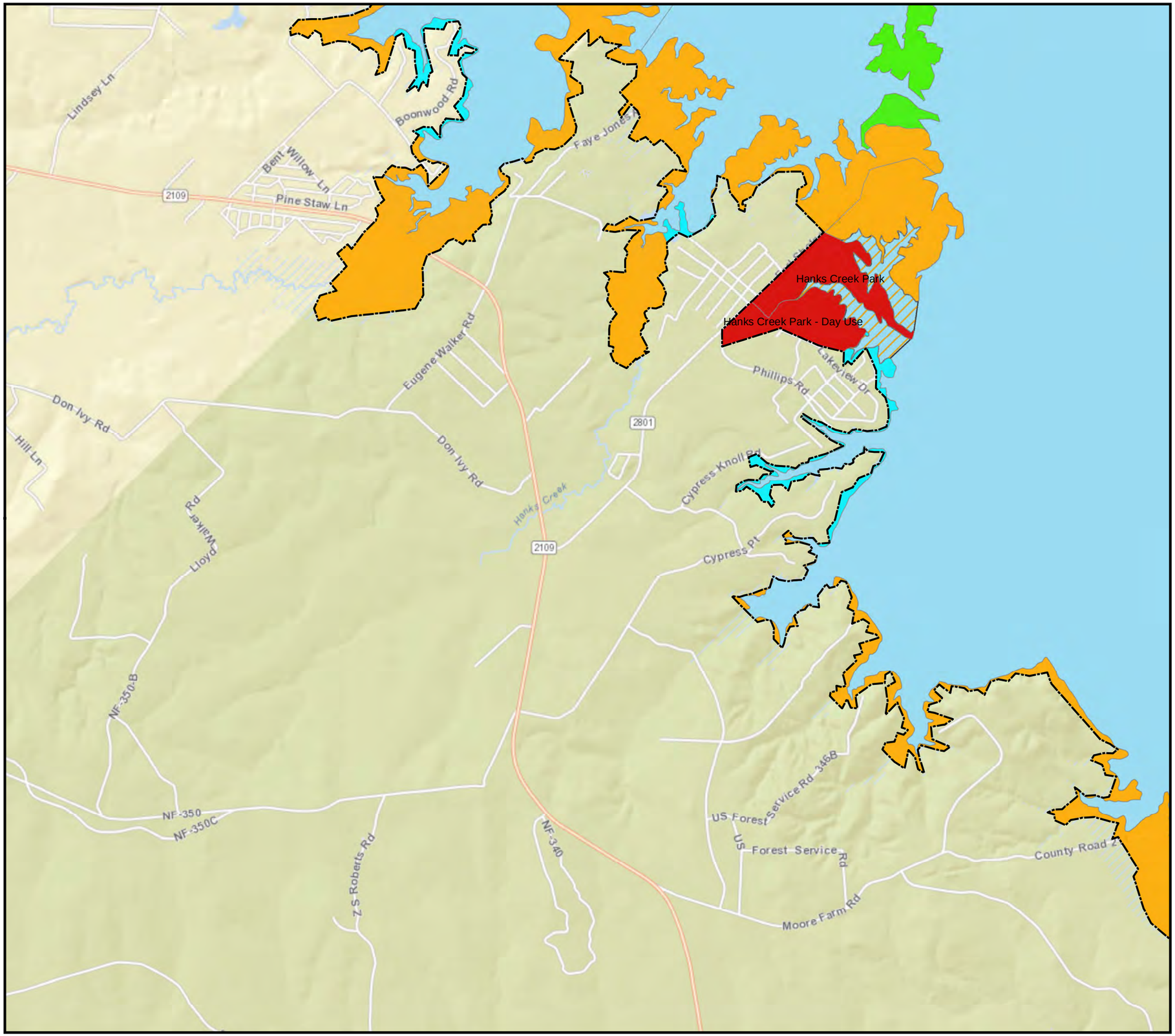
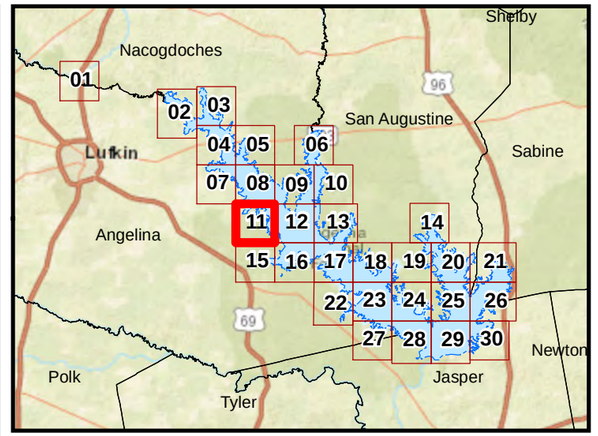
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-10





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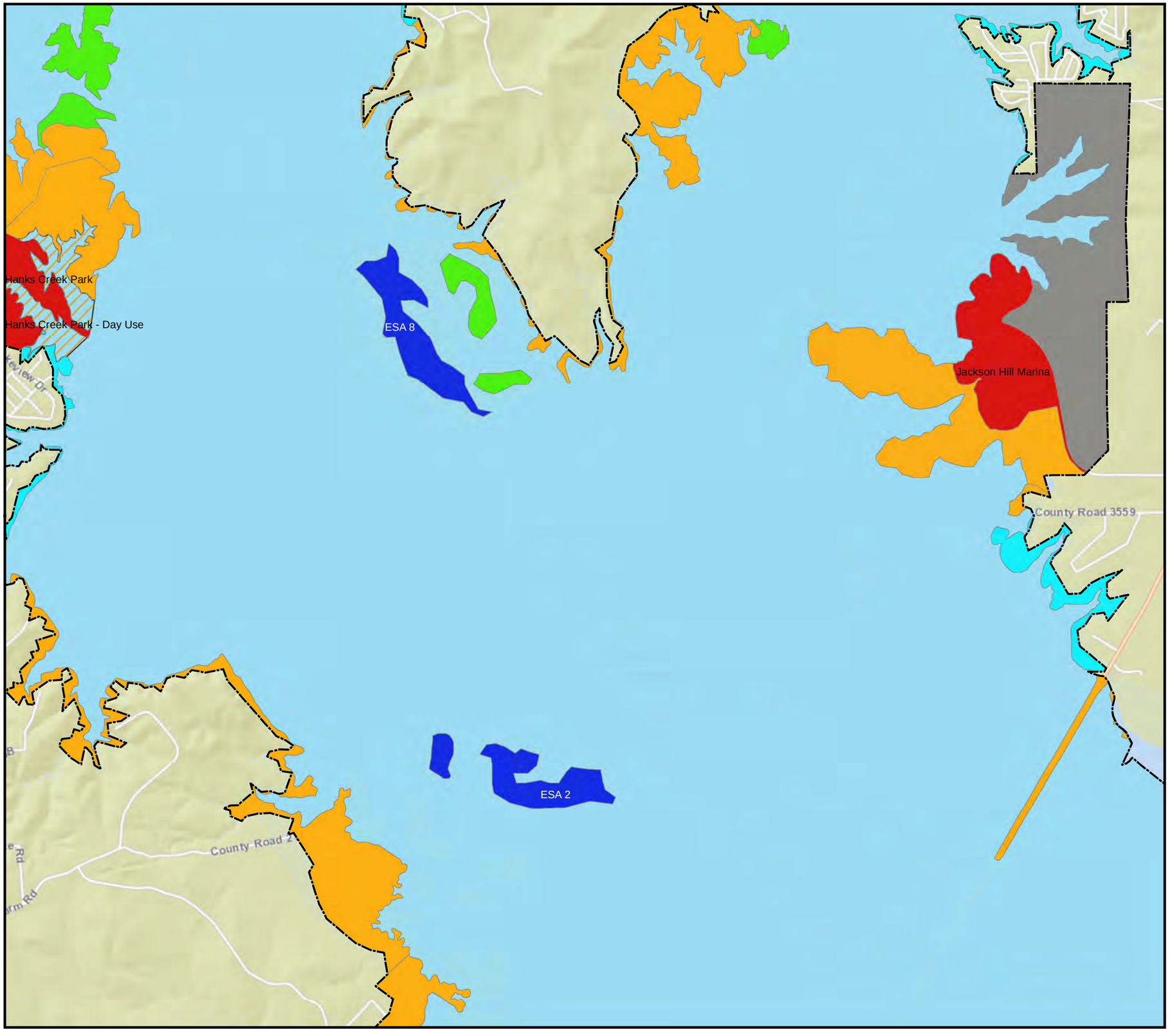
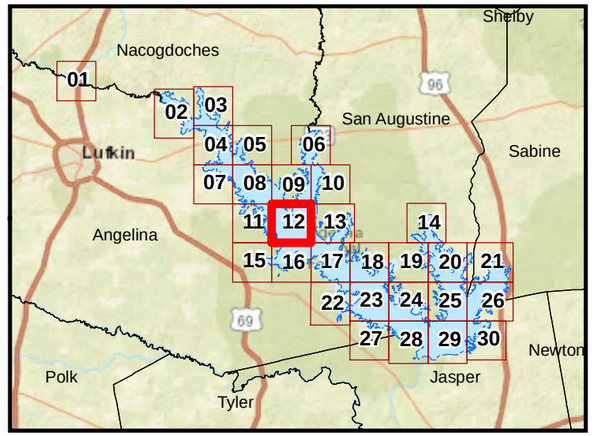
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-11





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- Project Operations
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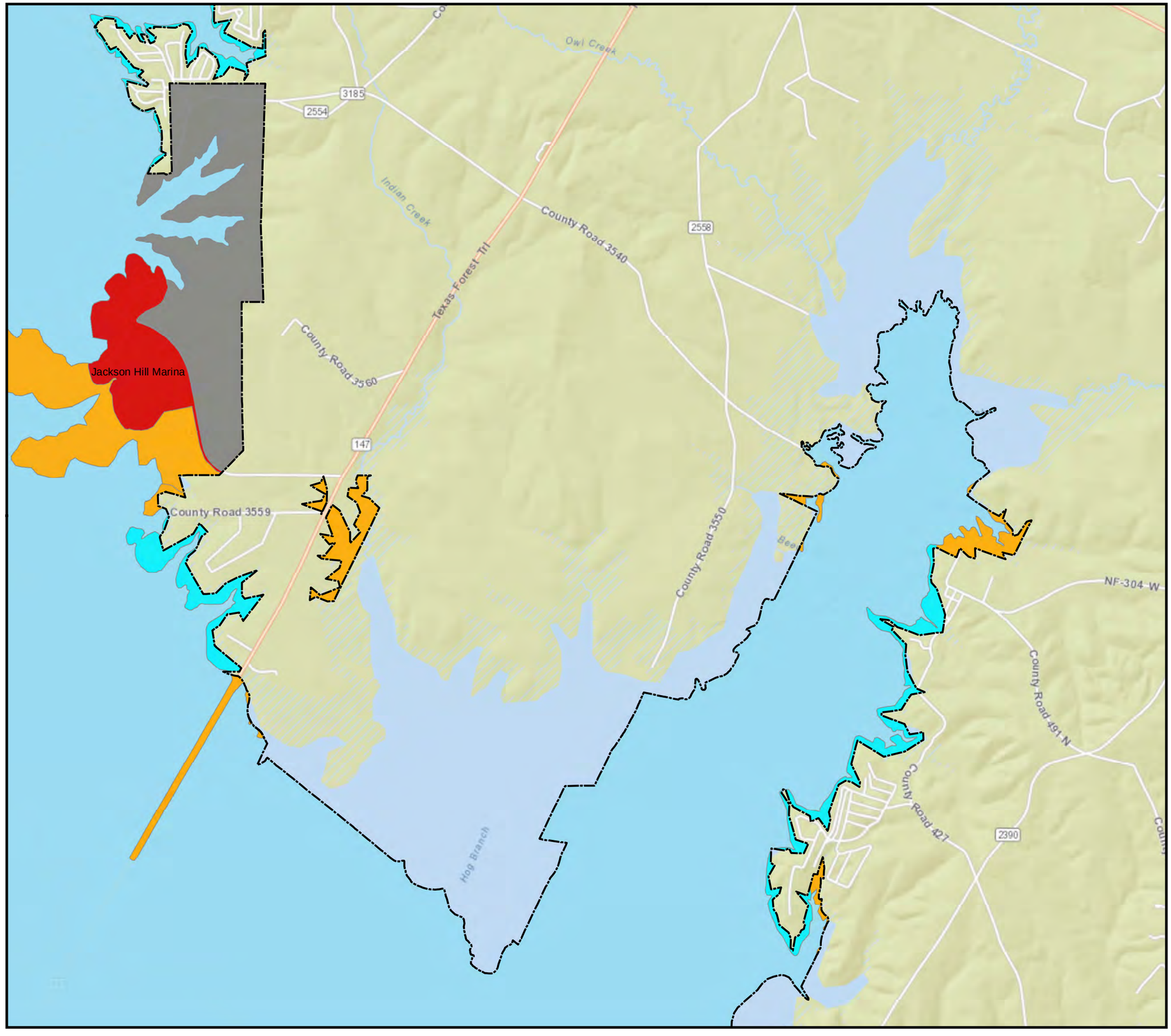
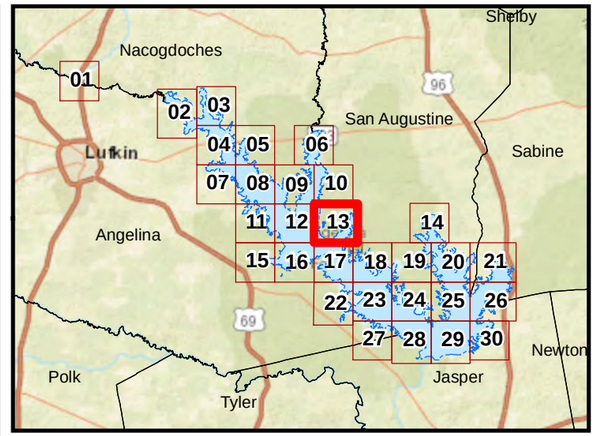
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-12





- Fee Boundary
- Project Operations
- High Density Recreation
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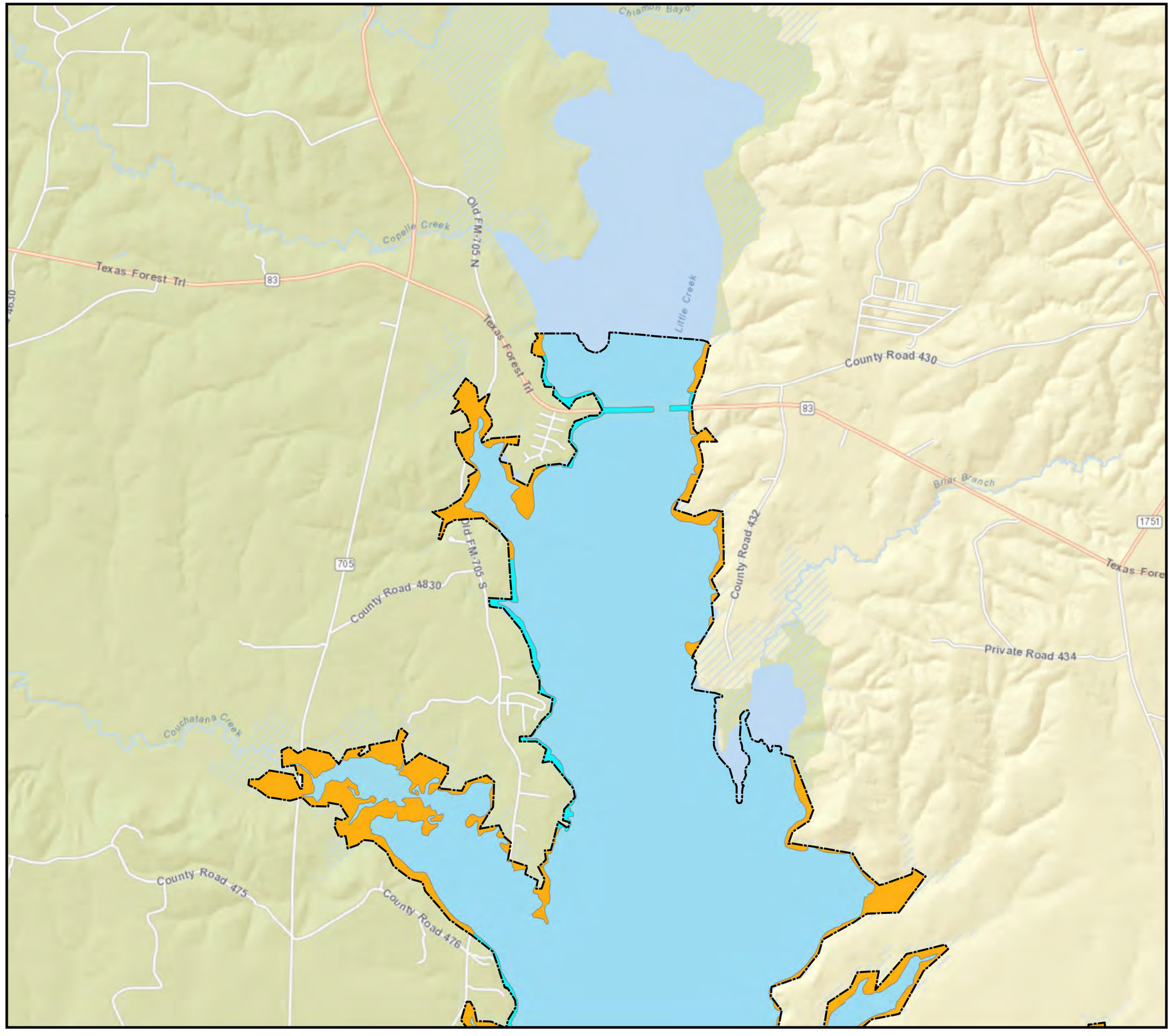
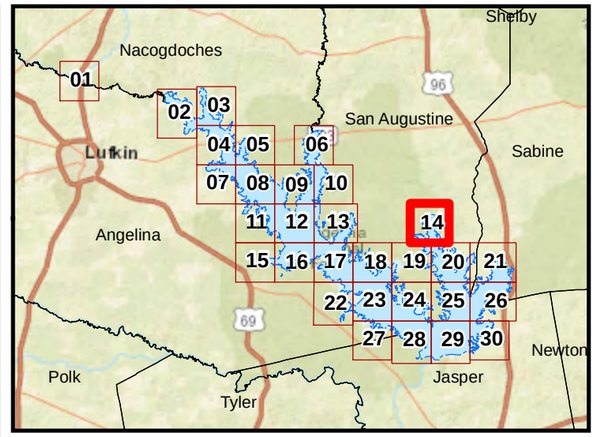
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-13





- Fee Boundary
- Project Operations
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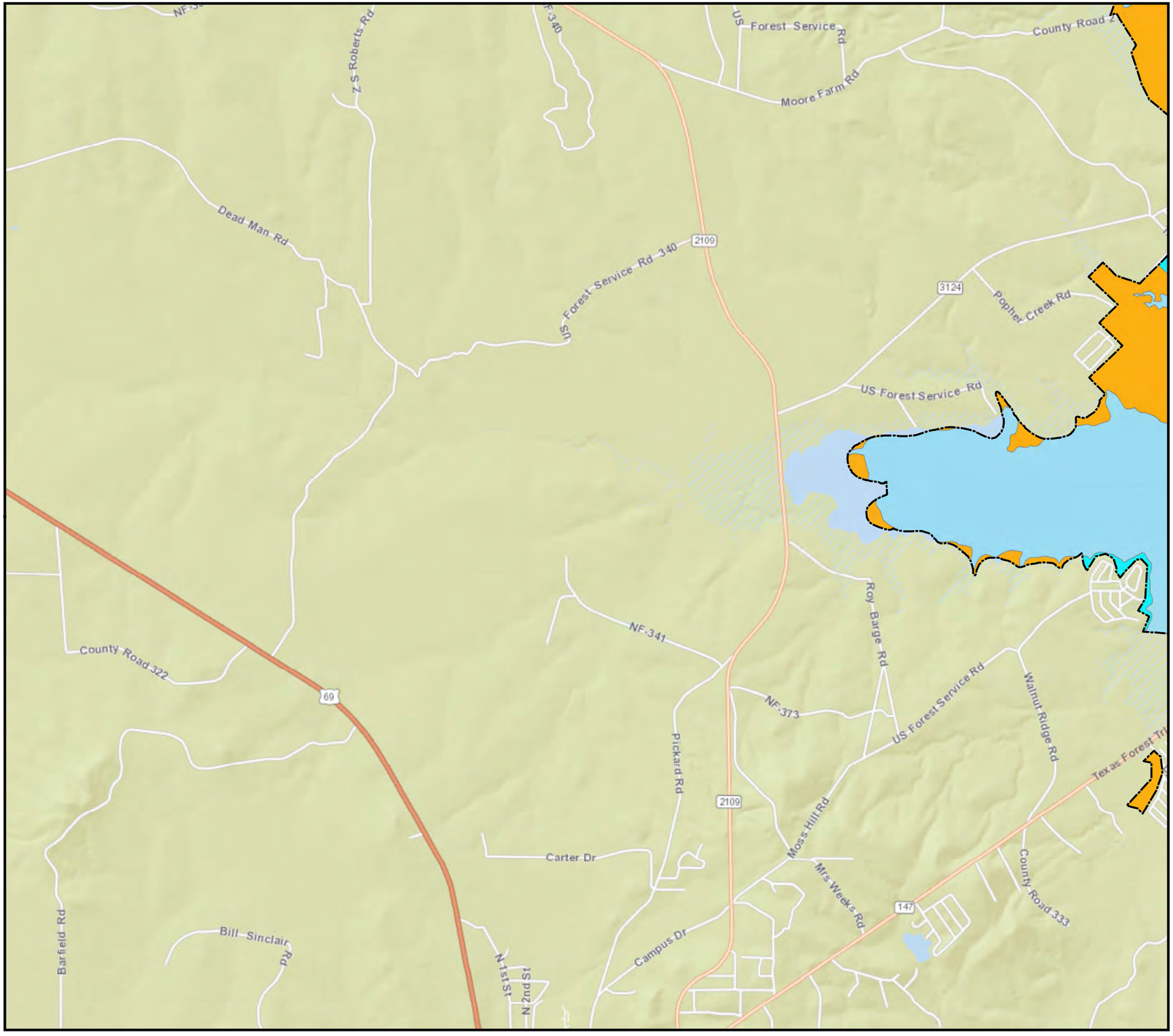
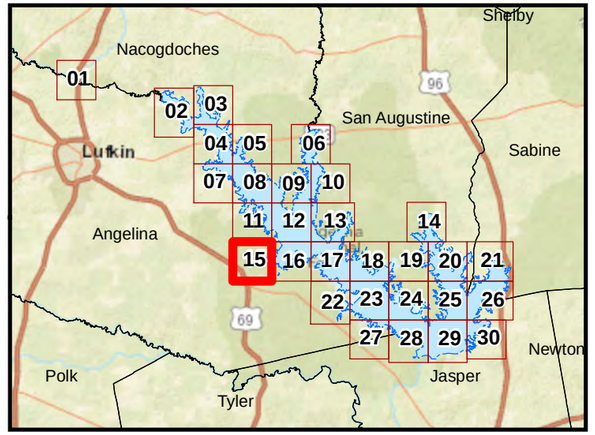
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-14





- Fee Boundary
- Project Operations
- High Density Recreation
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- Wildlife Management
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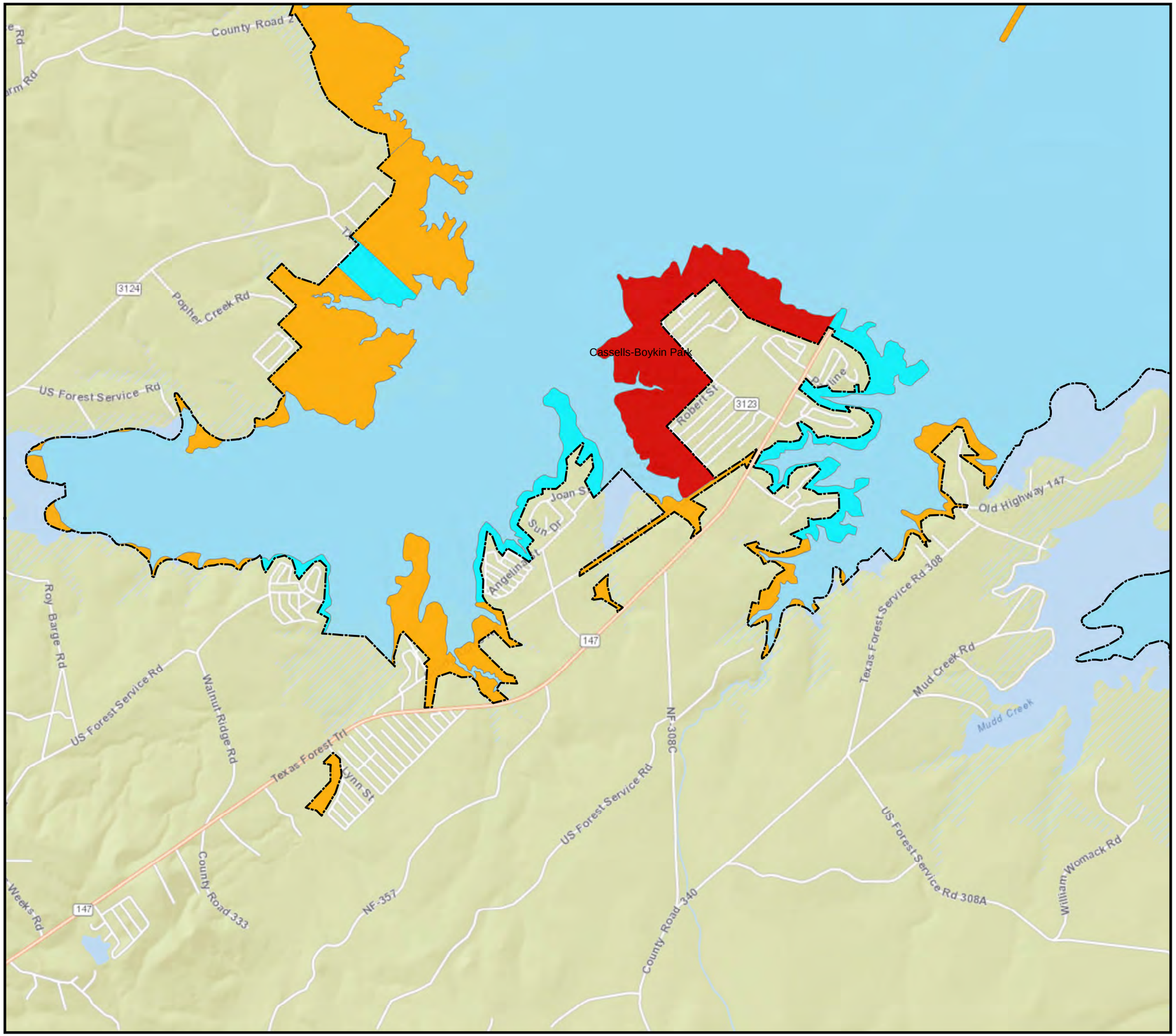
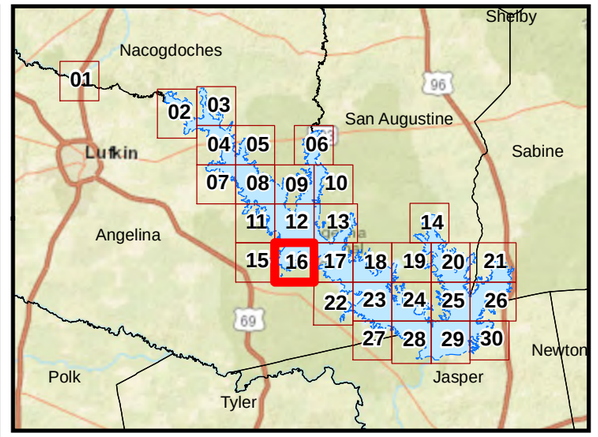
N

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-15





- Fee Boundary
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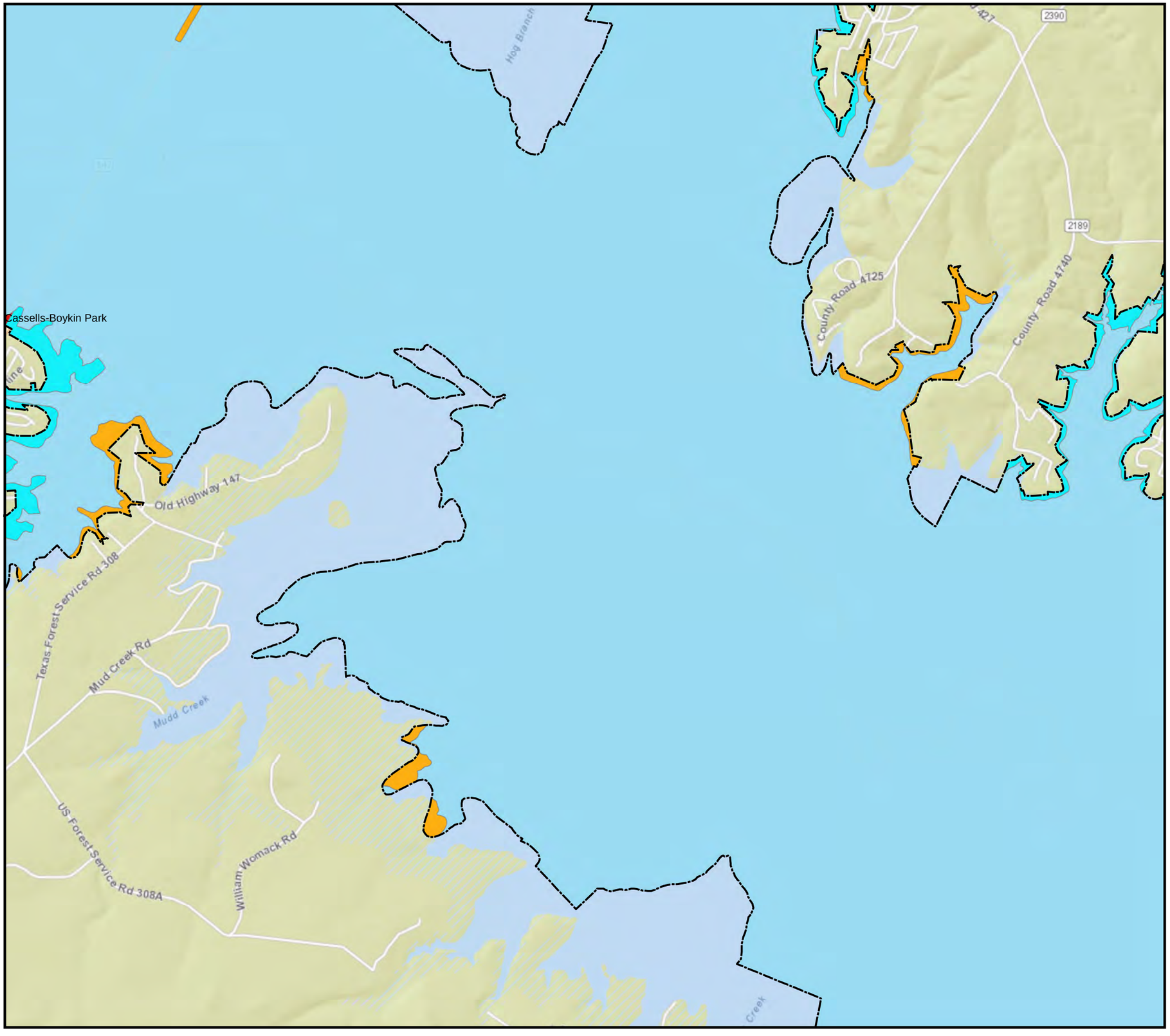
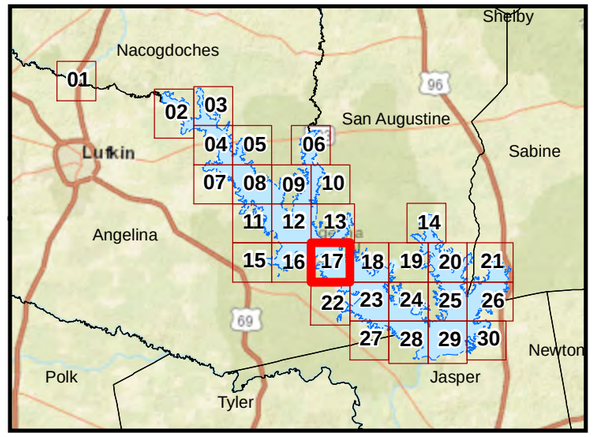
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-16





- Fee Boundary
- Project Operations
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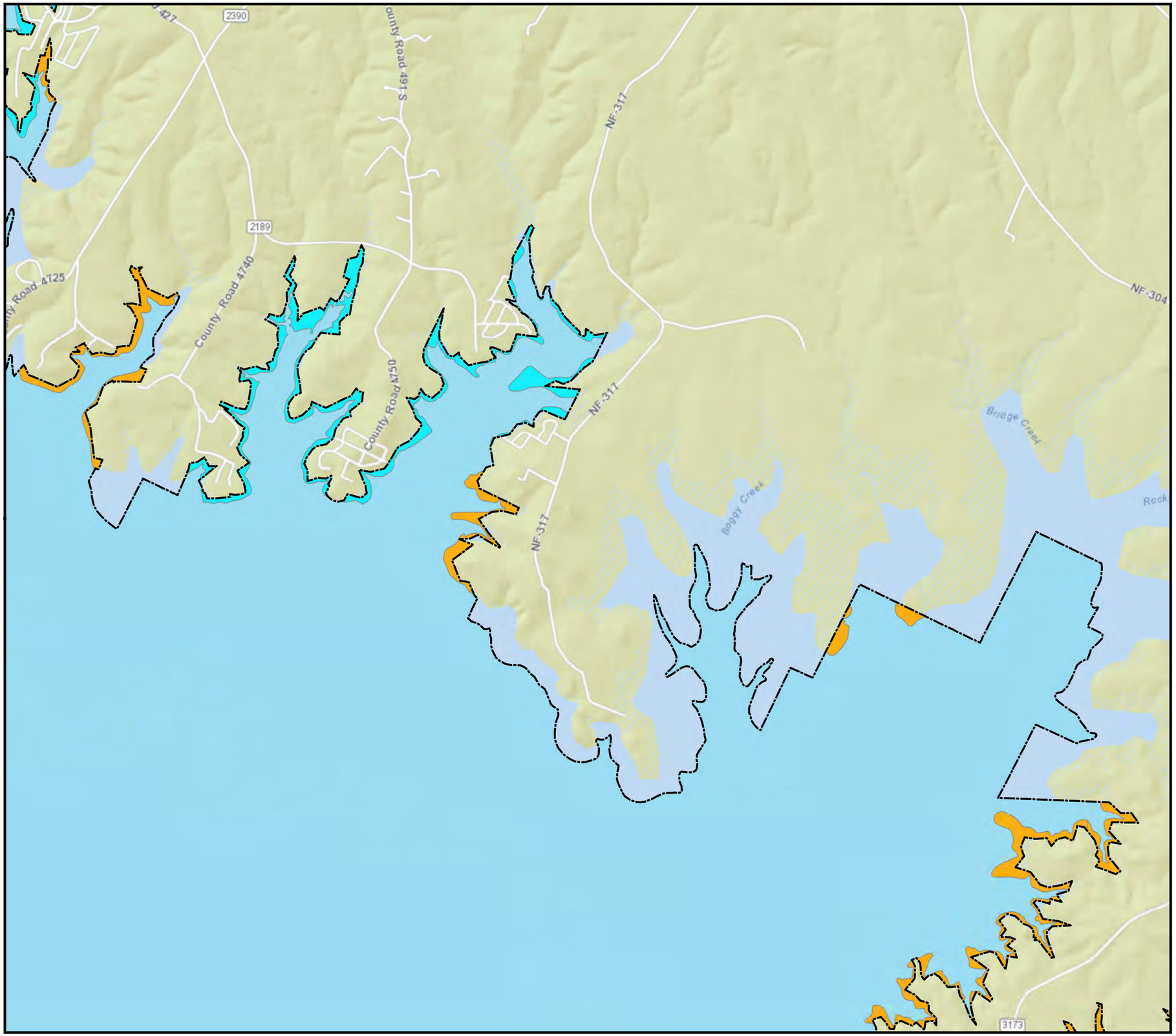
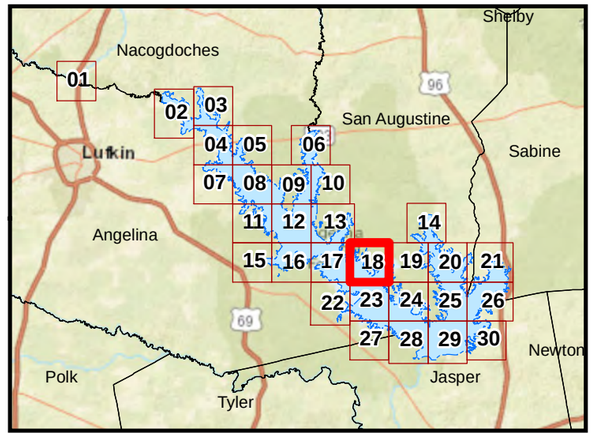
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-17





- Fee Boundary
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- Wildlife Management
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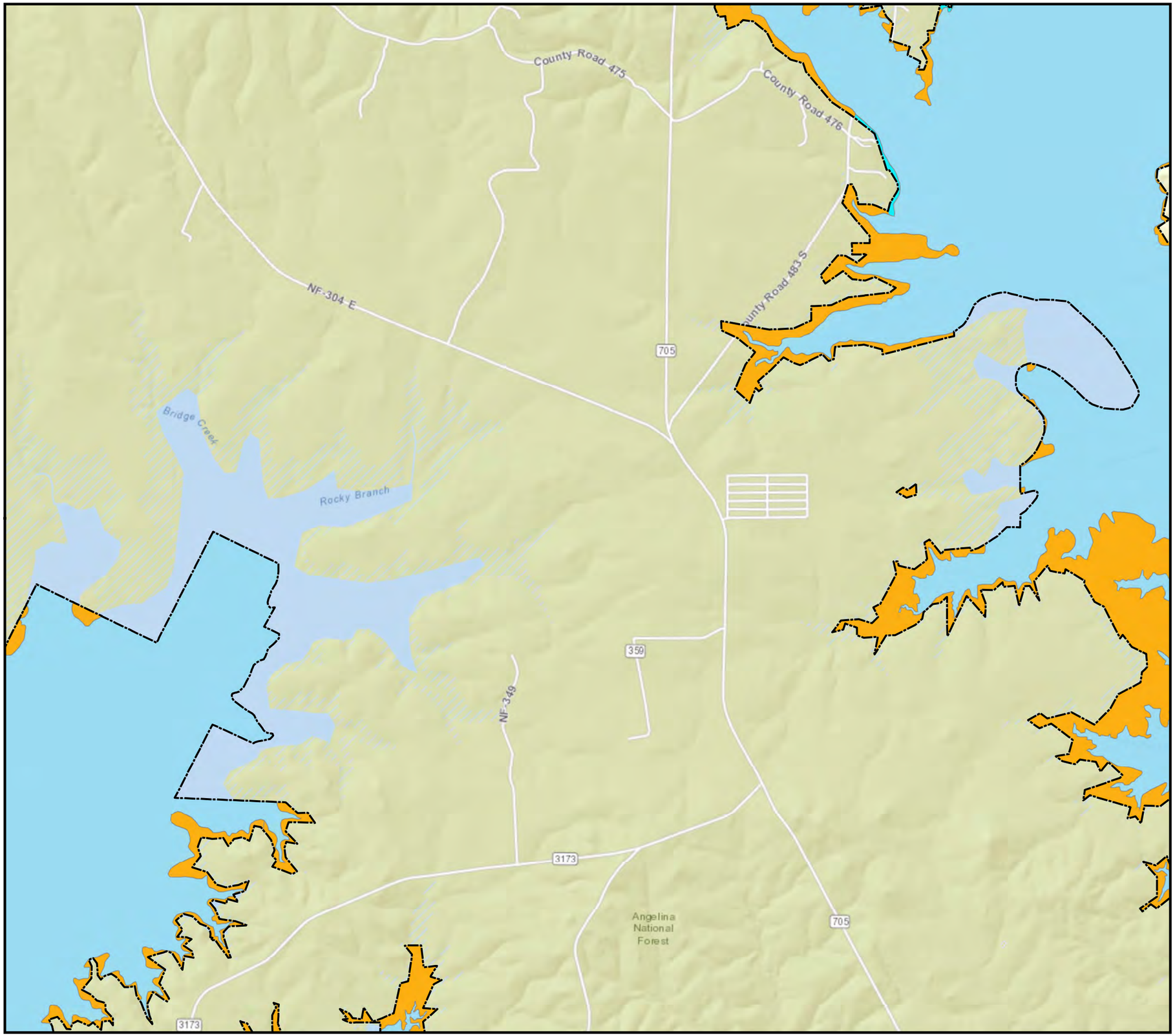
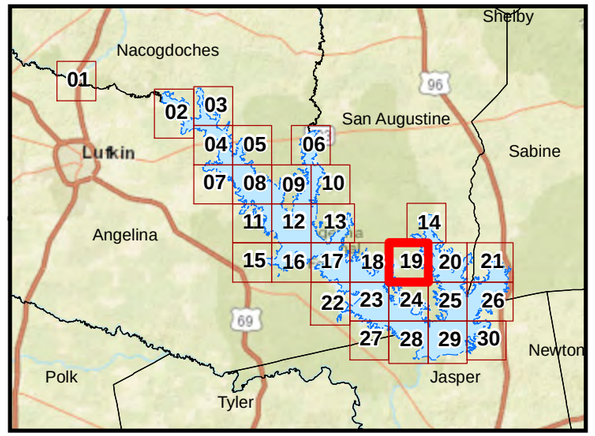
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-18





- Fee Boundary
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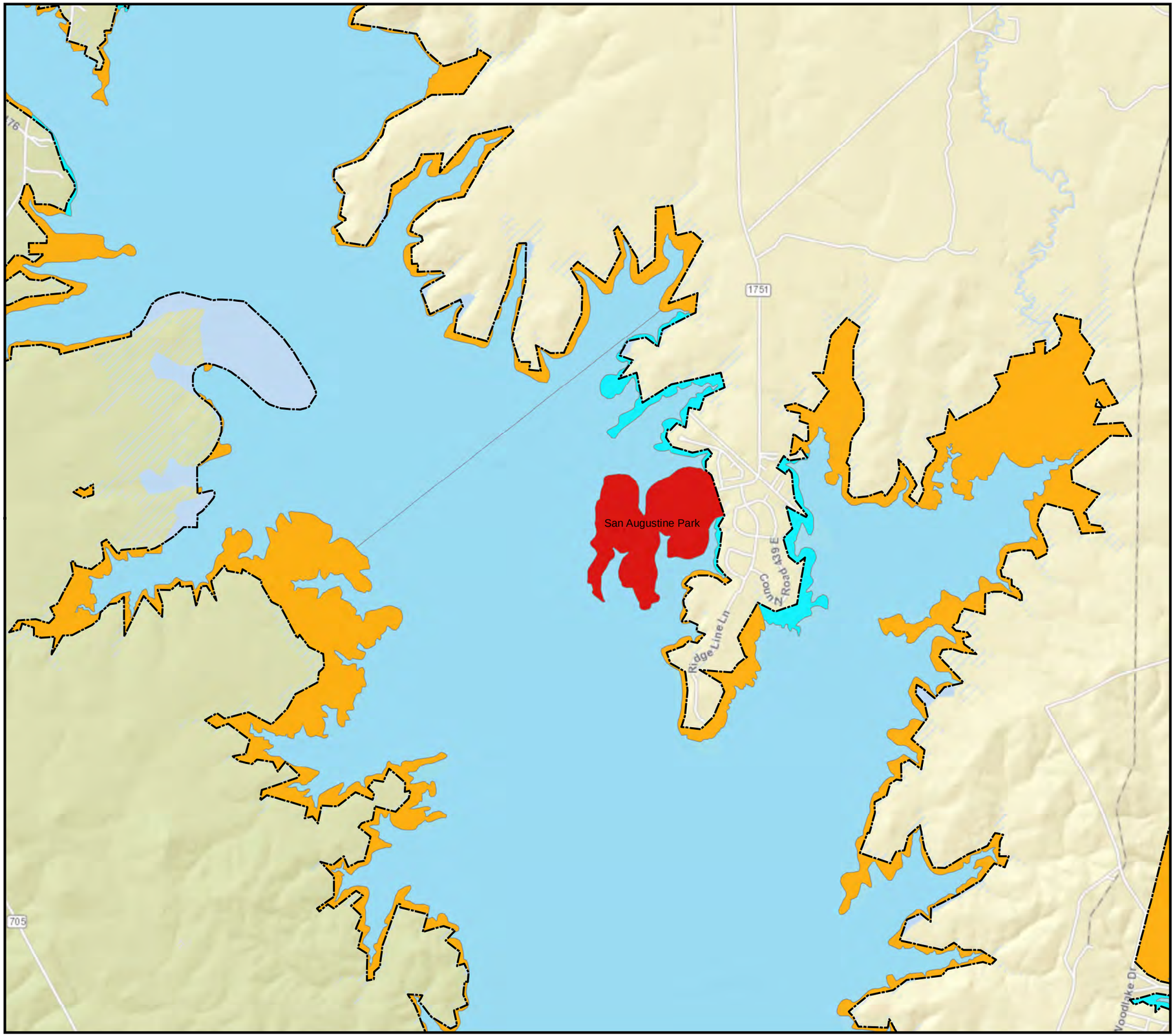
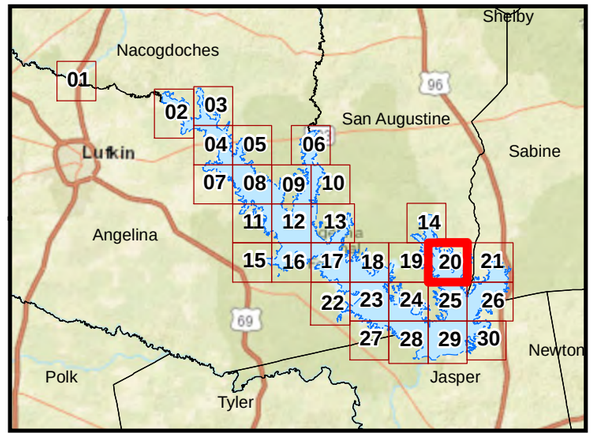
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-19





- Fee Boundary
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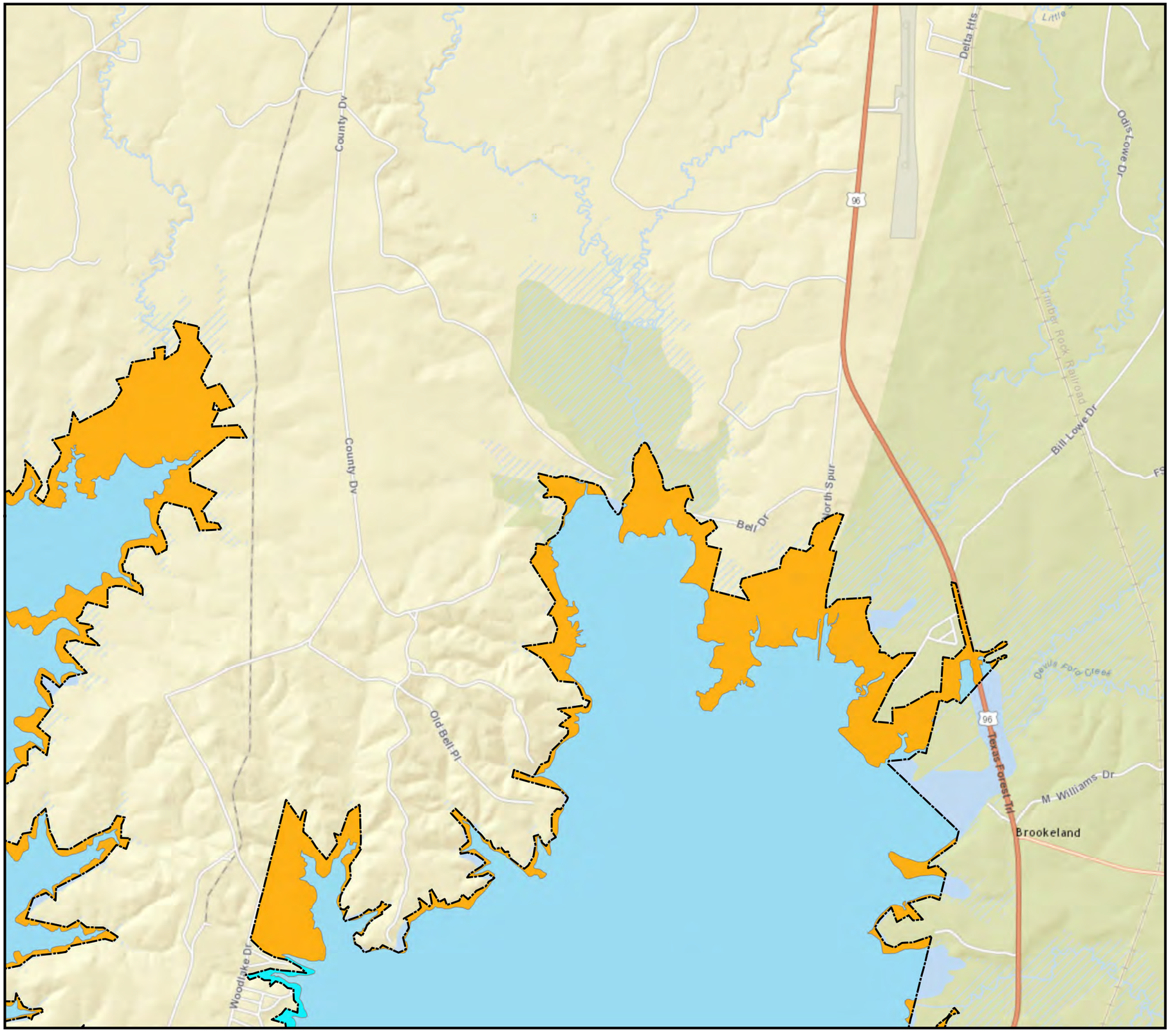
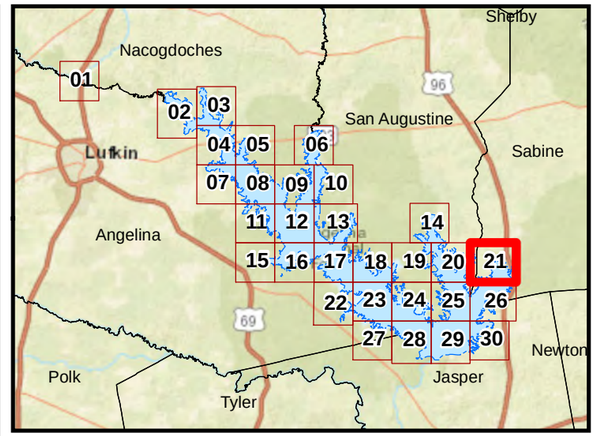
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-20





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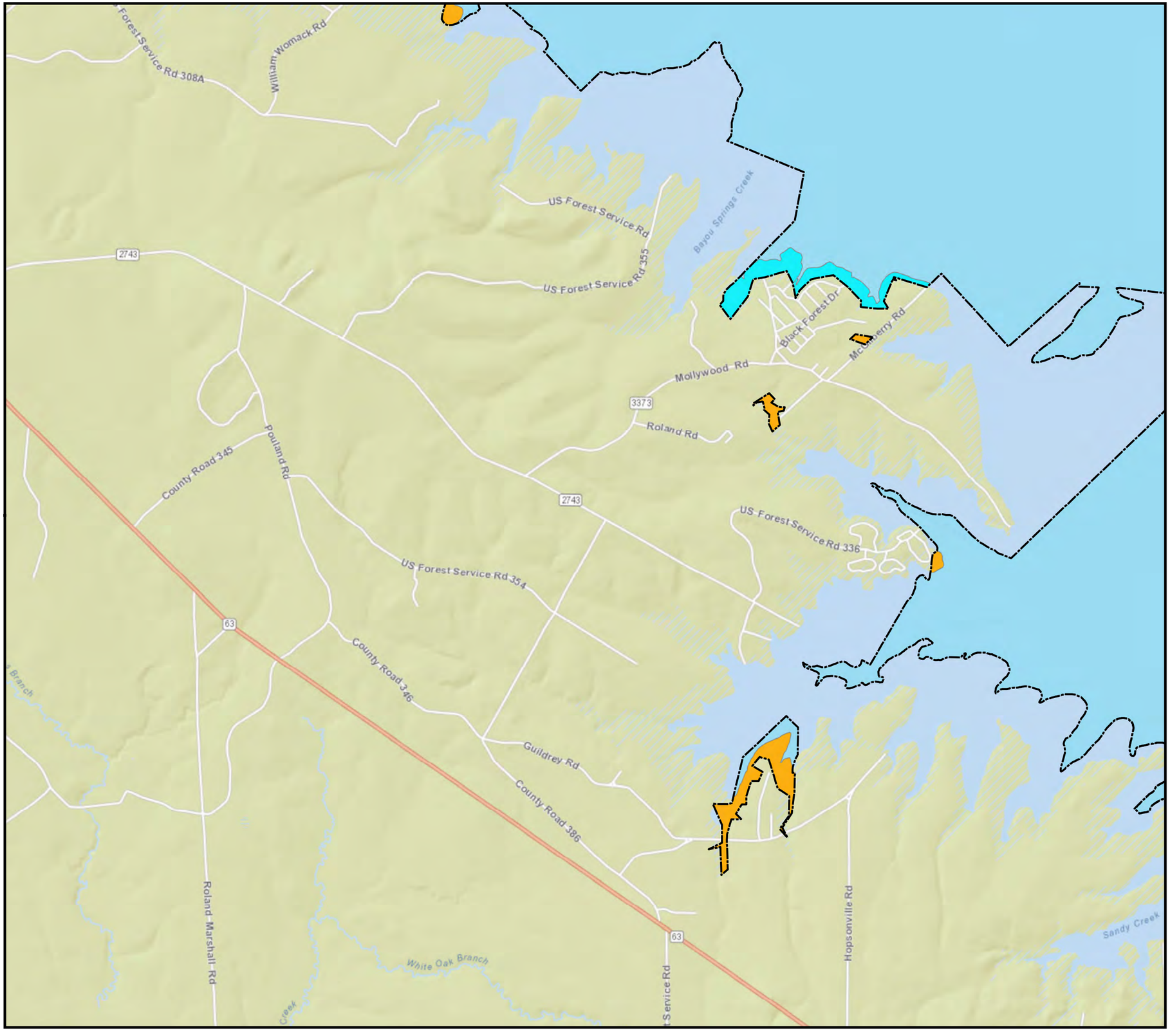
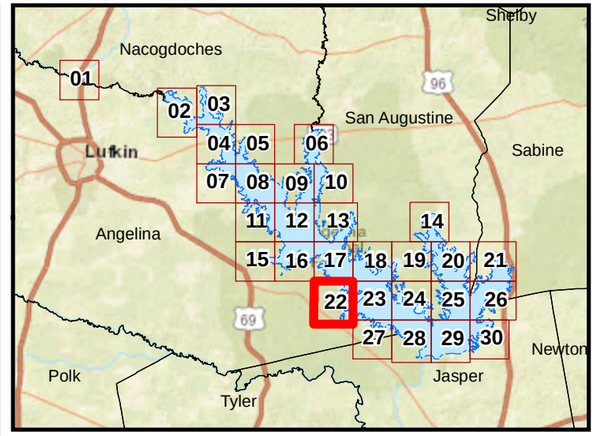
0 0.3 0.6 0.9 1.2 Miles

Date:	Map No.
January 2017	SR17MP-OC-21





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Land Use and Water Surface Classification

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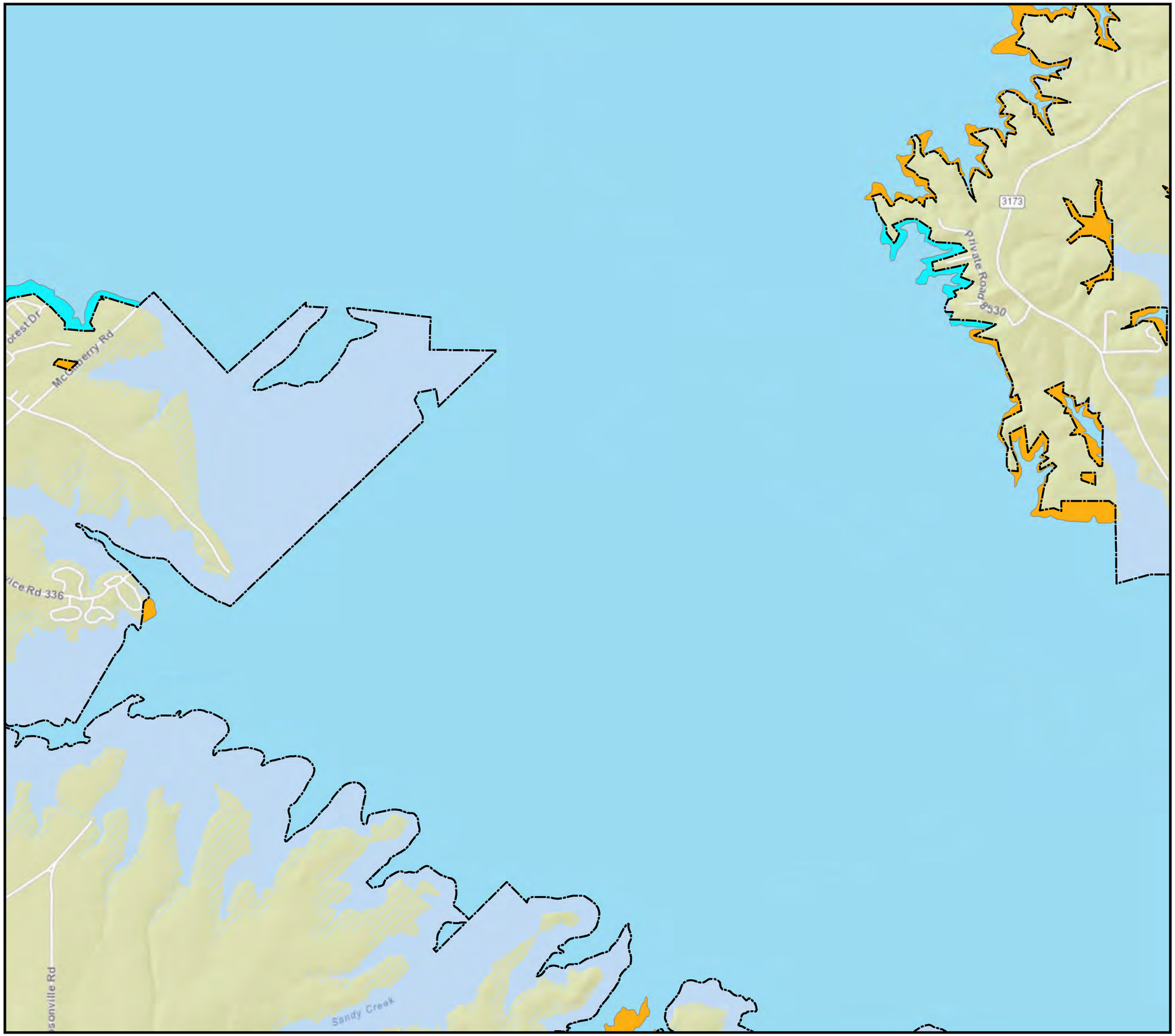
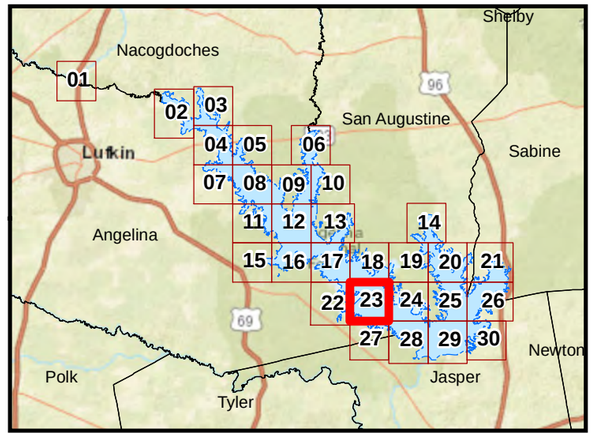
N

0 0.3 0.6 0.9 1.2 Miles

Date:	Map No.
January 2017	SR17MP-OC-22





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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Land Use and Water Surface Classification

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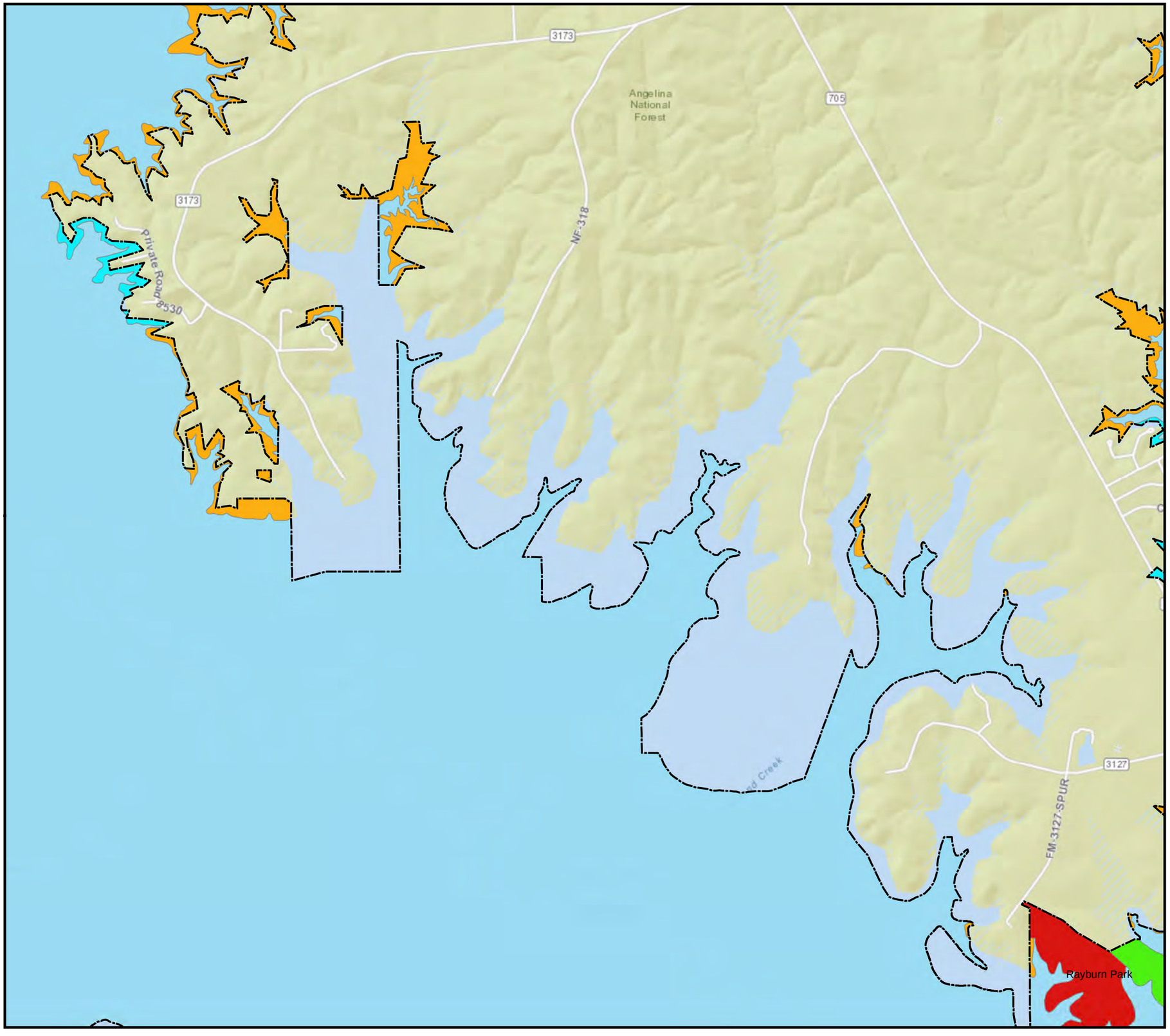
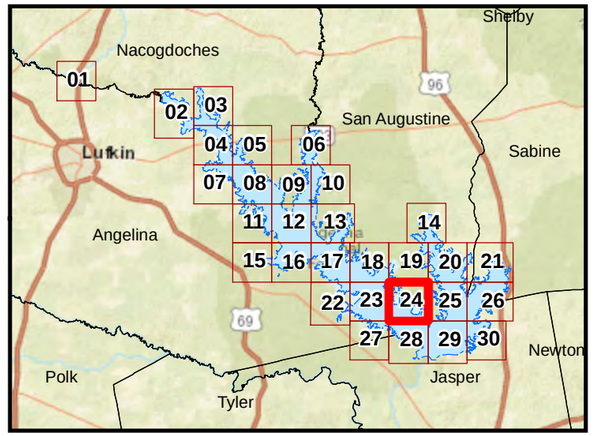
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-23





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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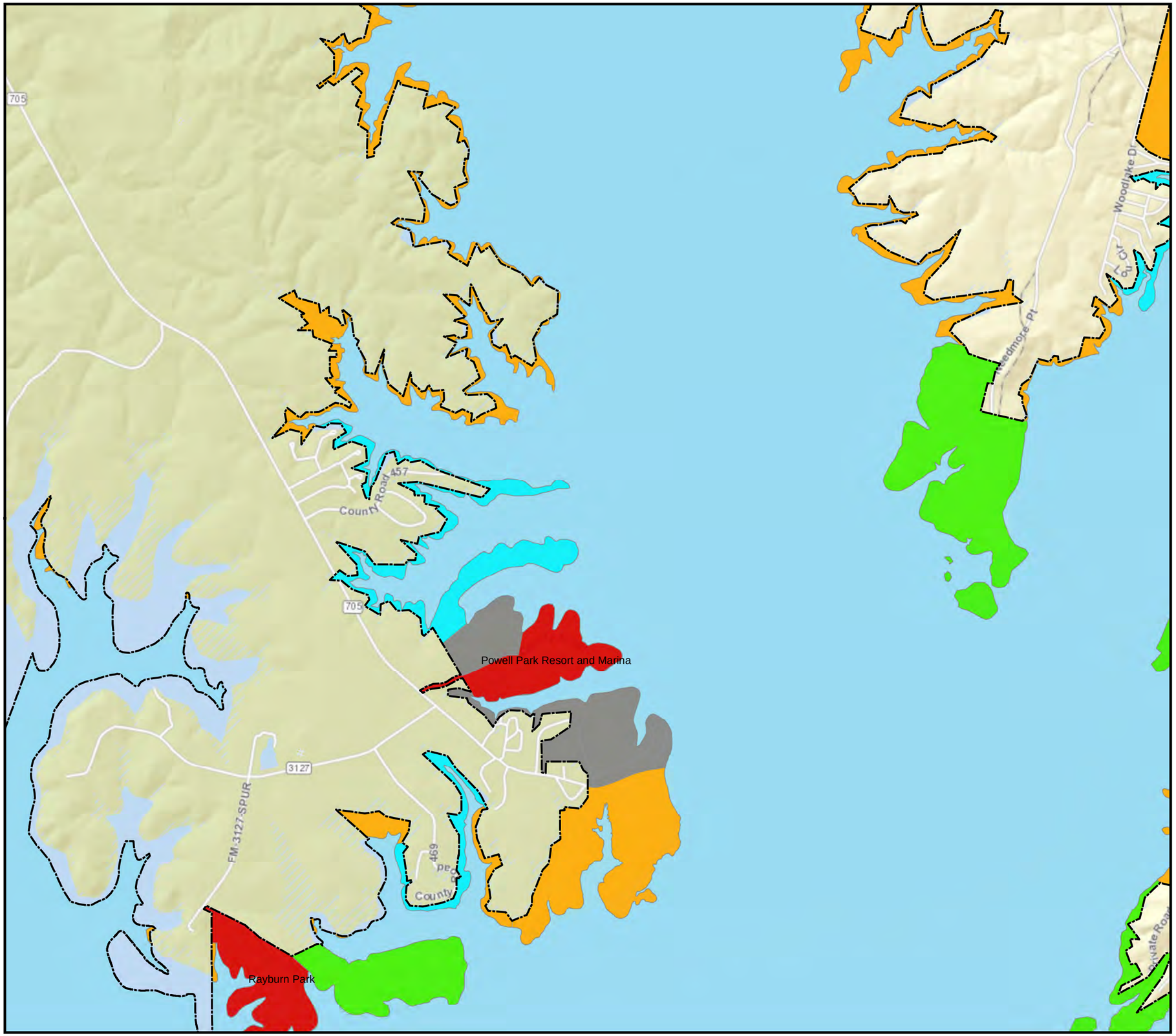
Land Use and Water Surface Classification

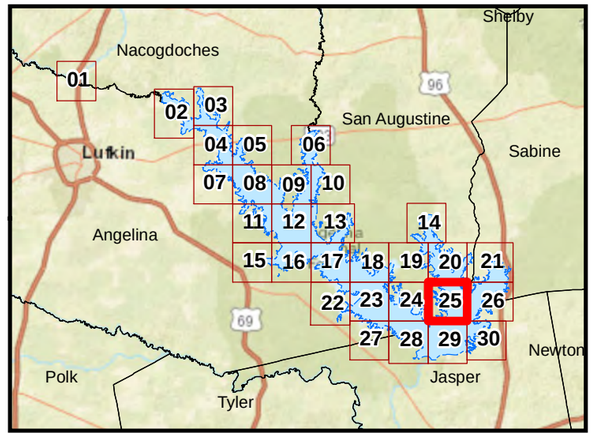
Page - 24

N

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-24





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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Fort Worth District

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Land Use and Water Surface Classification

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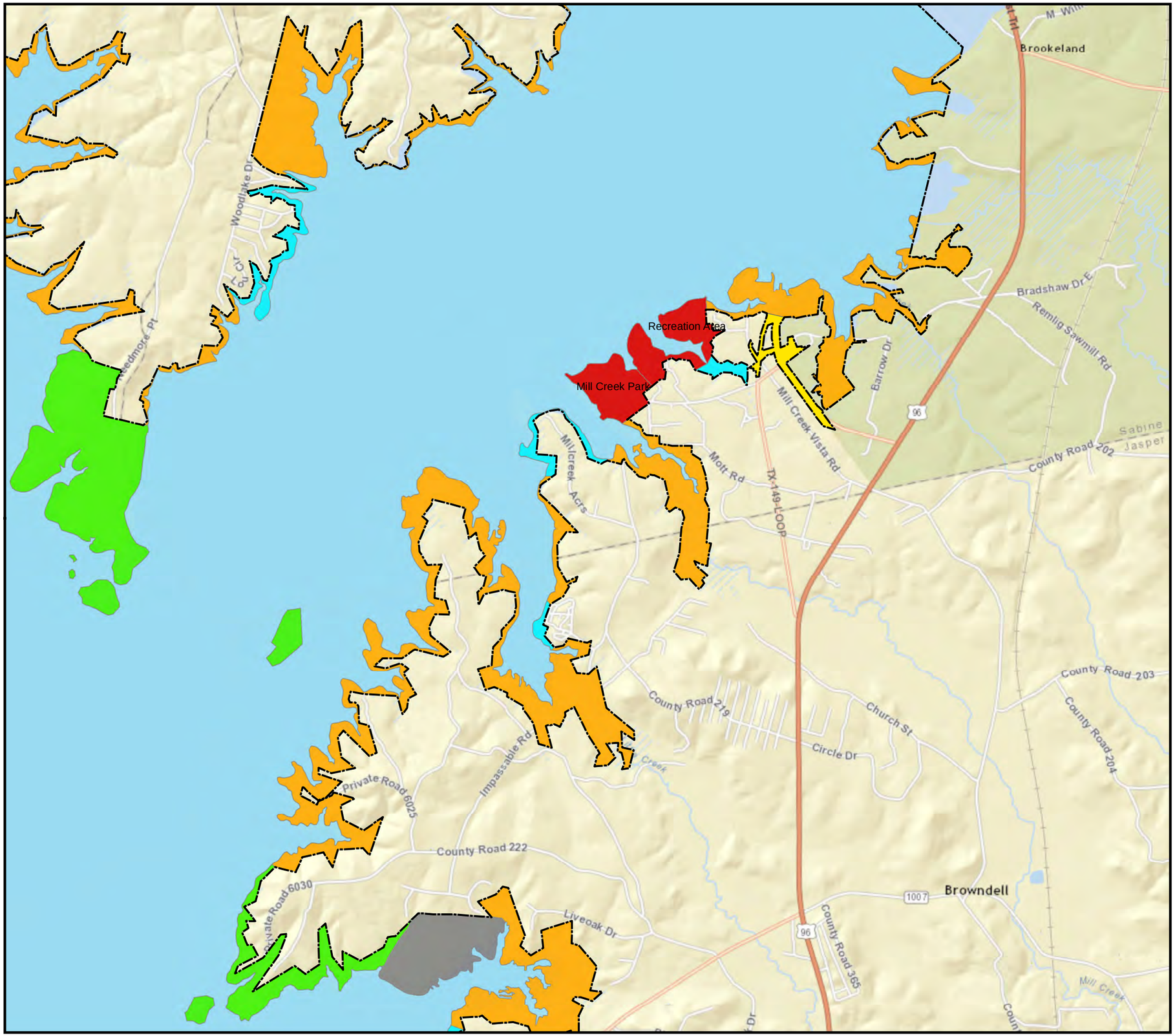
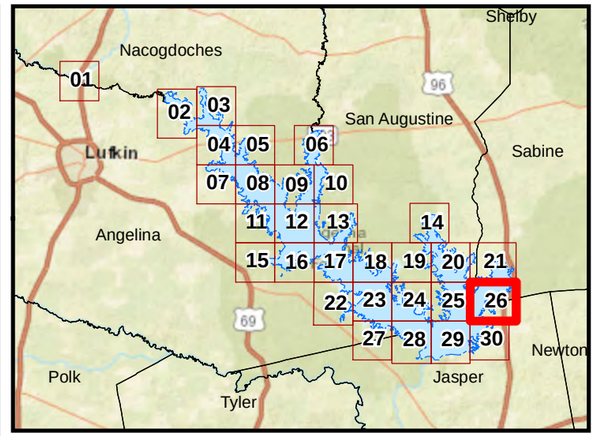
0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-25





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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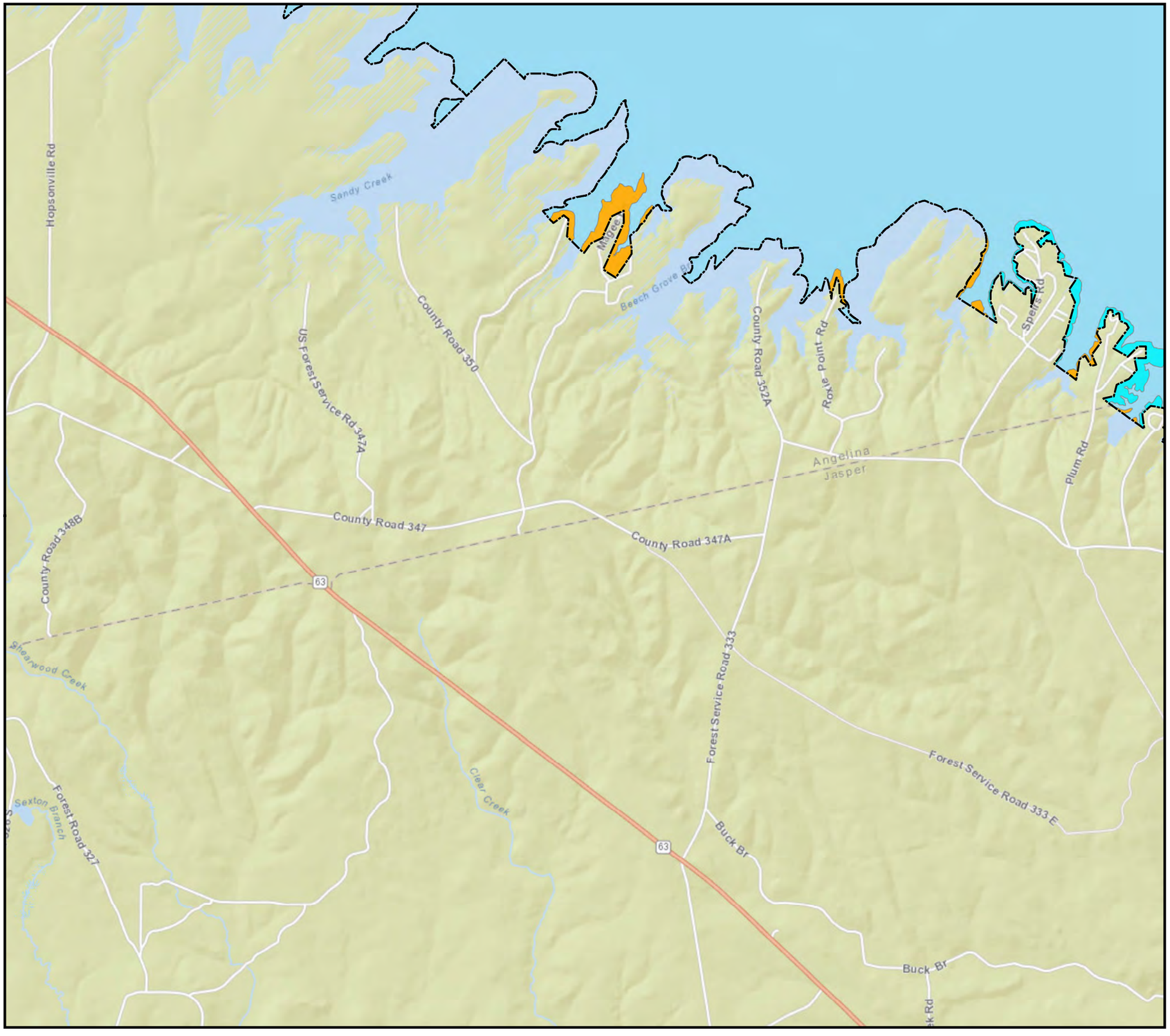
Sam Rayburn Reservoir Master Plan

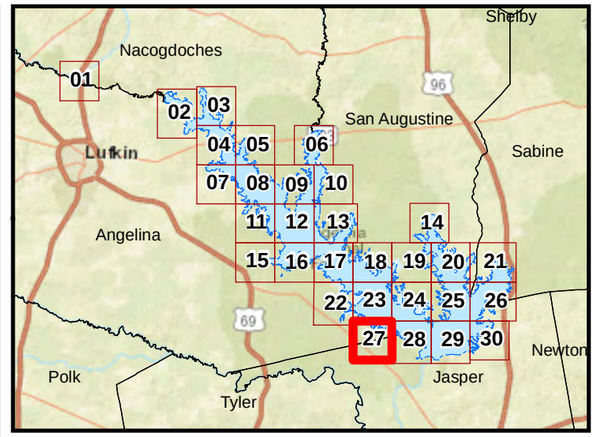
Land Use and Water Surface Classification

Page - 26

0 0.3 0.6 0.9 1.2 Miles

Date:	Map No.
January 2017	SR17MP-OC-26





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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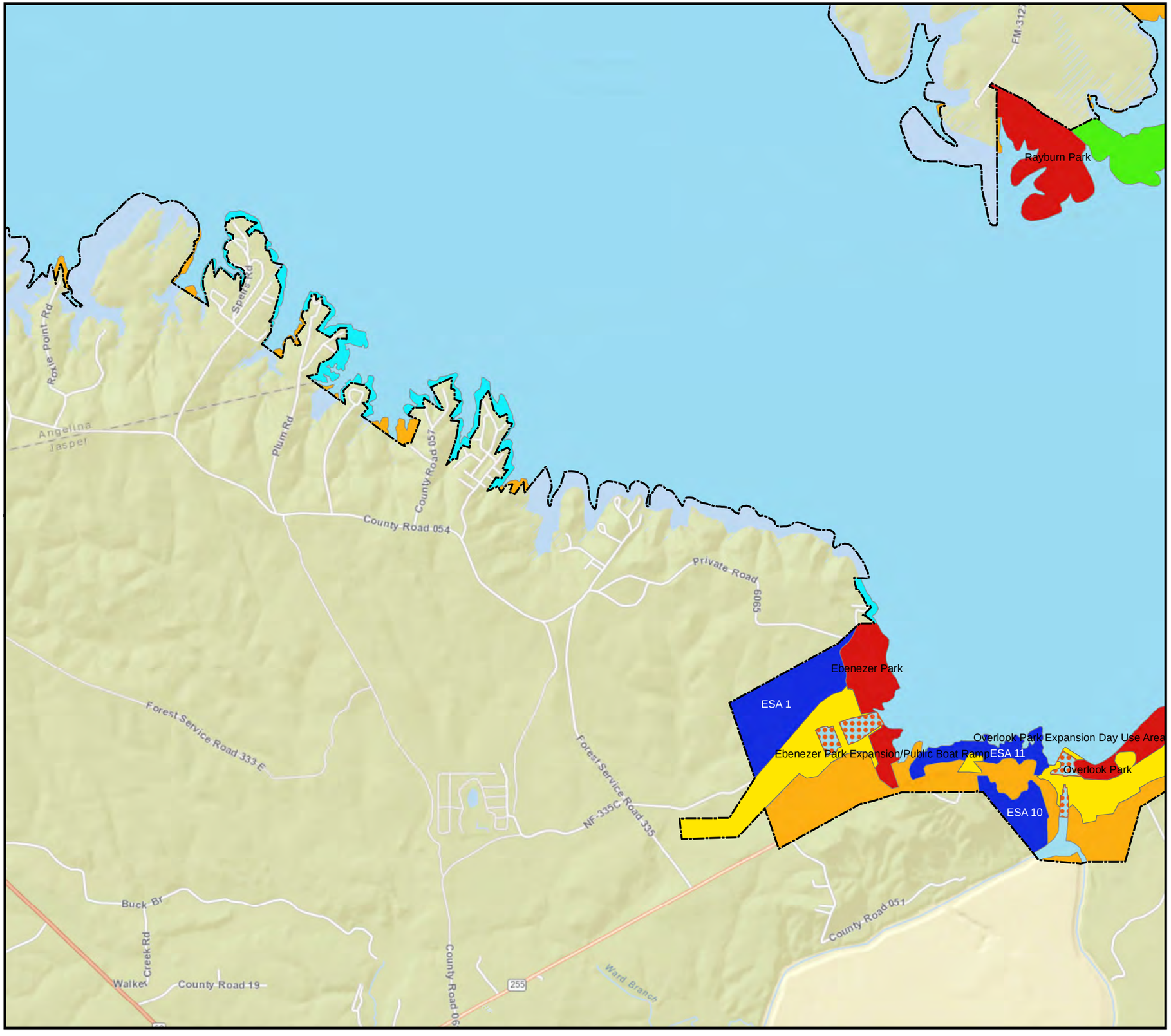
Sam Rayburn Reservoir Master Plan

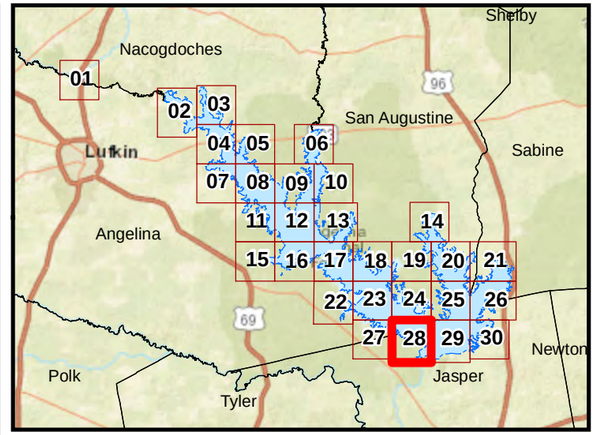
Land Use and Water Surface Classification

Page - 27

0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-27





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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Land Use and Water Surface Classification

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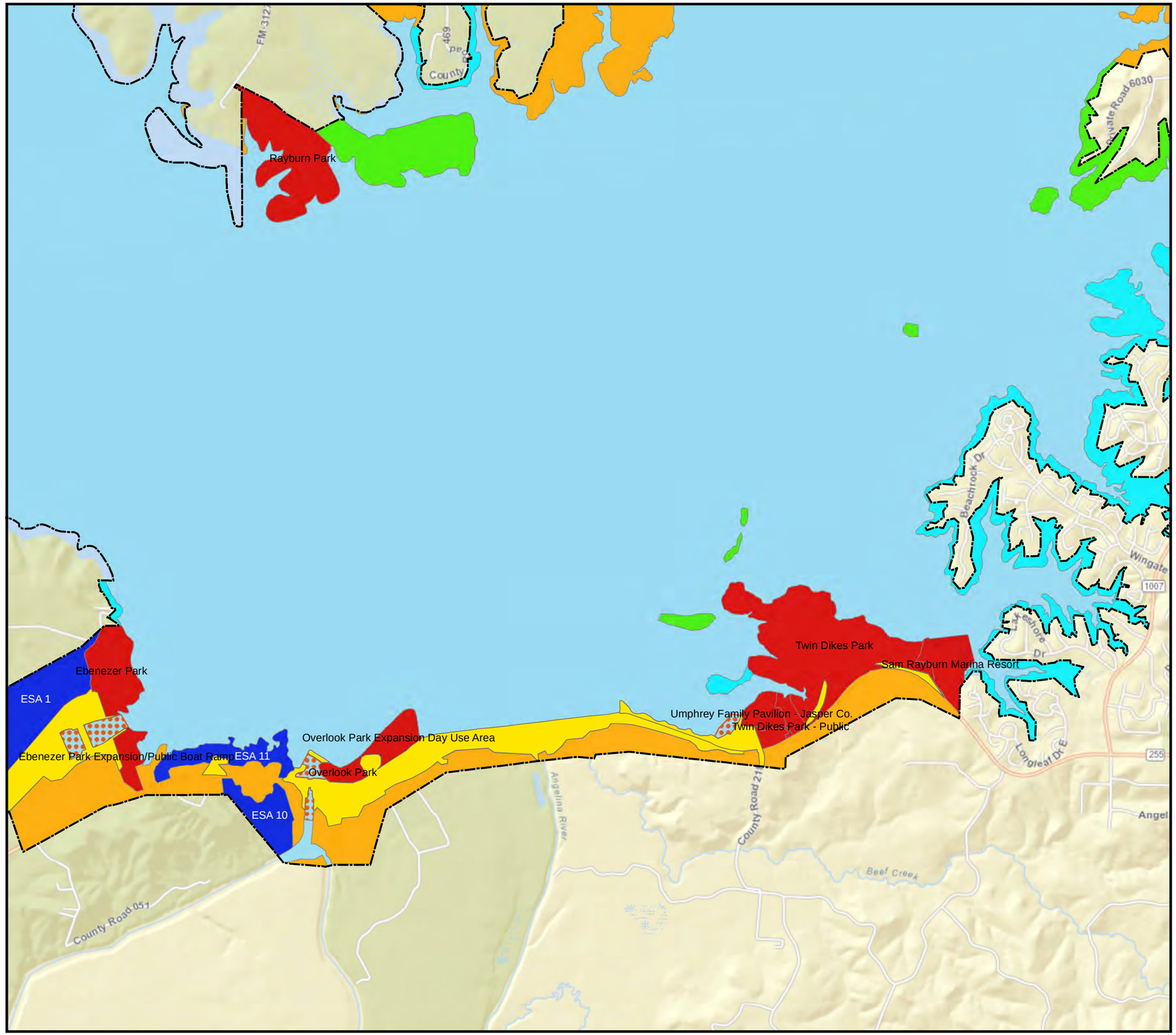
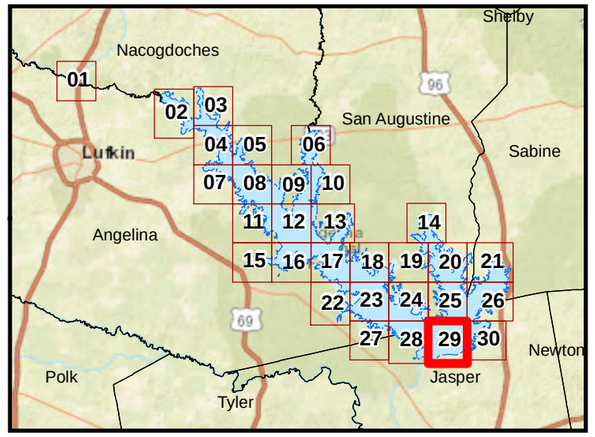
N

0 0.3 0.6 0.9 1.2 Miles

Date:	Map No.
January 2017	SR17MP-OC-28





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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Sam Rayburn Reservoir Master Plan

Land Use and Water Surface Classification

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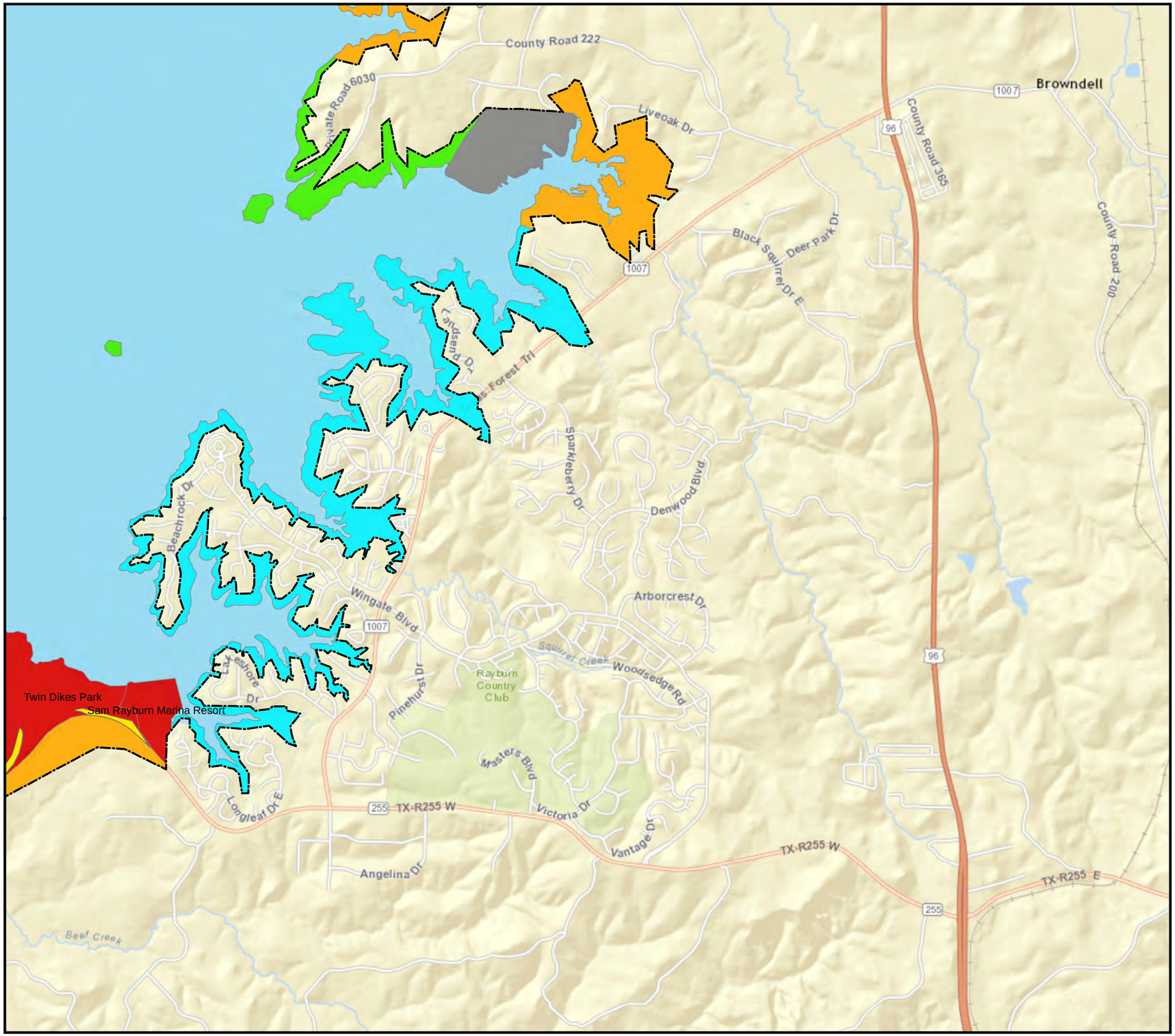
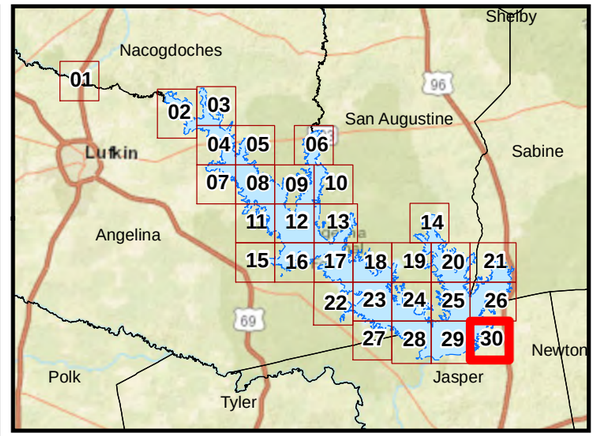
0 0.3 0.6 0.9 1.2 Miles

Date:	Map No.
January 2017	SR17MP-OC-29





- Fee Boundary
- Project Operations
- High Density Recreation
- Environmentally Sensitive Area
- Low Density Recreation
- Vegetative Management
- Wildlife Management
- Future or Inactive Recreation Areas
- Designated No-Wake
- Open Recreation
- Restricted

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Land Use and Water Surface Classification

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0 0.25 0.5 0.75 1 Miles

Date:	Map No.
January 2017	SR17MP-OC-30

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Ebenezer Park Expansion/Public Boat Ramp)

N

0 95 190 380 570 Feet

Date:	Map No.
January 2017	SR17MP-OR-01

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	30
Electrical Hook-Up	13
Group Picnic Shelter	
Picnic Sites	
Restrooms	1
Showers	4
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Ebenezer Park)

N

0 105 210 420 630 Feet

Date:	Map No.
January 2017	SR17MP-OR-02

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Sandy Creek Recreation Site - USFS)

N

0 140 280 560 840 Feet

Date:	Map No.
January 2017	SR17MP-OR-03

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Caney Creek Recreation Site - USFS)

0 337.5 675 1,350 2,025 Feet

Date:	Map No.
January 2017	SR17MP-OR-04

Item	Existing
Courtesy Dock	1
Group Campsites	
Campsites	17
Electrical Hook-Up	17
Group Picnic Shelter	1
Picnic Sites	
Restrooms	2
Showers	
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Cassells-Boykin Park)

0 345 690 1,380 2,070 Feet

Date:	Map No.
January 2017	SR17MP-OR-05

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Monterey Park)

N

0 400 800 1,600 2,400 Feet

Date:	Map No.
January 2017	SR17MP-OR-06

Item	Existing
Courtesy Dock	2
Group Campsites	1
Campsites	55
Electrical Hook-Up	55
Group Picnic Shelter	2
Picnic Sites	3
Restrooms	3
Showers	9
Dump Station	2

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Hanks Creek Park)

N

0 290 580 1,160 1,740 Feet

Date:	Map No.
January 2017	SR17MP-OR-07

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Ewing Park)

N

0 20 40 80 120 Feet

Date:	Map No.
January 2017	SR17MP-OR-08

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Marion Ferry Park)

N

0 187.5 375 750 1,125 Feet

Date:	Map No.
January 2017	SR17MP-OR-09

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	106
Electrical Hook-Up	84
Group Picnic Shelter	
Picnic Sites	84
Restrooms	1
Showers	
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Shirley Creek Park

N

0 105 210 420 630 Feet

Date:	Map No.
January 2017	SR17MP-OR-10

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Shirley Creek Park - Marina)

N

0 45 90 180 270 Feet

Date:	Map No.
January 2017	SR17MP-OR-11

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Ralph McAlister Park)

N

0 150 300 600 900 Feet

Date:	Map No.
January 2017	SR17MP-OR-12

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Townsend Recreation Site - USFS)

0 210 420 840 1,260 Feet

Date:	Map No.
January 2017	SR17MP-OR-13

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	69
Electrical Hook-Up	43
Group Picnic Shelter	
Picnic Sites	
Restrooms	1
Showers	1
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Jackson Hill Park - Marina)

N

0 337.5 675 1,350 2,025 Feet

Date:	Map No.
January 2017	SR17MP-OR-14

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Harvey Creek Recreation Site - USFS)

N

0 280 560 1,120 1,680
Feet

Date:	Map No.
January 2017	SR17MP-OR-15

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Bayou Recreation Site - USFS)

0 295 590 1,180 1,770 Feet

Date:	Map No.
January 2017	SR17MP-OR-16

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	49
Electrical Hook-Up	24
Group Picnic Shelter	
Picnic Sites	
Restrooms	3
Showers	4
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Rayburn Park)

N

0 320 640 1,280 1,920
Feet

Date:	Map No.
January 2017	SR17MP-OR-17

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(Powell Park - South)

N

0 155 310 620 930 Feet

Date:	Map No.
January 2017	SR17MP-OR-18

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Powell Park - North)

0 190 380 760 1,140 Feet

Date:	Map No.
January 2017	SR17MP-OR-19

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	96
Electrical Hook-Up	96
Group Picnic Shelter	1
Picnic Sites	10
Restrooms	9
Showers	4
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

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Recreational Areas

(Powell Park - Marina)

N

0 245 490 980 1,470 Feet

Date:	Map No.
January 2017	SR17MP-OR-20

Item	Existing
Courtesy Dock	1
Group Campsites	
Campsites	100
Electrical Hook-Up	100
Group Picnic Shelter	1
Picnic Sites	
Restrooms	3
Showers	6
Dump Station	1

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Sam Rayburn Reservoir Master Plan

Recreational Areas

(San Augustine Park)

0 195 390 780 1,170 Feet

Date:	Map No.
January 2017	SR17MP-OR-21

Item	Existing
Courtesy Dock	1
Group Campsites	
Campsites	110
Electrical Hook-Up	110
Group Picnic Shelter	
Picnic Sites	
Restrooms	3
Showers	8
Dump Station	2

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

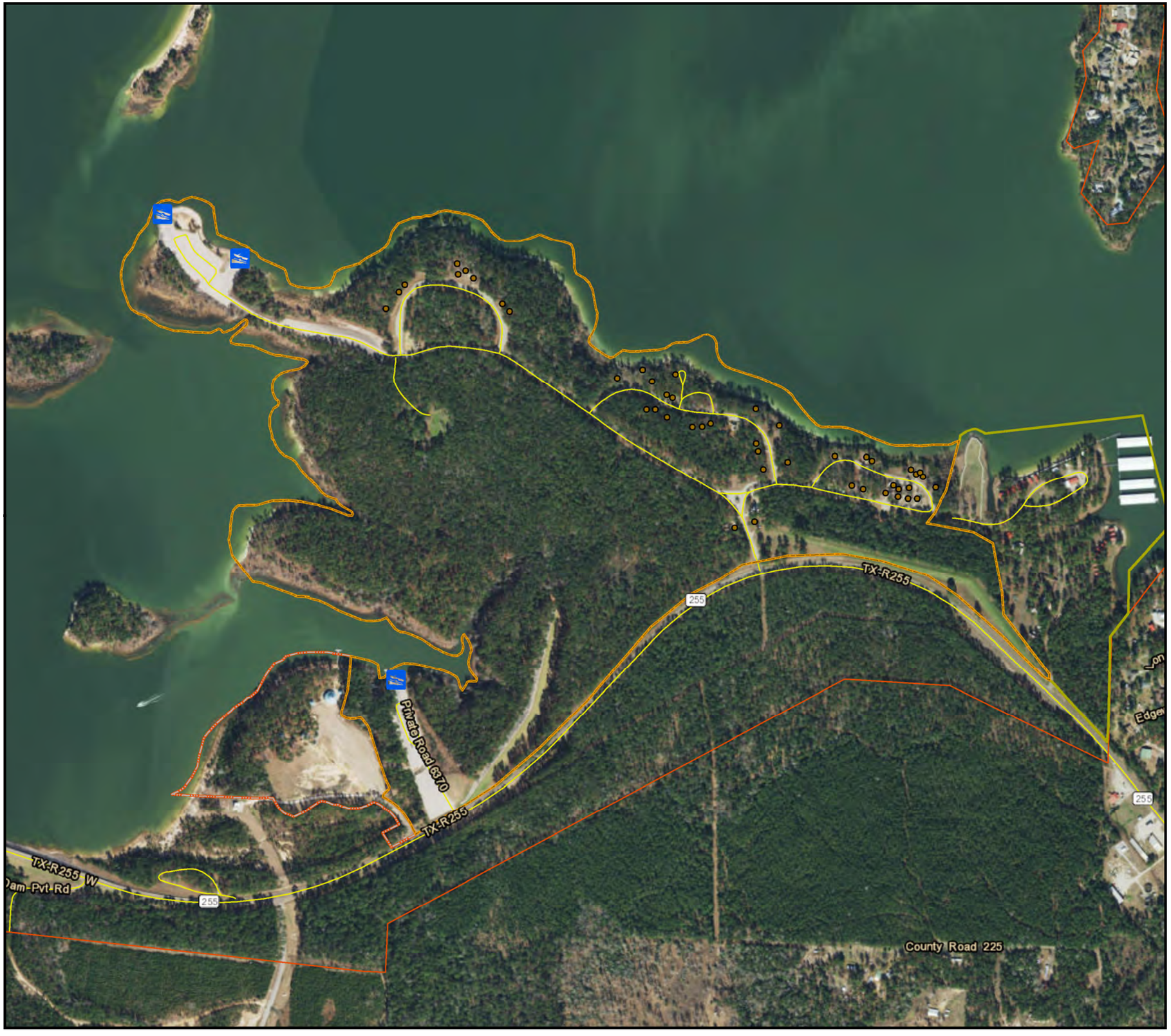
Sam Rayburn Reservoir Master Plan

Recreational Areas

(Mill Creek Park)

0 140 280 560 840 Feet

Date:	Map No.
January 2017	SR17MP-OR-22



Item	Existing
Courtesy Dock	1
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Twin Dikes Park

N

0 290 580 1,160 1,740 Feet

Date:	Map No.
January 2017	SR17MP-OR-23

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	77
Electrical Hook-Up	21
Group Picnic Shelter	3
Picnic Sites	10
Restrooms	2
Showers	4
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

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Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Sam Rayburn Marina Resort)

N

0 115 230 460 690 Feet

Date:	Map No.
January 2017	SR17MP-OR-24

Item	Existing
Courtesy Dock	1
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	1
Picnic Sites	
Restrooms	1
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Twin Dikes Park - Jasper County)

0 75 150 300 450 Feet

Date:	Map No.
January 2017	SR17MP-OR-25

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	
Restrooms	
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Overlook Park Expansion/ Day Use Area)

0 87.5 175 350 525 Feet

Date:	Map No.
January 2017	SR17MP-OR-26

Item	Existing
Courtesy Dock	
Group Campsites	
Campsites	
Electrical Hook-Up	
Group Picnic Shelter	
Picnic Sites	6
Restrooms	1
Showers	
Dump Station	

Legend

- Corps of Engineers Park
- Leased Marina
- Angelina County Park
- Jasper County Park
- Nacogdoches County Park
- U.S. Forest Service Park
- Fee Boundary
- Boat Ramp
- Camp Site

U.S. Army Corps of Engineers
Fort Worth District

Sam Rayburn Reservoir Master Plan

Recreational Areas

(Overlook Park)

0 62.5 125 250 375 Feet

Date:	Map No.
January 2017	SR17MP-OR-27

APPENDIX B – LIST OF DESIGN MEMORANDA

Sam Rayburn Dam and Reservoir Design Memoranda

Design Memo No.	Title	Date Approved
DM 1	Construction for FY 1956	Feb 3, 1956(1)
DM 2	General	Feb 16, 1956(1)
	General (Revised)	Oct 2, 1961
DM 3	Real Estate	
	Construction Area	
Part I	First Increment	Mar 8, 1956
Part I	Second Increment	May 14, 1957
	Relocations (Real Estate)	
Part I	GC&SF RR	Feb 12, 1958
Part II	First Increment (Hwy 147)	Apr 29, 1957
Part II	Second Increment (Hwy 147)	Sep 5, 1957
Part III	Highway 96	Mar 29 1960
	Reservoir Area	
Part I	Seg 2, 15, 17, 18, 19, 20	Jun 3, 1958
Part II	Seg 21, 22, 23, 24, 28, 29, 30, 31	Nov 10, 1958
Part III	Seg 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 25, 26	May 21, 1959
Part IV	Remaining Land Above Hwy 147	Jul 12, 1960
DM 4	Relocations	
Part I	Pipe Lines	
Sec A	United Gas 14” Lines	Jul 12, 1956
	United Gas 30”, 22” and 14” Lines (Revised)	Dec 31, 1958
Sec B	Tennessee Gas Transmission Line Crossing	Jul 20, 1956
Sec C	Texas Eastern Transmission Corps 24” Gas Lines	Sep 25, 1958
Sec D	Atlantic 10” Oil Line	May 20, 1960
Sec E	Magnolia Pipe Lines (4” & 8”)	Nov 9, 1959
Sec F	Natural Gas Pipe Line of America	Jul 13, 1961
Part II	Highways	
Sec A	State Highway 147 Bridge	Jul 6, 1956
Sec B	FM Road 2109	Nov 19, 1957
Sec C	State Highway 63 & U.S. Highway 96	May 9 , 1957
Sec D	FM Road 226 (Revised)	Jun 5, 1959
Sec E	FM Road 705	Oct 4, 1960
Sec F	State Highway 103	May 23, 1960

Design Memo No.	Title	Date Approved
Part III	County Roads	
	County Roads and Forest Service Roads	Nov 28, 1958
	Supplement Number 1	Jan 14, 1960
	Supplement Number 2	Mar 2, 1960
Part IV	Railroads	
Sec A	GC&SF Railway	Apr 14, 1958
Sec B	A&N Railway	May 23, 1960
Part V	Power & Telephone Lines	
Sec A	Texas Power & Lights Co.	Jul 23, 1962(1)
Sec B-1	Deep East Texas Co-op	Dec 20, 1961(1)
Sec B-2	Deep East Texas Co-op	Sep 23, 1962
Sec C	Jasper-Newton Co-op	Mar 24, 1961
Sec D	SW Bell Tell, Lufkin, Tel Exch, Tex Tel & Telegraph	Jul 9, 1962(1)
Part VI	Cemeteries	
Sec A	Cemeteries Number 1 though 16	Oct 15, 1958
Part VII	SPRR Embankment Protection	Jan 23, 1964
DM 5	Spillway	Oct 3, 1956
DM 6	Availability of Materials	Nov 5, 1956
DM 7	Earthen Dam	Jan 11, 1957
DM 8	Hydro Power Studies	Oct 7, 1956
DM 10	Clearing	
Part I		Feb 27, 1961
Part II		Apr 19, 1962
DM 11	Power Plant	
DM 11-1	Preliminary Design Report – Power Plant	Apr 14, 1960
DM 11-2	Flood Control Outlet & Power Intake Works – Inlet Channel, Outlet Channel Retaining Walls, Stilling Basin, Earthen Dam	Apr 21, 1960
DM 11-3F	Flood Control Outlet Works	Aug 23, 1961
DM 11-3I	Power Intake	Aug 23, 1961
DM 11-3P	Final Design Report – Power Plant	Aug 23, 1961
DM 12	Operational Buildings and Utilities (Revised)	Jan 22, 1963

Design Memo No.	Title	Date Approved
DM 13	Recreation Facilities	
A	Preliminary Recreation Plan (Letter)	May 28, 1957
B (C-1)	Construction Design Memo, Part of the Master Plan	May 1, 1963
B	Joint Master Plan, including reports from other agencies	Jan 2, 1966
DM 14	Brookeland (revised)	Apr 29, 1959
DM 15	Hydrology (revised)	Aug 5, 1959
DM 16	Cost Allocation	Nov 10, 1965(1)
DM 17	West Access Road	Mar 6, 1961
DM 18	Cathodic Protection of Flood Control and Power Intake Gates (revised)	May 9, 1962
DM 19	Shelter for Fallout Protection	Indefinite

(1) Date Submitted for Approval

APPENDIX C - NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTATION

DRAFT

Environmental Assessment for the Sam Rayburn Dam and Reservoir Master Plan

Angelina River

Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties, Texas

January 2017

US Army Corps of Engineers ®
Fort Worth District

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DRAFT FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT FOR THE
SAM RAYBURN DAM AND RESERVOIR
ANGELINA RIVER
ANGELINA, JASPER, NACOGDOCHES, SABINE, AND SAN AUGUSTINE COUNTIES, TEXAS

In accordance with the National Environmental Policy Act of 1969, including guidelines in 33 Code of Federal Regulations (CFR), Part 230, the Fort Worth District and the Regional Planning and Environmental Center (RPEC) of the U.S. Army Corps of Engineers (USACE) have assessed the potential of the Sam Rayburn Dam and Reservoir Master Plan revision (2017 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 Sam Rayburn Dam and Reservoir, including the land use classification of the USACE-managed lands. The Master Plan provides a comprehensive description of the project, a discussion of factors influencing resource management and development, new resource management objectives, the resource plan describing how project lands and waters will be managed, an identification and discussion of special topics, a synopsis of public involvement and input into the planning process, and descriptions of existing development.

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

The Proposed Action includes Master Plan revisions, coordination with the public, and updates to comply with USACE regulations and guidance, and reflects changes in land management and land uses that have occurred since 1970. Land classifications were refined to meet authorized project purposes and current resource objectives that address a mix of natural resource and recreation management objectives that are compatible with regional goals, recognize outdoor recreation trends, and are responsive to public comment. Required land and water surface classification changes associated with the Proposed Action include the following:

Land Classification	Proposed Action Description	Justification
Project Operations	The decrease of Project Operations from 1,000 acres to 370 acres resulted from the reclassification of 630 acres of prior Project Operations lands to Multiple Resource Managed Lands (MRML) – Vegetative Management (VM), Environmentally Sensitive Areas (ESA), and High Density Recreation (HDR).	All lands classified as Project Operations are managed and used primarily in support of critical operational requirements related to the primary missions of flood risk management, hydropower, and water conservation. The 370 acres that are now classified as Project Operations are sufficient for current and future operational requirements. The classification of 370 acres of Project Operations lands will have no effect on current or projected public use.
High Density Recreation	Approximately 3,861 acres were classified under the prior classification of Recreation – High Intensive Use and included public use areas, commercial concession areas, and private recreation lease areas. Approximately 2,263 of these acres were reclassified leaving 1,598 acres under the new, but similar classification of HDR. The reclassification of the 2,263 acres was accomplished as follows: • Prior Recreation – High Intensive Use areas, including the former Needmore, Massey-Good, and McElroy Parks, were reclassified to MRML – VM or MRML – Wildlife Management (WM). • Undeveloped portions of several actively managed HDR areas were reclassified as Future/Inactive Recreation Areas, including Tiger Creek Park and portions of Jackson Hill and Powell Parks.	In general terms, the amount of land classified for Recreation – Intensive Use in the 1970 Master Plan was excessive and was based on projected needs at the time the plan was written. Management experience since 1970 has clearly revealed that numerous reclassifications were needed to reflect actual use, evolving trends, and regional priorities. The reclassification of former Recreation – High Intensive Use areas and portions of actively managed HDR areas will not affect current or projected public use.
Environmentally Sensitive Areas	The classification of 1,809 acres as ESA resulted from the reclassification of several parcels of land under the prior classification of Recreation – Low Intensity.	Reclassification of the 1,809 acres was determined by the USACE study team to be necessary to provide a high level of protection for those areas supporting bottomland hardwood forests, longleaf pine savannah, and areas with steep, aesthetic bluffs and ravines. Habitat studies conducted as part of the Master Plan revision support the classification of these lands as ESA. The ESA also provide good to excellent habitat for endangered species and numerous Species of Conservation Concern.

Land Classification	Proposed Action Description	Justification
Environmentally Sensitive Areas, continued		Protection of cultural resources also justifies the classification of some areas as ESA. Classifying acres as ESA will afford these areas the highest level of protection from disturbance. The reclassification of 1,809 acres to ESA will have no effect on current or projected public use.
MRML – Low Density Recreation	The definition of the prior classification of Low Density Use is comparable to the definition of the current classification of MRML – Low Density Recreation (LDR). Land classification changes resulted in a net reduction of these acres from 8,862 acres to the current 2,249 acres. This reduction resulted from reclassification to MRML – VM, MRML – WM, and ESA.	The net reduction in MRML – LDR lands was necessary to recognize the high ecological value of those areas reclassified to VM, WM, and ESA. The largest portion of the reduction was a reclassification of lands to MRML-VM to recognize that this large area of land has been historically managed to insure healthy, productive forests and aesthetically pleasing shorelines rather than for recreational purposes. Those lands remaining as MRML – LDR are located primarily in shoreline areas where vegetation modification (mowing) permits occur in accordance with the Shoreline Policy. Current LDR lands are also located adjacent to dense residential development. These changes support management actions and recreational trends identified in the Statewide Comprehensive Outdoor Recreation Plan (TORP). Public use of all areas that were reclassified will not be affected now or in the foreseeable future. Public access in the form of natural surface hiking and biking is compatible with these classifications.
MRML – Wildlife Management	Approximately 8,379 acres of primarily water surface under the prior classification of Wildlife Management was reclassified as Open Recreation Water Surface. In addition, the former Needmore Park area and approximately 50 percent of Rayburn Park were reclassified as MRML – WM. These reclassifications resulted in 896 acres remaining under the MRML – WM classification.	As set forth in the Master Plan revision, there is no justification for any water surface areas to be classified as Fish & Wildlife Sanctuary. The water surface areas in question have never been specifically managed for wildlife and neither Texas Parks and Wildlife Department (TPWD) nor U.S. Fish and Wildlife Service

Land Classification	Proposed Action Description	Justification
MRML – Wildlife Management, continued		(USFWS) have published special waterfowl restrictions for the areas. The former undeveloped park areas that are now classified as MRML-WM have historically been managed for wildlife purposes. These reclassifications will have no effect on current or projected public use.
MRML – Vegetation Management	The classification of 10,296 acres to MRML – VM resulted from: • Reclassification of 630 acres from Project Operations • Reclassification of approximately 10,666 acres of prior Recreation - Low Intensity and Recreation – Intensive Use lands. The majority of the reclassified acreage was under the prior classification of Recreation - Low Intensity.	All parcels that were reclassified to MRML – VM were reclassified to recognize the long-term historic management of these lands to provide healthy and productive forests in accordance with directives specified in Public Law 86-717, the Forest Cover Act and to maintain an aesthetically pleasing, fully forested shoreline. This reclassification will have no effect on current or projected public use.
Future/Inactive Recreation Areas	The classification of 718 acres to Future/Inactive Recreation Areas resulted from the following changes: • 718 acres of former Recreation – Intensive Use was reclassified to Future/Inactive Recreation Area, including Tiger Creek Park and portions of Powell Park.	The parcels classified as Future/Inactive Recreation are undeveloped. Until there is a need to develop these lands, they will be managed as MRML lands. These reclassifications will have no effect on current or projected public use.

Note: The land classification changes described in this table are the result of changes to more than 60 individual parcels of land ranging from a few acres to several hundred acres. Acreages were measured using Geographic Information System (GIS) technology. The acreage numbers provided are approximate.

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

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

It is my finding, based on the EA, that the revision of the 1970 Master Plan for Sam Rayburn Dam and Reservoir will have no significant adverse impact on the environment and will not constitute a major Federal action significantly affecting the quality of the human or natural environment. Therefore, an EIS will not be prepared.

Date

Calvin C. Hudson II
Colonel, U.S. Army
District Commander

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ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the effects revising the Master Plan for Sam Rayburn Dam and Reservoir. The EA will facilitate the decision-making process regarding the Proposed Action and alternatives.

SECTION 1 *INTRODUCTION, PURPOSE, NEED, AND SCOPE* of the Proposed Action summarizes the purpose of and need for the Proposed Action, provides relevant background information, and describes the scope of the EA.

SECTION 2 *ALTERNATIVES INCLUDING THE PROPOSED ACTION* examines alternatives for implementing the Proposed Action and describes the recommended alternative.

SECTION 3 *AFFECTED ENVIRONMENT* describes the existing natural, cultural, and human environments.

ENVIRONMENTAL CONSEQUENCES identifies the potential effects of implementing the Proposed Action and alternatives.

SECTION 4 *CUMULATIVE IMPACTS* describes the impact on the environment that may result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions.

SECTION 5 *COMPLIANCE WITH ENVIRONMENTAL LAWS* provides a listing of environmental protection statutes and other environmental requirements.

SECTION 6 *IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES* identifies any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented.

SECTION 7 *PUBLIC AND AGENCY COORDINATION* provides a listing of individuals and agencies consulted during preparation of the EA.

SECTION 8 *REFERENCES* provides bibliographical information for cited sources.

SECTION 9 *ACRONYMS/ABBREVIATIONS*

SECTION 10 *LIST OF PREPARERS* identifies persons who prepared the document and their areas of expertise.

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ENVIRONMENTAL ASSESSMENT

Master Plan Revision

Sam Rayburn Dam and Reservoir
Angelina River
Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties, Texas

SECTION 1: INTRODUCTION

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

1.1 PROJECT LOCATION AND SETTING

Sam Rayburn Dam and Reservoir are located in east Texas approximately 10 miles northwest of the City of Jasper at river mile 25.2 on the Angelina River, a tributary of the Neches River. The reservoir is located in portions of five counties: Angelina, Jasper, Nacogdoches, Sabine, and San Augustine. Sam Rayburn Dam and Reservoir were authorized and constructed for the primary purposes of flood damage risk reduction, generation of hydroelectric power, and conservation of water for municipal, industrial, and agricultural uses. A major secondary use of project lands and waters is public water-oriented recreation. The reservoir area is heavily utilized by visitors from Beaumont, Port Arthur, Houston, Lufkin, and other large nearby population centers in Texas.

Table 1-1 outlines information regarding existing reservoir storage capacity at Sam Rayburn Reservoir. Detailed descriptions of Sam Rayburn Dam and Reservoir are provided in Section 1.5 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

Table 1-1. Water Storage Capacity

Feature	Elevation (feet)	Area (acres)	Storage	
			(acre-feet)	(inches)[1]
Top of Dam	190.0	-	-	-
Top of Parapet Wall	193.6	-	-	-
Updated Maximum Pool (1992 study)	186.9	195,370	6,195,080	33.70
Maximum Pool (Original Design)	183.0	180,000	5,588,544	30.50
Spillway Crest	176.0	153,800	4,420,949	24.15
Pool of Record (10 March 1992)	175.1			
Top of Flood Control Pool	173.0	142,700	3,976,169	21.73

Feature	Elevation (feet)	Area (acres)	Storage	
			(acre-feet)	(inches)[1]
Top of Power Pool	164.4	112,590	2,876,033	15.51
Power Head and Sediment Storage	149.0	72,013	1,460,990	7.89
Intake Invert	105.0	4,836	18,956	0.12
Streambed at Dam	70.0	-	-	-

[1]From a total drainage area of 3,449 square miles.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The purpose of the Proposed Action is to ensure that the conservation and sustainability of the land, water, and recreational resources at Sam Rayburn Dam and Reservoir are in compliance with applicable environmental laws and regulations and to maintain quality land for future use. The 2017 Master Plan is intended to serve as a comprehensive land and recreation management plan with an effective life of approximately 25 years.

The need for the Proposed Action is to bring the 1970 Master Plan up to date and to reflect changes in outdoor recreation trends, regional land use, population, legislative requirements, USACE management policy, and wildlife habitat that have occurred since 1970, as well as those changes anticipated to occur through 2040, at Sam Rayburn Dam and Reservoir. In particular, changes in outdoor recreation trends, increasing fragmentation of wildlife habitat, increasing demand for more infrastructure to support nearby population growth, and current legislative requirements necessitate a more current examination of the management of Federal land at Sam Rayburn Dam and Reservoir.

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

- Changes in national policies or public law mandates
- Operations and management budget allocations
- Recreation area closures
- Facility and infrastructure improvements
- Cooperative agreements with stakeholder agencies (such as Texas Parks and Wildlife Department [TPWD], the U.S. Forest Service (USFS), and the U.S. Fish and Wildlife Service [USFWS]) to operate and maintain public land
- Outdoor recreation trends identified in the Texas Outdoor Recreation Plan (TORP)
- Ecoregion priorities identified in the Texas Conservation Action Plan (TCAP)
- Evolving public concerns expressed through USACE public surveys and recreation area comment card program

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

1.3 SCOPE OF THE ACTION

This EA was prepared to evaluate existing conditions and potential impacts of proposed alternatives associated with the 2017 Master Plan. The alternative considerations were formulated to include all of Sam Rayburn Dam and Reservoir, as well as its appurtenant structures comprising the earthfill embankment, concrete spillway, water supply connections, outlet works, and surrounding federally-owned fee lands. These lands comprise all properties historically acquired to build the project, including USACE lands and lands leased by the USACE to other governmental or non-governmental entities. This EA was prepared pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1517), and the USACE implementing regulations, Policy and Procedures for Implementing NEPA, ER 200-2-2 (USACE 1988).

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SECTION 2: PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is necessary to revise the 1970 Master Plan so that it is compliant with USACE regulations and guidance and reflects current and desired future management goals. As part of this process, which includes public outreach and comment, two alternatives were developed for evaluation, including a No Action Alternative. The alternatives were developed using land classifications that indicate the primary use for which project lands are managed. There are five categories of land classification: Project Operations, High Density Recreation (HDR), Mitigation, Environmentally Sensitive Areas (ESA), and Multiple Resource Managed Lands (MRML). MRML are divided into four subcategories: Low Density Recreation (LDR), Vegetative Management (VM), Wildlife Management (WM), and Future/Inactive Recreation Areas.

The action alternative evaluated in this EA is compared to the No Action, which serves as the baseline condition. USACE guidance recommends the establishment of resource goals and objectives for purposes of development, conservation, and management of natural, cultural, and man-made resources at a project. Goals describe the desired end state of overall management efforts, whereas objectives are concise statements describing measurable and attainable management activities that support the stated goals. Goals and objectives are guidelines for obtaining maximum public benefits while minimizing adverse impacts on the environment and are developed in accordance with 1) authorized project purposes, 2) applicable laws and regulations, 3) resource capabilities and suitabilities, 4) regional needs, 5) other governmental plans and programs, and 6) expressed public desires. The five project-wide management goals established for Sam Rayburn Dam and Reservoir that were used in determining the Proposed Action, as well as the nationwide USACE Environmental Operating Principles, are discussed in detail Section 3.2 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

2.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

The No Action Alternative serves as a basis for comparison to the anticipated effects of the other action alternatives, and its inclusion in this EA is required by NEPA and CEQ regulations (40 CFR § 1502.14(d)). Under the No Action Alternative, the USACE would take no action and would not revise the 1970 Master Plan (USACE 1970). The operation and management of Sam Rayburn Dam and Reservoir would continue as outlined in the current Master Plan. No new resource analysis or land-use classifications would occur.

2.2 ALTERNATIVE 2: PROPOSED ACTION

Under Alternative 2, the Master Plan would be reviewed, coordinated with the public, revised to comply with USACE regulations and guidance, and revised to reflect changes in land management and land uses that have occurred over time or are

desired in the near future. The key to this alternative would be the revision of land classifications to USACE standards and the preparation of resource objectives that would reflect current and projected needs and be compatible with regional goals. Required changes associated with the Proposed Action would include reclassifications of land, classification of the water surface, adoption of new resource management objectives, and preparation of a resource plan describing how each land classification would be managed for the foreseeable future (see Appendix A of the 2017 Master Plan). The Proposed Action would result in the following land and water surface reclassifications (Tables 2-1 and 2-2) covering all Federal lands at Sam Rayburn Dam and Reservoir:

Table 2-1. Management Classification Proposals

1970 Land Classifications	Acres	Proposed New Land Classifications	Acres
Project Operations	1,000	Project Operations	370
Recreation – Intensive Use	3,861	HDR	1,598
		ESA	1,809
Recreation – Low Density Use	8,862	MRML – LDR	2,249
Wildlife and Natural Use	8,379[1]	MRML – WM	896
		MRML – VM	10,296
		MRML – Future/Inactive Recreation Areas	718

[1]Acres included water surface acres.
Note: Acreages vary depending on changes in lake levels, sedimentation, and shoreline erosion.

Table 2-2. Water Surface Classification Proposals

Classifications	Acres
Water Surface: Restricted	40
Water Surface: Designated No-wake[1]	190
Water Surface: Open Recreation	112,360

[1] No-wake areas located at boat ramps and marinas
Note: Acreages vary depending on changes in lake levels, sedimentation, and shoreline erosion.

The Proposed Action would meet regional goals associated with good stewardship of land and water resources, would meet regional recreation goals, would address identified recreational trends, and would allow for continued use and development of project lands without violating national policies or public laws. Therefore, this alternative is the Preferred Alternative and will carry forward as the Proposed Action. Components of the Proposed Action reclassifications are presented in Table 2.3.

1 **Table 2-3. Reclassification Proposals**

Land Classification	Proposed Action Description	Justification
Project Operations	The decrease of Project Operations from 1,000 acres to 370 acres resulted from the reclassification of 630 acres of prior Project Operations lands to Multiple Resource Managed Lands (MRML) – Vegetative Management (VM), Environmentally Sensitive Areas (ESA), and High Density Recreation (HDR).	All lands classified as Project Operations are managed and used primarily in support of critical operational requirements related to the primary missions of flood risk management, hydropower, and water conservation. The 370 acres that are now classified as Project Operations are sufficient for current and future operational requirements. The classification of 370 acres of Project Operations lands will have no effect on current or projected public use.
High Density Recreation	Approximately 3,861 acres were classified under the prior classification of Recreation – High Intensive Use and included public use areas, commercial concession areas, and private recreation lease areas. Approximately 2,263 of these acres were reclassified leaving 1,598 acres under the new, but similar classification of HDR. The reclassification of the 2,263 acres was accomplished as follows: • Prior Recreation – High Intensive Use areas, including the former Needmore, Massey-Good, and McElroy Parks, were reclassified to MRML – VM or MRML – WM. • Undeveloped portions of several actively managed HDR areas were reclassified as Future/Inactive Recreation Areas, including Tiger Creek Park and portions of Jackson Hill and Powell Parks.	In general terms, the amount of land classified for Recreation – Intensive Use in the 1970 Master Plan was excessive and was based on projected needs at the time the plan was written. Management experience since 1970 has clearly revealed that numerous reclassifications were needed to reflect actual use, evolving trends, and regional priorities. The reclassification of former Recreation – High Intensive Use areas and portions of actively managed HDR areas will not affect current or projected public use.
Environmentally Sensitive Areas	The classification of 1,809 acres as ESA resulted from the reclassification of several parcels of land under the prior classification of Recreation – Low Intensity.	Reclassification of the 1,809 acres was determined by the USACE study team to be necessary to provide a high level of protection for those areas supporting bottomland hardwood forests, longleaf pine savannah, and areas with steep, aesthetic bluffs and ravines. Habitat studies conducted as part of the Master Plan revision support the classification of these lands as ESA. The ESA also provide good to excellent habitat for endangered species and numerous Species of

Table 2-3, continued

Land Classification	Proposed Action Description	Justification
Environmentally Sensitive Areas, continued		Conservation Concern. Protection of cultural resources also justifies the classification of some areas as ESA. Classifying acres as ESA will afford these areas the highest level of protection from disturbance. The reclassification of 1,809 acres to ESA will have no effect on current or projected public use.
Multiple Resource Managed Lands (MRML) – Low Density Recreation	The definition of the prior classification of Low Density Use is comparable to the definition of the current classification of MRML – Low Density Recreation (LDR). Land classification changes resulted in a net reduction of these acres from 8,862 acres to the current 2,249 acres. This reduction resulted from reclassification to MRML – VM, MRML – WM, and ESA.	The net reduction in MRML – LDR lands was necessary was necessary to recognize the high ecological value of those areas reclassified to VM, WM, and ESA. The largest portion of the reduction was a reclassification of lands to MRML- VM to recognize that this large area of land has been historically managed to insure healthy, productive forests and aesthetically pleasing shorelines rather than for recreational purposes. Those lands remaining as MRML – LDR are located primarily in shoreline areas where vegetation modification (mowing) permits occur in accordance with the Shoreline Policy. Current LDR lands are also located adjacent to dense residential development. These changes support management actions and recreational trends identified in the Statewide Comprehensive Outdoor Recreation Plan (TORP). Public use of all areas that were reclassified will not be affected now or in the foreseeable future. Public access in the form of natural surface hiking and biking is compatible with these classifications.

Table 2-3, continued

Land Classification	Proposed Action Description	Justification
MRML – Wildlife Management	Approximately 8,379 acres of primarily water surface under the prior classification of Wildlife Management was reclassified as Open Recreation Water Surface. In addition, the former Needmore Park area and approximately 50 percent of Rayburn Park were reclassified as MRML – WM. These reclassifications resulted in 896 acres remaining under the MRML – WM classification.	As set forth in the Master Plan revision, there is no justification for any water surface areas to be classified as Fish & Wildlife Sanctuary. The water surface areas in question have never been specifically managed for wildlife and neither TPWD nor USFWS have published special waterfowl restrictions for the areas. The former undeveloped park areas that are now classified as MRML-WM have historically been managed for wildlife purposes. These reclassifications will have no effect on current or projected public use.
MRML – Vegetation Management	The classification of 10,296 acres to MRML – VM resulted from: • Reclassification of 630 acres from Project Operations • Reclassification of approximately 10,666 acres of prior Recreation - Low Intensity and Recreation – Intensive Use lands. The majority of the reclassified acreage was under the prior classification of Recreation - Low Intensity.	All parcels that were reclassified to MRML – VM were reclassified to recognize the long-term historic management of these lands to provide healthy and productive forests in accordance with directives specified in Public Law 86-717, the Forest Cover Act and to maintain an aesthetically pleasing, fully forested shoreline. This reclassification will have no effect on current or projected public use.
Future/Inactive Recreation Areas	The classification of 718 acres to Future/Inactive Recreation Areas resulted from the following changes: • 718 acres of former Recreation – Intensive Use was reclassified to Future/Inactive Recreation Area, including Tiger Creek Park and portions of Powell Park.	The parcels classified as Future/Inactive Recreation are undeveloped. Until there is a need to develop these lands, they will be managed as MRML lands. These reclassifications will have no effect on current or projected public use.

Note: The land classification changes described in this table are the result of changes to more than 60 individual parcels of land ranging from a few acres to several hundred acres. Acreages were measured using Geographic Information System (GIS) technology. The acreage numbers provided are approximate.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

Other alternatives to the Proposed Action were initially considered as part of the scoping process for this EA. However, none met the purpose of and need for the Proposed Action or the USACE regulations and guidance. Furthermore, no other alternatives addressed public concerns. As such, no other alternatives are being carried forward for analysis in this EA.

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SECTION 3: AFFECTED ENVIRONMENT AND CONSEQUENCES

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

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

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

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

3.1 LAND USE

Sam Rayburn Dam and Reservoir was originally constructed for the primary purposes of flood damage risk reduction, generation of hydroelectric power, and conservation of water for municipal, industrial, and agricultural uses. A major secondary use of project lands and waters is public water oriented recreation. When the pool elevation is at the normal or conservation pool elevation of 164.4 feet NGVD, the lake has a surface area of 112,590 acres. At flood control pool, the surface water area expands to 142,700 acres.

The USACE lands presently associated with Sam Rayburn Dam and Reservoir are listed in the 1970 Master Plan as follows:

- 1,000 acres of land classified as Project Operations
- 3,861 acres of land classified as Recreation – Intensive Use
- 8,862 acres of land classified as Recreation – Low Intensity
- 8,379 acres of primarily water surface classified as Wildlife Management

A total of 20 parcels are designated in the 1970 Master Plan as High Density Use Recreation areas at Sam Rayburn Dam and Reservoir. These areas include: Overlook Park, Ebenezer Park, Cassels-Boykins Park, Monterey Park, Hanks Creek Park, Marion Ferry Park, Ewing Park, Etoile Park, Shirley Creek Park, Ralph McAlister Park, Jackson Hill Park, Rayburn Park, Powell Park, San Augustine Park, Needmore Park, Massey-Good Park, McElroy Park, Mill Creek Park, Tiger Creek Park, and Twin Dikes Park. Four of these 20 parcels, (Needmore, Massey-Good, McElroy, and Tiger Creek Parks) are listed as undeveloped parks available for future development. There are five additional parks owned by USFS, located adjacent to the reservoir, but outside of USACE owned lands.

Four marinas also operate on the lake under a concession lease with the USACE. The majority of the USACE park operations and maintenance activities, including mowing, cleaning, building repairs, road repairs, utility repairs, trash removal, and related tasks, are accomplished through service contracts.

In general, a major portion of Sam Rayburn Dam and Reservoir is surrounded by the Angelina National Forest and a small section of the Sabine National Forest. Both forests are managed by the USFS, which issued a use permit to the USACE for approximately 33,000 acres for the development of Sam Rayburn Reservoir. The lands under USACE administration are generally forested with pine and mixed hardwoods.

3.1.1 Alternative 1: No Action Alternative

The No Action Alternative for Sam Rayburn Dam and Reservoir is defined as the USACE taking no action, which means the Master Plan would not be revised and no new resources analysis or land use classifications would occur. The operation and management of Sam Rayburn Dam and Reservoir and USACE lands would continue as outlined in the existing Master Plan. Although this alternative does not result in a

Master Plan that meets current regulations and guidance, there would be no significant impacts on land uses on project lands.

3.1.2 Alternative 2: Proposed Action

The objectives for revising the 2017 Master Plan were to capture current land use, management, and the USACE policies that have evolved to meet day-to-day operational needs. The reclassification changes and new resource objectives required for the Proposed Action were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued use and development of project lands. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on land use. For example, much of the land currently classified as Recreation Low Intensity was reclassified resulting in 10,296 acres classified as MRML – VM compared to the No Action, and an additional 1,809 acres reclassified as ESA compared to the No Action (see Table 2-3). Additionally, 896 acres of MRML – WM classification is proposed and Recreation – Intensive Use areas were reduced from 3,861 acres to 1,598 acres of the new, but similar High Density Recreation classification. These reclassifications would recognize long-standing and ongoing public use and management and afford protection to and potentially benefit wildlife, wildlife habitats, sensitive species habitat, cultural resources, and ecologically sensitive areas. The new resources objectives would provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

3.2 WATER RESOURCES

Surface Water

The Sam Rayburn Reservoir watershed drains approximately 1,385 square miles and spans10 counties (Angelina, Cherokee, Jasper, Nacogdoches, Newton, Sabine, San Augustine, Shelby, and Smith), encompassing the towns of Henderson, Jacksonville, Lufkin, Nacogdoches, and Tyler, Texas. At conservation pool, the reservoir contains 112,590 surface acres of water. At flood control pool, the surface water area expands to 142,700 acres. Depths range from 12 feet to 90 feet deep. The City of Lufkin has contracted for water in Sam Rayburn Reservoir, but no withdrawal facilities have been built.

The drainage area upstream of Sam Rayburn Reservoir is 3,449 square miles. The total drainage area of the Angelina River is 3,556 square miles, and it is the principal tributary of the Neches River. Portions of the Angelina watershed lie within the following nine counties; Angelina, Cherokee, Jasper, Nacogdoches, Rusk, Sabine, San Augustine, Shelby, and Smith. The Angelina River is formed by the junction of the Shawnee and Barnhart Creeks in southwestern Rusk County near Henderson, Texas. The river flows in a general southeasterly direction to its confluence with the Neches River. The river system's average streambed slopes vary widely. Shawnee Creek's average streambed slope is a steep 10.3 feet per mile, while it drops off to less dramatic slopes of 3.3 feet per mile between the Shawne and Barnhart Junction and Mud Creek.

This is compared to the almost level slopes of 1.1 foot per mile from there to the head of Sam Rayburn Reservoir and to the less than 0.5 foot per mile in the pine flats below the reservoir.

The Angelina River has four main tributaries above the Sam Rayburn Dam. Stricker Creek, a left bank tributary, enters at mile 178.0 and has a length of 33 miles. Mud Creek enters at mile 168.2 and has a length of 67 miles. Attoyac Bayou enters at mile 53.7 and has a length of 119 miles. Ayish Bayou enters just above the dam at mile 25.7 and has a length of 70 miles.

Ground Water

The water table in the area surrounding the reservoir generally follows the configuration of the local topography. The reservoir has raised the water table in a narrow belt around their margin, but most of this water can be considered as temporary bank storage in as much as it returns to the reservoir when the pool level drops. As classified by the Texas Water Development Board, there are four aquifers in the subject area: the Catahoula formation, a primary aquifer; the Sparta formation, a secondary aquifer; and two minor aquifers, the Yegua formation and the Jackson group. The Sparta formation is the most northerly outcropping aquifer in the area. Because the Sparta has contact with Sam Rayburn water at maximum pool level only, it receives very little recharge from the reservoir.

Continuing in a downstream direction, the next outcropping formation is the Yegua, a minor aquifer. Though the Yegua aquifer supplies water for several small towns, its lithologic characteristics still render it a minor aquifer. Recharge from reservoir water appears to be insignificant. The outcrops of the Jackson group adjoin the Yegua outcrop belt. The Jackson aquifer like the Yegua, is considered a minor aquifer but generally yields less water than the Yegua. Only minor recharge from the reservoir appears to be taking place. The outcrop of the Catahoula formation, the primary aquifer of the area, is exposed to reservoir water at the Sam Rayburn Dam. Only about half of the width of the belt is in contact with the reservoir. The Catahoula is the basal member of the Gulf Coast Aquifer, which consists of a sequence of several sedimentary formations. Some reservoir water probably recharges the Catahoula, but the quantity would be small because of the limited area of contact, cementation of the sands, and the lens-like nature of its members.

The Permanent Salt Water Barrier, located near Beaumont, Texas, on the Neches River, is operated and maintained by the Lower Neches Valley Authority. The main purpose of the Salt Water Barrier is to prevent salt water from intruding in the Neches River upstream of the City of Beaumont during low flow periods.

Water Quality

Existing water quality at Sam Rayburn Reservoir is affected by municipal discharge, rainfall, and associated storm water flows originating from natural, agricultural, residential, and commercial runoff, as well as industrial point and nonpoint

sources. Texas Commission on Environmental Quality (TCEQ) sets and implements standards for surface water quality to improve and maintain the quality of water in the state based on various beneficial use categories for the water body. The Texas Integrated Report of Surface Water Quality, pursuant to the Clean Water Act Sections 305(b) and 303(d), evaluates the quality of surface waters in Texas and identifies those that do not meet uses and criteria defined in the Texas Surface Water Quality Standards (TSWQS). The Texas Integrated Report describes the status of Texas' natural waters based on historical data, and assigns waterways to various categories depending on the extent to which they attain the TSWQS. Furthermore, the U.S. Environmental Protection Agency (USEPA) must approve the 303(d) list before it can be finalized.

Water bodies are divided into and evaluated by defined, classified segments. Sam Rayburn Reservoir is divided into two classified segments: Sam Rayburn Reservoir (Segment ID: 0610) and Angelina River/Sam Rayburn Reservoir (Segment ID: 0615). According to the 2012 Texas Integrated Report Index of Water Quality Impairments, mercury in edible tissue was identified as the only pollutant parameter not meeting assigned water quality standards in the Sam Rayburn Reservoir segment. In the Angelina River/Sam Rayburn Reservoir segment, depressed dissolved oxygen, impaired fish community, and mercury in edible tissue were identified as parameters not meeting water quality standards.

The Sam Rayburn Reservoir segment is physically described as from the Sam Rayburn Dam in Jasper County to 3.5 miles upstream of Marion's Ferry on the Angelina River and 2.5 miles downstream of Curry Creek in the Attoyac Bayou. The reservoir is further divided into 10 assessment units: Sam Rayburn main pool by the dam to the Bear Creek and Ayish Arms (0610_01), Sam Rayburn lower Angelina River arm (0610_02), Sam Rayburn mid-Angelina River arm area near State Highway 147 (0610_03), Sam Rayburn upper mid-Angelina River arm (0610_04), Sam Rayburn lower Attoyac Bayou arm (0610_05), Sam Rayburn upper Attoyac Bayou arm (0610_06), Sam Rayburn upper Angelina arm (0610_07), Sam Rayburn Bear Creek arm (0610_08), Sam Rayburn lower Ayish Bayou arm (0610_09), and the Sam Rayburn upper Ayish Bayou arm (0610_10).

All Sam Rayburn Reservoir assessment units listed above have identified mercury in edible tissue as a parameter not meeting water quality standards. Additionally, they are all listed in the 2012 Texas Integrated Report—Texas 303(d) List, dating back to the year 1996. Only segments/assessment units identified as requiring restrictions on effluent discharges in order to implement water quality standards based on total maximum daily loads (TMDLs) of identified pollutants are listed in the 303(d) document. Currently, all assessment units for this segment are awaiting further data collection/evaluation before a management strategy is selected for addressing the mercury in edible tissues.

The Angelina River/Sam Rayburn Reservoir (segment 0615) does not meet water quality standards for dissolved oxygen, impaired fish community, and mercury in

edible tissue. It was determined that additional information will be collected/evaluated before a management strategy is selected to address the mercury in edible tissue and impaired fish community parameters. A review of the standards for depressed dissolved oxygen will be conducted prior to strategy selection for that particular parameter. This segment is also currently found on the 303(d) list, first listed in 2002.

The 2012 Texas Integrated Report Water Bodies with Concerns for Use Attainment and Screening Levels identifies segments near the study area as having some level of concern for various parameters. Assessment of each beneficial use is accomplished by applying several assessment methods. These methods often have several criteria or screening levels that are used to evaluate assessment parameters. Use attainment assessment methods are used to determine use support and concerns for near-nonattainment. Water quality concerns are determined based on a defined amount exceeding the screening levels and potential lack of information in data sets used to evaluate various parameters.

Due to the presence of pollutants, specifically mercury and dioxins, the Texas Department of State Health Services (TDSHS) issued a fish and shellfish consumption advisory on 24 January 2014 for the Neches River Basin (including B.A. Steinhagen and Sam Rayburn Reservoirs). Consumption advisories do not apply to all species, rather only blue catfish (*Ictalurus furcatus*) (>30 inches), flathead catfish (*Pylodictis olivaris*), gar (*Atractosteus* sp. and *Lepisosteus* sp.), largemouth bass (*Micropterus salmoides*) (>16 inches), smallmouth buffalo (*Ictiobus bubalus*), and spotted bass (*Micropterus punctulatus*) (>16 inches). Mercury and other pollutants enter the food web via ingestion/absorption by plants, aquatic invertebrates, and other small organisms that make up the prey base. As larger organisms prey on smaller organisms, bioaccumulation occurs such that the larger predators exhibit higher concentrations of pollutants, as reflected in the consumption advisory's size class specifications. Additionally, the advisory warns that women of childbearing age and children under the age of 12 should not eat the fish listed above as mercury is particularly dangerous to developing nervous systems.

3.2.1 Alternative 1: No Action Alternative

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

3.2.2 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of water resources. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on water quality. For example, 10,296 acres would be classified as MRML – VM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Additionally, 896 acres of MRML – WM classification is proposed under the Proposed Action. Vegetation would act as a buffer to trap runoff,

thus potentially reducing sedimentation. The new resources objectives would provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

3.3 CLIMATE

The climate of the Angelina watershed is considered to be generally mild, with the annual normal temperature being about 66 degrees Fahrenheit throughout the watershed. However, sharp extremes are occasionally recorded, as short duration freezes and snowfall occur occasionally throughout the winter. The summers are hot and fairly humid. Southerly winds prevail during the spring, summer, and fall months.

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

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

3.3.1 Alternative 1: No Action Alternative

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

3.3.2 Alternative 2: Proposed Action

Revision of the Sam Rayburn Dam and Reservoir Master Plan would have no impact on the climate of the Project area.

3.4 CLIMATE CHANGE AND GREENHOUSE GASES

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

warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHG (CEQ 2014).

According to the most recent estimating tools from the USEPA, there are currently no reportable GHG contributors within Angelina, Jasper, Nacogdoches, San Augustine, or Sabine counties (USEPA 2016). The general operations and recreation facilities associated with Sam Rayburn Dam and Reservoir do not approach the proposed reportable limits. The USACE does have management plans in place such as routine equipment maintenance, holistic vegetative management plans, natural resource management plans, and public education and outreach programs to protect regional natural resources. In addition, the USACE will continue monitoring programs as required to meet applicable laws and policies.

As mentioned previously, the USACE manages project lands and recreational programs to advance broad national climate change mitigation goals, including but not limited to climate change resilience and carbon sequestration, as set forth in EO 13653, EO 13693, and related USACE policy.

3.4.1 Alternative 1: No Action Alternative

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

3.4.2 Alternative 2: Proposed Action

Under the Proposed Action, current Sam Rayburn Dam and Reservoir project management plans and monitoring programs would not be changed. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on GHG issues. For example, 10,296 acres would be classified as MRML – VM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Additionally, 896 acres of MRML – WM classification is proposed under the Proposed Action. The reclassification of lands to ESA, MRML-WM, and VM from MRML-LDR and HDR would allow current passive recreational uses to continue on the lands in question with no net increase in emissions. The overall reduction in HDR acreage from 3,861 acres to 1,598 acres may, over the life of the Master Plan, have the potential to reduce the amount of acreage that is developed for HDR activities thus reducing the potential for increased emissions from recreational vehicles and boat motors. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative. In the event that GHG issues become significant enough to impact the current operations at Sam Rayburn Dam and Reservoir, the 2017 Master Plan and all associated documents would be reviewed and revised as necessary.

3.5 AIR QUALITY

National Ambient Air Quality Standards (NAAQS) have been established by the USEPA, Office of Air Quality Planning and Standards (OAQPS), for six criteria pollutants that are deemed to potentially impact human health and the environment. These include 1) carbon monoxide (CO); 2) lead (Pb); 3) nitrogen dioxide (NO_2); 4) ozone (O_3); 5) particulate matter <10 microns (PM-10); and 6) sulfur dioxide (SO_2). Ground level or "bad" ozone is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC (USEPA 2011). Currently, none of the counties in which Sam Rayburn Dam and Reservoir are located are listed as nonattainment areas (USEPA 2016b).

In conducting routine operations and maintenance activities at Sam Rayburn Dam and Reservoir, the USACE will comply with all Federal, state, and local laws governing air quality and will implement best management practices to protect air quality. Prescribed fire is a useful land management tool for improving native prairie and certain forested areas and will be conducted in accordance with the Texas Administrative Code, Section 111.211(1). Statutory requirements governing prescribed fire and other types of outdoor burning are explained in the TCEQ publication “Outdoor Burning in Texas” available on the TCEQ website. USACE guidance for wildland fire management is set forth in EP 1130-2-540.

3.5.1 Alternative 1: No Action Alternative

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

3.5.2 Alternative 2: Proposed Action

Existing operation and management of at Sam Rayburn Dam and Reservoir is compliant with the Clean Air Act and would not change with implementation of the 2017 Master Plan. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on air quality. For example, 10,296 acres would be classified as MRML – VM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Additionally, 896 acres of MRML – WM classification is proposed under the Proposed Action. The reclassification of lands to ESA, MRML-WM, and VM from MRML-LDR and HDR would allow current passive recreational uses to continue on the lands in question with no net increase in emissions. The overall reduction in HDR acreage from 3,861 acres to 1,598 acres may, over the life of the Master Plan, have the potential to reduce the amount of acreage that is developed for HDR activities, thus reducing the potential for emissions from recreational vehicles and boat motors that could occur under the No Action Alternative. The Proposed Action could also reduce fugitive dust emissions as a result of potentially limiting development.

The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action Alternative.

3.6 TOPOGRAPHY, GEOLOGY, AND SOILS

Topography

USACE land associated with Sam Rayburn Dam and Reservoir varies from hilly and rolling to broad slopes and flat terrain. In general, upland areas are moderately to sharply dissected, while lowlands are relatively flat. There are a number of tributary streams with valleys that have formed major embankments and numerous coves that are of value to the scenic interest of visitors to the reservoir.

The land in the Sam Rayburn Reservoir area is characterized by a low, flat valley with slow runoff and poor drainage. Since deliberate impoundment in March 1965, the average annual runoff into Sam Rayburn Reservoir is 2,381,900 acre-feet or 12.95 inches of runoff. The annual inflow has ranged from a minimum of 585,500 acre-feet in 1971 to a maximum of 4,605,100 acre-feet in 1991. The maximum monthly inflow was 1,201,400 acre-feet computed in March 2001. On occasion, the monthly inflow has been zero.

Geology

The Neches River Basin, in which the Sam Rayburn Reservoir lies, is wholly located within the sub-province of the Gulf Coastal Plains within the Interior Coastal Plains physiographic province. The Interior Coastal Plains comprise alternating belts of resistant un-cemented sand among weaker shales that erode into long, sandy ridges. The formations outcropping in the region consist of sedimentary deposits of marine and non-marine origin of Tertiary age. The formations dip gently southward to the Gulf of Mexico at approximately 100 feet per mile with the older formations outcropping upstream from the younger.

The upper half of the basin is underlain by Eocene formations which, due to differential in duration of the strata, tend to produce a hilly region that becomes heavily forested in the southern portion. The strata are principally marine and beach deposited sands and clays with some sandstone, shale and siltstone beds. The more weather resistant strata tend to form ridges of hills following the east-west strike of the strata with steep northern faces and gently sloping southern faces. Sam Rayburn Reservoir, except for small portions adjacent to the dam, is located in this area.

The Sam Rayburn Dam site is underlain by the Catahoula formation of Oligocene age. The Catahoula formation consists of non-marine lagunal and deltaic deposits of clay, silts, some moderately hard sandstone and siltstone, and beds of turf and volcanic ash, some of which altered to Fuller's earth. All the formations in this region are considered young on the geological time scale and contain few strata that could be

considered hard rock. Many of the sand and silt horizons are indurate. Generally, the clays are compact and shale-like in structure.

Soils

The soils reflect their parent materials in that they are predominantly sand, clay, and sandy clay. The soils of the East Texas Timber Country consist mainly of fine sands (sugar-sands) and sandy loams. The alluvial soils throughout the reservoir area occur only in narrow strips along the numerous streams. These soils consist of deep beds of materials washed from adjacent uplands. The predominant uplands soils are the Lufkin fine sandy loam and the Susquehanna group and the bottom lands are Bibb fine sandy loam, Bibb clay and Bibb clay loam. The soils have been developed mostly from beds of non-calcareous clay, sandy clay, clay shale or sand. Detailed information on all soil types surrounding Sam Rayburn Reservoir is available on websites maintained by the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture.

The terrain of the Angelina River headwaters is light colored, has loamy surfaces and deep reddish clay subsoils. As the tributaries of Sam Rayburn flow southward, the soil tends to be acidic, with sandy to loamy surfaces and deep, reddish loam or clay subsoils. Pine and hardwood forests cover most of the Angelina River watershed area, but nearly 25 percent of the watershed is considered prime farmland.

Prime Farmland

The Farmland Protection Policy Act (FPPA) of 1980 and 1985 requires Federal agencies to take into consideration any potential disturbances to soils deemed to be prime or unique farmlands. The FPPA also encourages agencies to minimalize or mitigate impacts to soils and to avoid irreversible conversion of farmland to non-agricultural uses. The NRCS identified 6,509 acres of the Government-managed land as prime farmland, as follows: San Augustine/Sabine counties 2,231 acres; Nacogdoches County, 1,245 acres; Angelina County, 2,971 acres; and Jasper County, 62 acres.

Sedimentation and Shoreline Erosion

Sedimentation

During the design of Sam Rayburn Reservoir, it was estimated the rate of sedimentation in the reservoir would be 0.083 acre-feet per square mile of drainage area per year. This would amount to approximately 288 acre-feet of sediment being deposited annually. The reservoir capacity below elevation 149.0 msl, head, 1,452,000 acre-feet, was allocated for sediment storage.

Erosion

Shoreline erosion at Sam Rayburn Reservoir is affected by several hydrologic factors such as soil type, lake level, wind or wave velocity, wind or wave directions, wind or wave duration, and ground slopes. The effects of erosion around the reservoir vary from those areas of almost no erosion to those evident in areas where erosion has

progressed to a point beyond the Government property line. Generally the soil involved is known colloquially as sugar sand, has the texture of course sugar, and behaves much as would be expected from the name. In addition to the extreme susceptibility of the soil to erosion, the problem is generally compounded by the tree growth in the area. The net effect is that tree roots, combined with other ground cover, tend to hinder surface erosion and thus wave action undercuts the shoreline rather than forming beaches as would be normally expected. Eventually the overburden which has been undercut collapses and the process begins again. Vegetation that falls into the reservoir as a result of the overburden collapse is not removed in order that it may assist in temporarily hindering wave action causing erosion.

3.6.1 Alternative 1: No Action Alternative

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions, so there would be no short- or long-term, minor, moderate or major, beneficial, or adverse impacts on topography, geology, soils, Prime Farmland, sedimentation, or shoreline erosion as a result of implementing the No Action Alternative. However, Prime Farmlands classified as MRML-LDR and MRML-HDR could potentially be adversely impacted as a result of future recreational developments.

3.6.2 Alternative 2: Proposed Action

Topography, geology, soils, Prime Farmland, sedimentation, and shoreline erosion were considered during the refining process of land reclassifications for the 2017 Master Plan. No intrusive actions are proposed, and Sam Rayburn Dam and Reservoir project resource management plans would not be changed, as the intent of the Proposed Action is to reflect current land uses and guide future management. Therefore, no significant adverse impacts on topography, geology, or soils would occur as a result of implementing revisions to the Sam Rayburn Dam and Reservoir Master Plan. Soil disturbing activities are not proposed under the Master Plan Revision, which could potentially impact Prime Farmlands. Any proposed future soil disturbing activities occurring on Prime or Unique Farmlands would be coordinated with the NRCS.

Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on Prime Farmlands. For example, 10,296 acres would be classified as MRML – VM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Additionally, 896 acres of MRML – WM classification is proposed under the Proposed Action. The overall reduction in HDR acreage from 3,861 acres to 1,598 acres will limit future intensive development, thus reducing the potential impacts on Prime Farmland. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

3.7 NATURAL RESOURCES

Natural resources include the vegetation, wetland, wildlife, fisheries, and aquatic resources in the vicinity of Sam Rayburn Dam and Reservoir. In addition, the Angelina

National Forest and other state resources are present within Sam Rayburn Dam and Reservoir project lands.

Vegetation

USACE regulations and policy require a basic inventory of the vegetation at all operational projects. This inventory, referred to in Engineering Pamphlet (EP) 1130-2-540 as a Level 1 inventory, classifies the vegetation in accordance with the National Vegetation Classification System (NVCS) down to the Sub-Class level, which is a very broad classification level. The inventory data, presented in Table 3-1, is recorded in the USACE national database referred to as the Operations and Maintenance Business Information Link (OMBIL) and is useful in providing a general characterization of the vegetation on all operational projects. Daily management of USACE lands requires more detailed knowledge of the vegetation down to the Association level within the NVCS, and for most management prescriptions, down to the individual species level of dominant vegetation.

Table 3-1. Vegetation Classification Records

Order	Class	Sub-Class	Acreage
Non-Vegetated (includes open water surface of the lake)	Non-Vegetated	Non-Vegetated	93,891
Herb Dominated	Herbaceous Vegetation	Annual graminoid or forb vegetation	4
Herb Dominated	Herbaceous Vegetation	Hydromorphic rooted vegetation	643
Herb Dominated	Herbaceous Vegetation	Perennial graminoid vegetation (grasslands)	520
Shrub Dominated	Shrubland (Scrub)	Deciduous shrubland (scrub)	2,032
Tree Dominated	Closed Tree Canopy	Deciduous closed tree canopy	5,939
Tree Dominated	Closed Tree Canopy	Evergreen forest	6,005
Tree Dominated	Closed Tree Canopy	Mixed evergreen-deciduous closed tree canopy	772
Tree Dominated	Open Tree Canopy	Mixed evergreen-deciduous open tree canopy	5,000

Using habitat types and descriptions from the Texas Conservation Action Plan (TCAP) and USEPA ecoregion descriptions, the following are the major habitat types found on USACE lands at Sam Rayburn Dam and Reservoir. Species listed are representative of dominant species found in each habitat type but should not be considered a comprehensive listing.

Pine Forest

Generally on drier sites, this is a dominant habitat type that is represented in Table 3-1 sub-class as “Evergreen forest”. Pine forests are generally closed tree canopy forests dominated by loblolly pine (*Pinus taeda*), shortleaf pine (*Pinus echinata*),

or a mixture of these two species. Most of the pine forest on USACE land is naturally occurring but there are a few remnant pine plantations that were established prior to Federal ownership. Where these remnant plantations exist, slash pine (*Pinue elliottii*) may be present. These forests will generally have a minor component of deciduous trees including sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), post oak (*Quercus stellata*), white oak (*Quercus alba*), southern red oak (*Quercus falcata*), mockernut hickory (*Carya tomentosa*), shagbark hickory (*Carya ovata*), American elm (*Ulmus americana*), winged elm (*Ulmus alata*) and eastern red cedar (*Juniperus virginiana*).

Pine-Oak Forest

Typically occurring on more mesic sites, this habitat type is approximately equal in abundance on USACE lands to the pine forests described above. The pine-oak forest is represented in Table 3-1 as "mixed evergreen-deciduous" forest. Dominant and co-dominant tree species include loblolly and shortleaf pine, white oak, southern red oak, cherrybark oak (*Quercus pagoda*), Shumard oak (*Quercus shumardii*), hickories, black walnut (*Juglans nigra*), sweetgum, magnolia (*Magnolia* sp.), and blackgum.

Longleaf Pine Savannah

Typically on dry, sandy upland sites, this is a minor habitat type on USACE land and exists primarily in the vicinity of Ebenezer Park and a few other isolated locations. The dominant vegetation is a longleaf pine (*Pinus palustris*)-little bluestem (*Shizachyrium scoparium*) mix.

Bottomland Hardwoods

Located along flat riverine corridors, primarily in the Attoyac River and Ayish Bayou Arms of Sam Rayburn Reservoir, this habitat type is approximately equal in abundance to the pine forest and pine-hardwood forests and is represented in Table 3-1 as "deciduous closed tree canopy". Dominant and co-dominant species include water oak (*Quercus nigra*), willow oak (*Quercus phellos*), overcup oak (*Quercus lyrata*), nuttall oak (*Quercus nutalli*), swamp chestnut oak (*Quercus michauxii*), red maple (*Acer rubrum*), water tupelo (*Nyssa aquatic*), river birch (*Betula nigra*), and green ash (*Fraxinus pennsylvanica*).

Forested Wetland

Located along flat shoreline areas of the reservoir, this habitat type is included in the "deciduous shrubland" sub-class listed in Table 3-1. This habitat type is dominated by buttonbush (*Cephalanthus occidentalis*) flats with occasional stands of baldcypress (*Taxodium distichum*).

Perennial Grassland

This minor habitat type is located primarily on the downstream slope of Sam Rayburn Dam and in isolated pockets in developed park areas. Grass species in these areas is dominated by exotic Bermuda grass (*Cynodon dactylon*) with a minor component of native grasses.

Emergent Wetlands

This habitat type consists of rooted aquatic plants in shallow areas of the reservoir that are generally protected from exposure to strong wind and wave action. The dominant native species include American lotus (*Nelumbo lutea*) and soft-stem bulrush (*Schoenoplectus tabernaemontani*). Introduced species include cattail (*Typha* sp.).

Rare Plants and Plant Communities

The TCAP for the Western Gulf Coastal Plain ecoregion lists rare plants and plant communities known to exist in the region surrounding Sam Rayburn Reservoir. Species of Greatest Conservation Need and rare plant communities in the region immediately surrounding Sam Rayburn Reservoir are provided in Appendix E of the 2017 Master Plan.

Periodically Flooded Shorelines

Routine flood risk management operations result in many miles of shoreline being frequently flooded up to approximately elevation 170 NGVD. This frequent inundation generally does not persist for long periods of time that would cause significant tree mortality. However, major flood events that reach approximately elevation 175-176 NGVD will result in those areas lying below elevation 168 NGVD being inundated for periods of approximately 60 days or longer. This period of time is of sufficient duration to result in the death of most trees growing at or below the 168 elevation. Flood events of this magnitude occurred in the early 1990s and in 2015. When shoreline trees die from flooding, some are salvaged as timber where practical. After stored flood water has been released from the reservoir, the shorelines where trees were lost will begin to revegetate naturally with tree species that are adapted to the upland soil types that exist along most shorelines.

The dominant trees that naturally reseed and begin to grow on these shorelines are typically light-seeded species such as shortleaf and loblolly pine, sweetgums, and elms. Some willow (*Salix* sp.) and cottonwood (*Populus* sp.) will colonize some sites. With few exceptions the trees that naturally colonize these shoreline areas are not tolerant to flooding. This cycle of flooding, followed by natural regeneration can leave shoreline areas somewhat barren, a condition that is not visually appealing and does not provide high quality wildlife habitat.

In an effort to reduce the negative effects of this cycle, USACE planted trees with greater flood tolerance on approximately 2,000 acres of narrow shoreline areas after the early 1990s flood events. The planted trees included Nuttall oak, willow oak, water oak, overcup oak, green ash, bald cypress and others that are typically adapted to frequently flooded bottomland sites. These plantings were reasonably successful considering that the soil types where these trees were planted are typically upland soils that do not naturally support flood tolerant tree species. USACE will continue to evaluate reforestation efforts that provide the greatest benefit along shorelines that are periodically inundated for long periods of time.

Habitat Evaluation Study

As part of the 2017 Master Plan, the USACE completed a comprehensive habitat evaluation to describe the quality of the major habitat types on USACE administered public lands. At 66 sample points located across all habitat types around the perimeter of the entire reservoir, data was collected using the TPWD's Wildlife Habitat Appraisal Procedure (WHAP). All plant species were identified in order to prepare a Floristic Quality Assessment (FQA). A summary of the study results can be found in Section 2.2.1.3 and Appendix D of the 2017 Master Plan.

Wetlands

Wetlands and other waters of the U.S. are regulated under Section 404 of the Clean Water Act, as amended, and EO 11990, Protection of Wetlands. According to USACE regulations, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Table 3-2 presents the acreages of various types of wetlands present at Sam Rayburn Reservoir. Data was retrieved from the FY2015 Wetland Class records reported in OMBIL.

Table 3-2. Wetland Classes

System	Sub-System	Class	Acres
Lacustrine	Limnetic	Open Water/Unknown Bottom	4,669
Lacustrine	Littoral	Emergent Wetland	8,606
Palustrine	No Sub-System	Forested Wetland	2,941
Riverine	Lower Perennial	Open Water/Unknown Bottom	115
Riverine	Littoral	Open Water/Unknown Bottom	73

Fisheries and Wildlife Resources

Fisheries and Aquatic Resources

Sam Rayburn Reservoir is a sport fishery destination with numerous public boat ramps, marinas, and bait and tackle shops. The number one species of interest at the reservoir is largemouth bass. Sam Rayburn Reservoir currently boasts the ninth largest bass taken out of Texas waters at 16.8 pounds. The reservoir is featured on most professional and amateur fishing tournament series, including Bass Masters, McDonald's Big Bass Splash, and numerous local events. The Sam Rayburn Reservoir project office processes up to 300 tournament permits annually.

While Sam Rayburn Reservoir is operated by USACE, the TPWD remains the primary agency in charge of managing the fisheries resources. Since 2010, TPWD has stocked over 4.5 million fingerling and fry Florida largemouth bass (*Micropterus salmoides*) in Sam Rayburn Reservoir.

Most freshwater fish species found in Texas can also be found at Sam Rayburn Reservoir. Fish species present include gizzard shad (*Dorosoma cepedianum*), threadfin shad (*Dorosoma pentenense*), bluegill (*Lepomis macrochirus*), blue catfish, channel catfish (*Ictalurus punctatus*), flathead catfish, white bass (*Morone chrysops*), yellow bass (*Morone mississippiensis*), spotted bass, largemouth bass, striped bass (*Morone saxatilis*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), yellow bullhead (*Ameiurus natalis*), black bullhead (*Ameiurus melas*), redbreast sunfish (*Lepomis auritus*), warmouth (*Lepomis gulosus*), longear sunfish (*Lepomis megalotis*), redear sunfish (*Lepomis microlophus*), redspotted sunfish (*Lepomis miniatus*), freshwater drum (*Aplodinotus grunniens*), bowfin (*Amia calva*), bigmouth buffalo, smallmouth buffalo (*Ictiobus bubalus*), alligator gar (*Atractosteus spatula*), longnose gar (*Lepisosteus osseus*), and redfin pickerel (*Esox americanus*).

TPWD began providing fish population and creel survey reports biannually at Sam Rayburn Reservoir in 2004. In 2012 and 2013, TPWD surveyed fish populations at Sam Rayburn Reservoir using a combination of electrofishing and gill net sampling. Several prey species, catfishes, temperate basses, black basses, and crappie were detected and analyzed for the 2012 report.

The survey revealed that gizzard shad, threadfin shad, and bluegill were the most abundant prey species and provided a sufficient prey base as sport fish weights were within favorable ranges. The 2012-2013 surveys indicate anglers did not target sunfish. Anglers targeting catfish were responsible for 9 to 12 percent of all fishing over the last three survey years. Blue and channel catfish relative abundance was stable compared to previous years, and an estimated 35,844 catfish, mostly channel catfish, were harvested during the 2012-2013 survey period.

Temperate bass populations continued their recent trend upwards since 2009. Gill net hauls of white bass show increased numbers compared to historical lows. Yellow bass abundance has increased as well. However, since 2008 no fishing effort has been directed at temperate bass.

Spotted bass were present, albeit in low abundance compared to Florida largemouth bass. Estimated angler harvest of spotted bass was 3,507 in 2012-2013.

Regarding all the fishing efforts conducted at Sam Rayburn Reservoir, nearly 79 percent of the annual fishing effort was directed towards black bass. Largemouth bass have continued to increase in abundance over the past three survey years. Size classes and fish condition were noted as favorable as well. Angler catch rates have remained high and steady as well (range = 1.1-1.3 fish per hour).

Recreational Fishery

The Sam Rayburn Reservoir supports a recreational fishery resource consistently recognized as one of the top producing black bass (*Micropterus* spp.) fishing lakes in the nation. The resource supports a major fishing industry contributing

an estimated $47 million in economic value to the local region. The reservoir hosts hundreds of tournaments each year, from amateur to top professional series tournaments; including the largest known amateur tournament. Tournament activity is permitted through event permits by the USACE and hosted at the various marinas, parks and recreation facilities surrounding the lake. Managed by the TPWD, the fishery includes warm water fish species common to the region and has supported the popular recreational and tournament fishing pressure for over five decades. The reservoir remains one of the most popular and recognized fishery resources drawing recreational fishermen and tournament participants to fish the largest lake in Texas from across the country and around the world.

Terrestrial Wildlife Resources

Game wildlife species prevalent at Sam Rayburn include white-tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), swamp rabbit (*Sylvilagus aquaticus*), and cottontail rabbit (*Sylvilagus* sp.). Fur bearers include otter (*Lutrinae* sp.), mink (*Neovison vison*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), Virginia opossum (*Didelphis virginiana*), nutria (*Myocastor coypus*), North American beaver (*Castor canadensis)*, and eastern skunk (*Mephitidae* sp.).

Upland game birds include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), wild turkey (*Meleagris gallopavo)*, and American wood cock (*Scolopax minor*). Numerous species of game ducks and geese also frequent the habitat at Sam Rayburn. Among these are mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), American widgeon (*Anas Americana*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), scaup (*Aythya* sp.), redhead (*Aythya Americana*), canvas back (*Aythya valisineria*), ring-necked duck (*Aythya collaris*), Canada geese (*Branta Canadensis*), and snow geese (*Chen caerulescens*).

Non-game birds include warblers (*Parulidae* spp.), hawks (*Accipitridae* spp.), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), herons (Ardeidae), egrets (*Ardeidae* spp.), sandpipers (*Scolopacidae* sp.), owls (*Strigiformes* spp.), sparrows (*Passeridae* spp.), finches (*Fringillidae* spp.), flycatchers (*Tyrannidae* spp.), vultures (*Cathartidae* spp.), crows (*Corvus* spp.), woodpeckers (*Picida* spp.), and common loon (*Gavia immer*).

3.7.1 Alternative 1: No Action Alternative

The No Action Alternative for Sam Rayburn Dam and Reservoir does not involve any activities that would directly and immediately contribute to changes in existing conditions. Therefore, no immediate or short- term minor, moderate, or major; or beneficial or adverse impacts on natural resources would occur. However, maintaining existing land classifications would not recognize the need to protect important habitats such as the longleaf pine savannah forests, bottomland hardwood forests, wetlands, or scenic areas, which could lead to long-term moderate or major negative impacts on natural resources as a result of implementing the No Action Alternative.

3.7.2 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of natural resources. The Proposed Action for revising the Sam Rayburn Dam and Reservoir Master Plan would allow project lands to continue supporting the USFWS and TPWD missions associated with wildlife conservation and implementation of operational practices that would protect and enhance wildlife and fishery populations. As detailed previously in Table 2-3, thousands of acres of land would be reclassified to recognize the high value of existing habitats and resources and to ensure their preservation, to recognize important ecological resources, to manage land for wildlife purposes, and to reflect actual use, evolving trends, and regional priorities. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on natural resources.

For example, 896 acres would be classified as MRML – WM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Reclassification of land to these land uses would afford protection to and potentially benefit wildlife, wildlife habitats, habitat diversity, sensitive species habitat, cultural resources, and ecologically sensitive areas. The magnitude of these benefits would depend on the intensity of future management actions on these lands. Furthermore, the Proposed Action would be compatible with conservation principles and measures to protect migratory birds as mandated by EO 13186, and support the wildlife action plans of the state of Texas. The new resources objectives would provide a level of consistency in beneficial management practices that would not occur with the No Action Alternative.

3.8 THREATENED AND ENDANGERED SPECIES

Threatened species are those which are likely to become endangered within the foreseeable future. Endangered species are in danger of extinction throughout all or a significant portion of their range. The USFWS Information for Planning and Conservation (IPaC) states that several species of birds and flowering plants, identified as Federally threatened and endangered species, potentially occur within USACE managed property at Sam Rayburn Reservoir (refer to Appendix E of the 2017 Master Plan). Additionally, one reptile species was listed as a candidate for protection under the Endangered Species Act.

Table 3-3 indicates the various species of birds, flowering plants, and reptiles listed by the USFWS as Threatened, Endangered or Candidate species that could potentially be found at Sam Rayburn Reservoir.

Table 3-3. Federally Threatened and Endangered Species

Common Name	Scientific Name	Federal Status	Occurrence
Birds			
Least Tern	*Sterna antillarum*	E	Rare
Piping Plover	*Charadrius melodus*	T	Rare
Red Knot	*Calidris canutus rufa*	T	Rare
Red-cockaded Woodpecker	*Picoides borealis*	E	Occasional
Flowering Plants			
Navasota's Ladies-tresses	*Spiranthes parksii*	E	Rare
Texas Golden Gladecress	*Leavenworthia texana*	E	Rare
White Bladderpod	*Lesquerella pallida*	E	Rare
Reptiles			
Louisiana Pine Snake	*Pituophis ruthveni*	C	Occasional

Federal Listings: *E - Endangered, T - Threatened, C – Candidate*
Occasional: Species is present on project site, but seen only a few times or during seasonal events.
Rare: Species is present on project site and seen at intervals of 2 to 5 years, or is present in limited numbers.

Piping plovers, least terns, and red knots all potentially utilize the reservoir when favorable open shoreline habitat is available. However, projects at Sam Rayburn Dam and Reservoir are only considered to cause potential environmental impacts on these species in the Sam Rayburn Reservoir area if a project entails wind energy development.

The red-cockaded woodpecker is cardinal sized with a wingspan of about 15 inches. The black cap and nape outline large white cheek patches which are more readily visible than the small red cockade displayed by adult males. The relatively small, yet rare, patches of mature longleaf pine within and surrounding USACE property are preferred by RCW for cavity excavation and subsequent nesting but other southern pine species may be used.

Red-cockaded woodpeckers are considered keystone species for southern pine forests. The cavities they create for roosting and nesting, and later abandoned for newer cavities, are utilized by various other wildlife including insects, birds, snakes, lizards, squirrels, and frogs.

Additionally, Navasota ladies-tresses, Texas golden gladecress, and white bladderpod, all Federally endangered plant species, may also occur within Sam Rayburn Reservoir. Designated critical habitat for the Texas golden gladecress has been established in the general area, although none are on or adjacent to Sam Rayburn Reservoir. There are no Federally listed fish, mammals, or mollusks with the potential to occur at Sam Rayburn Reservoir.

For discussions regarding TPWD state-listed species and Texas Natural Diversity Database information, please refer to Section 2.2.4 and Appendix E of the 2017 Master Plan.

3.8.1 Alternative 1: No Action Alternative

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

3.8.2 Alternative 2: Proposed Action

Under the Proposed Action, the USACE would continue cooperative management plans with the USFWS to preserve, enhance, and protect critical wildlife habitat resources. Land reclassifications and new resource objectives proposed as part of the Proposed Action would have a potential long-term beneficial impact on protected species. For example, 896 acres would be classified as MRML – WM compared to the No Action, and an additional 1,809 acres would be reclassified as ESA compared to the No Action (see Table 2-3). Reclassification of land to these land uses would afford protection to and potentially benefit wildlife, wildlife habitats, habitat diversity, sensitive species habitat, cultural resources, and ecologically sensitive areas. The magnitude of these benefits would depend on the intensity of future management actions on these lands. The new resources objectives would provide a level of consistency in beneficial management practices that would not occur with the No Action Alternative. The Proposed Action would be in compliance with Section 7 of the Endangered Species Act (ESA), and any future activities that could potentially result in impacts on Federally species would be coordinated with USFWS through Section 7 of the ESA.

3.9 INVASIVE SPECIES

Invasive species are defined as exotic species whose introduction into the ecosystem is likely to cause environmental or economic harm or harm human health. Exotic species are those that are not native to the area, and thus have not evolved the natural checks and balances that normally keep growth in check. These are often difficult and expensive to control. Like almost all ecological systems, Sam Rayburn Dam and Reservoir is experiencing impacts from a number of terrestrial and aquatic invasive species.

Table 3-4 lists the invasive species that occur on Sam Rayburn Reservoir fee lands. Data was retrieved from the FY2015 Project Site Invasive Species Records as reported in OMBIL and from the project Operations Division. Descriptions of the invasive species and management strategies by species of primary concern are included in Section 2.2.5 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

Table 3-4. Invasive Species that occur on Sam Rayburn Reservoir Fee Lands

Species	Occurrence	Acres Impacted	Percent of Total Acres Impacted
Aquatic Plants			
Alligator Weed (*Alternanthera philoxeroides*)	Minor	1,000	0.87%
*Bladderwort (*Uticularia* sp.)	-	-	-
*Broadleaf Arrowhead (*Sagittaria latifolia*))	-	-	-
*Coontail (*Ceratophyllum demersum*)	-	-	-
Fragrant Water Lily (*Nymphaea odorata*)	Minor	500	0.44%
*Frog's Bit (*Limnobium spongia*)	-	-	-
Giant Salvinia (*Salvinia molesta*)	Significant/Major	2,750	2.40%
*Hydrilla (*Esthwaite Waterweed*)	Minor	25	0.02%
*Mosquito Fern (*Azolla filiculoides*)	-	-	-
*Parrot Feather (*Myriophyllum aquaticum*)	-	-	-
*Pennywort (*Hydrocotyle sibthorpiodes*)	-	-	-
Water Hyacinth (*Eichhornia crassipes*)	Significant/Major	5,000	4.36%
*Water Primrose (*Ludwigia peloides*)	-	-	-
Terrestrial Plants			
Chinese Tallow Tree (*Triadica sebifera*)	Moderate	3,000	2.61%
Japanese Climbing Fern (*Lygodium japonicum*)	Minor	100	0.09%
Torpedo Grass (*Panicum repens*)	Minor	5,000	4.36%
*Yaupon Holly (*Ilex vomitoria*)	Significant/Major	2,500	2.18%
Animals			
Wild Boar (*Sus scrofa*)	Moderate	5,000	4.36%
Nutria (*Myocastor coypus*)	-	-	-
Crazy Rasberry Ant (*Nylanderia fulva*)	Minor	1	0.00%
Red Imported Fire Ant (*Solenopsis invicta*)	Minor	350	0.30%

*Denotes Pest Species

3.9.1 Alternative 1: No Action Alternative

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions; therefore Sam Rayburn Dam and Reservoir would continue to be managed according to the existing invasive species management practices. The No Action Alternative may result in minor, long-term adverse impacts resulting from the lack of resource objectives that emphasize management and control of invasive species.

3.9.2 Alternative 2: Proposed Action

The land reclassifications required to revise the 2017 Master Plan are compatible with the lake's invasive species management practices. Therefore, invasive species would continue to be managed to the extent possible. The new resource objectives developed under the Proposed Action would result in minor, long-term beneficial impacts.

3.10 TIMBER RESOURCES

The majority of project lands above the conservation pool elevation of 170.0 NGVD are forested with a mix of tree species representative of the Pineywoods ecoregion. This forested land, consisting of approximately 17,716 acres is managed for multiple uses, one of which is a sustainable supply of timber. The selective harvest of timber on USACE lands at Sam Rayburn Reservoir has occurred on a routine basis since the late 1970s. In addition to the planned sale of timber, periodic major flood events, such as occurred in 1990 and 2015, as well as storm events such as hurricanes Rita and Ike, result in the salvage of merchantable timber. Timber resources and management of timber resources are discussed in detail in Section 2.2.6 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

3.10.1 Alternative 1: No Action Alternative

The No Action Alternative does not involve any activities that would contribute to changes in existing conditions, so timber resources at Sam Rayburn Dam and Reservoir would continue to be managed according to the existing management practices. The No Action Alternative may result in minor, long-term adverse impacts resulting from the lack of resource objectives that emphasize management of timber resources.

3.10.2 Alternative 2: Proposed Action

The land reclassifications proposed in the 2017 Master Plan are compatible with Sam Rayburn Dam and Reservoir's timber management practices. Therefore, these resources would continue to be managed, and no significant adverse impacts on resources would occur as a result of implementing the 2017 Master Plan. The new resource objectives developed under the Proposed Action would result in minor, long-term beneficial impacts.

3.11 CULTURAL, HISTORICAL, AND ARCHAEOLOGICAL RESOURCES

Cultural resources preservation and management is an equal and integral part of all resource management at Civil Works operating projects. The term "cultural resources" is a broad term meant to include anything that is of cultural significance to humans and that has some historical value, and generally includes, but is not limited to, the following categories of resources: archaeological sites (historic and prehistoric), historic standing structures, traditional cultural properties, and sacred sites. To date, 265 archeological sites have been recorded at Sam Rayburn Reservoir. None have been formally listed on the National Register of Historic Places (NRHP) and none have received the designation of "eligible" for NRHP inclusion. In some cases, this is due to the fact that the site might be inundated by the reservoir at its conservation pool level. In other cases, it is a result of the fact that limited NRHP eligibility testing has been performed at Sam Rayburn Reservoir. The cultural, historical, and archaeological resources are described in detail in Section 2.3 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

Numerous cultural resources laws establish the importance of cultural resources to our Nation's heritage. With the passage of these laws, the historical intent of Congress has been to ensure that the Federal government protects cultural resources. Stewardship of cultural resources on USACE Civil Works water resources projects is an important part of the overall Federal responsibility.

3.11.1 Alternative 1: No Action Alternative

There would be no direct or immediate minor, moderate or major, beneficial or adverse impacts on cultural resources as a result of implementing the No Action Alternative, as there would be no changes to the existing Master Plan. However, maintaining existing land classifications would not recognize the presence or importance of cultural resources, which could lead to long-term negative moderate or major impacts as a result of implementing the No Action Alternative.

3.11.2 Alternative 2: Proposed Action

Impacts on cultural, historical, and archaeological resources were considered during the refinement processes of land reclassifications. Based on previous surveys at Sam Rayburn Dam and Reservoir, the required reclassifications would not change current cultural resource management plans or alter areas where these resources exist. The Proposed Action would potentially result in long-term and moderate beneficial impacts with some reclassifications providing additional development protections and adding resource objectives to help protect cultural resources. Therefore, no significant adverse impacts on cultural, historical, and archaeological resources would occur as a result of implementing revisions to the Sam Rayburn Dam and Reservoir Master Plan. Any future ground-disturbing activities would take into account Section 106 of the NHPA and other applicable cultural resource statutes to insure that cultural resources are protected.

3.12 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The zone of interest for the socioeconomic analysis consists of Angelina, Jasper, Sabine, San Augustine, and Nacogdoches Counties in Texas. The population, education level, employment rates, income, and household characteristics of the area are discussed in detail in Section 2.3 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

3.12.1 Alternative 1: No Action Alternative

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

3.12.2 Alternative 2: Proposed Action

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

3.13 RECREATION

The majority of visitors to Sam Rayburn Reservoir come from a 100-mile radius of the reservoir. These visitors are a diverse group of people with a wide variety of interests. Examples of visitors include campers who utilize the campgrounds around the reservoir and in the county and Federally operated parks; adjacent residents; hunters and anglers who utilize hunting grounds and participate in fishing tournaments; marina customers who utilize the marinas on the reservoir; and day users who picnic, hike, bird watch, bicycle and ride horses. Sam Rayburn Reservoir is the primary location for water-related recreation, providing the public with a location for boating, sailing, canoeing/kayaking, paddle boarding, and swimming in the area. Sam Rayburn has consistently provided high quality angling opportunities for multiple fish species and is regarded as a premier fishing destination in Texas. On average, Sam Rayburn Reservoir entertains approximately 1.5 million visits per year with the peak visitation months running from March through September. Recreational facilities, activities, and needs are discussed in detail in Section 2.4 of the 2017 Master Plan and are incorporated herein by reference (USACE 2017).

3.13.1 Alternative 1: No Action Alternative

Under the No Action Alternative, the 1970 Master Plan would not be revised. No significant adverse impacts on recreation would be anticipated.

3.13.2 Alternative 2: Proposed Action

The primary objective for revising the Sam Rayburn Dam and Reservoir Master Plan is to capture current land use and management that has evolved to meet day-to-day operational needs. Under the Proposed Action, the required revisions to the Sam Rayburn Dam and Reservoir Master Plan would be compatible with current recreation management plans and recognizes regional and national outdoor recreation trends. The reclassification changes required for the Proposed Action were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued recreational use and development of project lands. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on recreation as a result of implementing the Proposed Action.

3.14 AESTHETICS

Sam Rayburn Reservoir proper and surrounding Federal lands offer public, open space values and scenic vistas that are unique in the region. Natural Resources Management Objectives for the lake will continue to minimize activities which disturb the scenic beauty and aesthetics of the lake.

3.14.1 Alternative 1: No Action Alternative

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

3.14.2 Alternative 2: Proposed Action

Sam Rayburn Dam and Reservoir currently play a pivotal role in availability of parks and open space in the area. Even though the amount of acreage available for HDR and LDR would decrease with implementation of the 2017 Master Plan, these land reclassifications reflect changes in land management and land uses that have occurred since 1970 at Sam Rayburn Dam and Reservoir. The conversion of these lands would have no effect on current or projected public use. Furthermore, the increase in the acreage of land classified as ESA and MRML-VM would protect lands that are aesthetically pleasing, limit future development, and provide for a continuous canopy, forested shoreline. Therefore, no adverse impacts on visual resources would result from implementation of the 2017 Master Plan. The new resource objectives developed under the Proposed Action would result in minor, long-term beneficial impacts.

3.15 HAZARDOUS MATERIALS AND SOLID WASTE

This section describes existing conditions within the Project area with regard to potential environmental contamination and the sources of releases to the environment. Contaminants could enter the Sam Rayburn Reservoir environment via air or water pathways. The highways and roads, railroads, and oil and gas pipelines in the vicinity could also provide sources of contaminants to the Project area.

3.15.1 Alternative 1: No Action Alternative

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

3.15.2 Alternative 2: Proposed Action

The land reclassifications required to revise the Master Plan would be compatible with Sam Rayburn Dam and Reservoir hazardous and toxic waste management practices. Therefore, no short- or long-term, minor, moderate or major, beneficial, or adverse impacts due to hazardous, toxic, or radioactive wastes would occur as a result of implementing the 2017 Master Plan.

3.16 HEALTH AND SAFETY

The authorized purposes of Sam Rayburn Dam and Reservoir include flood damage risk reduction, water supply, water quality, and recreation. The USACE, with assistance from the TPWD, has established public outreach programs to educate the public on water safety and conservation of natural resources. In addition to the water safety outreach programs, the USACE has established recreation management practices to protect the public. These include safe boating and swimming regulations, safe hunting regulations, and speed limit and pedestrian signs for park roads. Sam Rayburn Dam and Reservoir also has solid waste management plans in place for camping and day-use areas. Sam Rayburn Dam and Reservoir personnel are in place to enforce these policies, rules, and regulations during normal park hours.

3.16.1 Alternative 1: No Action Alternative

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

3.16.2 Alternative 2: Proposed Action

Under the Proposed Action, the required revisions to the Sam Rayburn Dam and Reservoir Master Plan would be compatible with project safety management plans. The project would continue to have reporting guidelines in place should water quality become a threat to public health. The Proposed Action would potentially result in long-term and moderate beneficial impacts on public health and safety through implementation of health and safety related management objectives and the reclassification of 40 acres of water surface as restricted and 190 acres as designated no-wake for public safety purposes. Existing regulations and safety programs throughout the Sam Rayburn Dam and Reservoir area would continue to be enforced to ensure public safety. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on public health and safety as a result of implementing the Proposed Action.

3.17 SUMMARY OF CONSEQUENCES AND BENEFITS

Table 3-5 provides a tabular summary of the consequences and benefits for the No Action and Proposed Action alternatives for each of the 16 assessed resource categories.

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Table 3-5. Summary of Consequences and Benefits

Resource	Change Resulting from Revised Master Plan	Environmental Consequences		Benefits Summary
		No Action Alternative	Proposed Action	
Land Use	No effect on private lands. Emphasis is on protection of wildlife and environmental values on USACE land and maintaining current level of developed recreation facilities.	Fails to recognize recreation trends and regional natural resource priorities.	Recognizes recreation trends and regional natural resource priorities identified by TPWD and public comment.	Land classification changes and new resource objectives fully recognize passive use recreation trends and regional environmental values.
Water Resources Including Groundwater, Wetlands, and Water Quality	Small change to recognize value of wetlands.	Fails to recognize the water quality benefits of good land stewardship and need to protect wetlands.	Promotes restoration and protection of wetlands and good land stewardship.	Specific resource objective promotes restoration and protection of wetlands.
Climate	Minor change to recognize need for sustainable, energy efficient design.	Fails to promote sustainable, energy efficient design.	Promotes land management practices and design standards that promote sustainability.	Specific resource objectives promote national climate change mitigation goal. LEED standards for green design, construction, and operation activities will be employed to the extent practicable.
Climate Change and GHG	Same as for Climate	Same as for Climate	Same as for Climate	Same as for Climate
Air Quality	No change	No effect	No effect	No added benefit
Topography, Geology and Soils	Minor change to place emphasis on good stewardship of land and water resources.	Fails to specifically recognize known and potential soil erosion problems.	Encourages good stewardship that would reduce existing and potential erosion.	Specific resource objectives call for stopping erosion from overuse and land disturbing activities.
Natural Resources	Moderate benefits through land reclassification and resource objectives.	Fails to recognize ESAs, and regional priorities calling for protection of wildlife habitat.	Gives full recognition of sensitive resources and regional trends and priorities related to natural resources.	Reclassification of lands included 1,809 acres of ESA and an increase in lands emphasizing wildlife management.
Threatened and Endangered Species	Minor change to recognize both Federal and state-listed species.	Fails to recognize current Federal and state-listed species.	Fully recognizes Federal and state-listed species as well as SGCN listed in Texas and Rare species listed by TPWD.	The revised master plan sets forth the most recent listing of Federal and state-listed species.
Invasive Species	Minor change to recognize several recent and potentially aggressive invasive species.	Fails to recognize current invasive species and associated problems.	Fully recognizes current species and the need to be vigilant as new species may occur.	Specific resource objectives specify that invasive species shall be monitored and controlled as needed.
Timber Resources	Minor benefits through land reclassification and resource objectives.	Fails to promote sustained yield of timber and practices compatible with ecosystem management and public recreational use.	Promotes sustainable timber management practices compatible with ecosystem management and public recreational use.	Specific resource objectives specify that forest management activities be conducted to produce a sustained yield of timber to the extent compatible with ecosystem management principles and public recreational use.
Cultural, Historical, and Archaeological Resources	Minor change to recognize current status of cultural resources.	Included cursory information about cultural resources that is inadequate for future management and protection.	Recognizes the presence of cultural resources and places emphasis on protection and management.	Reclassification of lands and specific resource objectives were included for protection of cultural resources.
Socioeconomics and Environmental Justice	No change	No effect	No effect	No added benefit
Recreation	Moderate benefits to outdoor recreation programs.	Fails to recognize current outdoor recreation trends.	Fully recognizes current outdoor recreation trends.	Specific management objectives focused on outdoor recreation opportunities and trends are included.
Aesthetics	Minor benefits through land reclassification and resource objectives.	Fails to minimize activities that disturb the scenic beauty and aesthetics of the lake.	Promotes activities that limit disturbance to the scenic beauty and aesthetics of the lake.	Specific management objectives to minimize activities that disturb the scenic beauty and aesthetics of the lake.
Hazardous Materials and Solid Waste	No change	No effect	No effect	No added benefit

Resource	Change Resulting from Revised Master Plan	Environmental Consequences		Benefits Summary
		No Action Alternative	Proposed Action	
Health and Safety	Minor change to promote public safety awareness.	Fails to emphasize public safety programs.	Recognizes the need for public safety programs.	Includes specific management objectives to increase water safety outreach efforts. Also, classifies 40 acres of water surface as restricted and 190 acres as designated no-wake for public safety purposes.

SECTION 4: CUMULATIVE IMPACTS

The CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time by various agencies (Federal, state, or local) or individuals. CEQ guidance on cumulative impacts requires the definition of the scope of the other actions and their interrelationship with the Proposed Action (CEQ 1997). The scope must consider geographic and temporal overlaps with the Proposed Action and all other actions occurring within the zone of interest. Informed decision making is served by consideration of cumulative impacts resulting from activities that are proposed, under construction, recently completed, or anticipated to be implemented in the reasonably foreseeable future. This cumulative impacts analysis summarizes expected environmental impacts from the combined impacts of past, current, and reasonably foreseeable future activities affecting any part of the human or natural environments impacted by the Proposed Action.

4.1 PAST IMPACTS WITHIN THE ZONE OF INTEREST

Sam Rayburn Dam and Reservoir was authorized and constructed for the primary purposes of flood damage risk reduction, generation of hydroelectric power, and conservation of water for municipal, industrial and agricultural uses. A major secondary use of project lands and waters is public water oriented recreation.

For the most part, Sam Rayburn Reservoir is surrounded by the Angelina National Forest and a small section of the Sabine National Forest. Both forests are managed by the USFS which issued a use permit to the USACE for approximately 33,000 acres for the development of Sam Rayburn Reservoir.

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

Future management of the Flowage Easement Lands at Sam Rayburn Dam and Reservoir includes routine inspection of these areas to ensure that the Government's rights specified in the easement deeds are protected. In almost all cases, the Government acquired the right to prevent placement of fill material or habitable structures on the easement area. Placement of any structure that may interfere with the USACE flood risk management and water conservation missions may also be prohibited. USACE anticipates additional residential expansion surrounding fee-owned lands for the foreseeable future.

Regional and county mobility plans call for general roadway improvements of some existing roadways within the surrounding vicinity of USACE lands. Local road

expansion or construction projects are either planned or anticipated to take place within the zone of interest during the planning horizon of the 2017 Master Plan.

The Resource Plan in Chapter 5 of the 2017 Master Plan lists several actions that may occur in the future. Two new boat ramps are proposed, one on the Angelina River below the dam, and one in the new addition to Ebenezer Park. Additionally, public comments received recommended possible new boat ramps at key locations within developed subdivisions. Construction of these ramps would comply with conditions specified in any Regional General Permits pursuant to Section 404 of the Clean Water Act. In addition, prior to any ramp or ramps being constructed, USACE would determine if the anticipated impacts warrant preparation of an Environmental Assessment or if the action meets the criteria for a Categorical Exclusion. In either case, best management practices would be employed during ramp construction to minimize and mitigate any adverse impacts. In addition to the potential for one or more new boat ramps, future plans described in Chapter 5 of the 2017 Master Plan also addresses the need to extend one or more boat ramps in the northern sector of the lake to be serviceable during low water conditions. These possible ramp extensions would also require compliance with Section 404 of the Clean Water Act and would employ best management practices during construction activities.

4.3 ANALYSIS OF CUMULATIVE IMPACTS

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

4.3.1 Land Use

A major impact would occur if any action is inconsistent with adopted land use plans or if an action would substantially alter those resources required for, supporting, or benefiting the current use. Under the No Action Alternative, land use would not change. Although the Proposed Action would result in the reclassification of project lands, the reclassifications were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued use and development of project lands. Therefore, cumulative impacts on land use within the area surrounding Sam Rayburn Dam and Reservoir, when combined with past and proposed actions in the region, are anticipated to be minimal.

4.3.2 Water Resources

Sam Rayburn Dam and Reservoir was developed for flood control, water supply, hydroelectric power, navigation, and recreation purposes. The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of water resources. Therefore, negative cumulative impacts on water resources and water quality within the area surrounding Sam Rayburn Dam and Reservoir are not anticipated to increase when combined with past and proposed actions in the region.

4.3.3 Climate

The Proposed Action would neither affect nor be affected by the climate. Therefore, implementation of the 2017 Master Plan, when combined with other existing and proposed projects in the region, would not result in major cumulative impacts on the climate.

4.3.4 Climate Change and GHG

Under the Proposed Action, current Sam Rayburn Dam and Reservoir project management plans and monitoring programs would not be changed. In the event that GHG emission issues become significant enough to impact the current operations at Sam Rayburn Dam and Reservoir, the 2017 Master Plan and all associated documents would be reviewed and revised as necessary. Therefore, implementation of the 2017 Master Plan, when combined with other existing and proposed projects in the region, would not result in major cumulative impacts on climate change or GHG.

4.3.5 Air Quality

For the area surrounding Sam Rayburn Dam and Reservoir, activities that could add to air emissions in the area are likely few and minor in nature. The Proposed Action would not adversely impact air quality within the area. Vehicle traffic along park and area roadways and routine daily activities in nearby communities contribute to current and future emission sources. Seasonal prescribed burning on Sam Rayburn Dam and Reservoir lands would have minor, negative impacts on air quality through elevated ground-level ozone and particulate matter concentrations; however, these seasonal burns are generally scheduled so that impacts are minimized. Minor improvements to the communities in the Sam Rayburn Dam and Reservoir area, such as construction of new business buildings and highway improvement projects could also contribute to minor future emissions.

4.3.6 Topography, Geology, and Soils

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

Land use around Sam Rayburn Reservoir has changed in the past several years. Given the projected population growth and vast acreage of Prime Farmland in the area, there could be cumulative impacts on Prime Farmland in the Project area. However, the cumulative impacts on Prime Farmland from the Proposed Action at Sam Rayburn Dam and Reservoir are anticipated to be negligible when combined with past and proposed actions in the area.

4.3.7 Natural Resources

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

4.3.8 Threatened and Endangered Species

The Proposed Action and No Action Alternative would not adversely impact threatened and endangered species within the area. Should Federally listed species change in the future, the USACE would continue cooperative management plans with the USFWS to preserve, enhance, and protect critical wildlife habitat resources. Past, present, and future projects in the Sam Rayburn Dam and Reservoir area are not anticipated to impact threatened and endangered species. Therefore, there would be no significant cumulative impacts on threatened and endangered species resulting from the revision of the Sam Rayburn Dam and Reservoir Master Plan when combined with past and proposed actions in the area.

4.3.9 Invasive Species

Feral hogs continue to have a presence at differing levels throughout the year given food availability and the abundance of cover afforded by bottomland hardwoods around Sam Rayburn Dam and Reservoir. Other nuisance species that impact the health and productivity of the natural resources at Sam Rayburn Reservoir include giant salvinia, Japanese climbing fern, and water hyacinth. The USACE will continue its proactive herbicide treatments to control these species that affect not only the natural biological resources, but also recreational opportunities. Pesticide treatment for invasive ants will also continue. The USACE will also continue to monitor for zebra mussels and take all practicable measures to prevent them from becoming introduced to Sam Rayburn Lake.

Invasive species control has and will continue to be conducted on various areas across the project lands. Implementing Best Management Practices (BMPs) will control

the introduction and distribution of invasive species, ensuring that proposed actions in the region will not contribute to the overall cumulative impacts related to invasive species. The land reclassifications required to revise the Master Plan are compatible with Sam Rayburn Dam and Reservoir invasive species management practices. Therefore, cumulative impacts from invasive species within the area surrounding Sam Rayburn Dam and Reservoir are not anticipated to increase when combined with past and proposed actions in the region.

4.3.10 Timber Resources

The bottomland forests of the main tributaries of Sam Rayburn Dam and Reservoir have high value as wildlife habitat, but do not have significant value as commercial timber. Although timber resource extraction may increase in the Sam Rayburn Dam and Reservoir area in the future, cumulative impacts on these resources from implementation of the 2017 Master Plan, when combined with past and proposed actions in the region, are anticipated to be negligible.

4.3.11 Cultural, Historical, and Archaeological Resources

The Proposed Action would not affect cultural resources or historic properties. Therefore, this action, when combined with other existing and proposed projects in the region, would not result in major cumulative impacts on cultural resources or historic properties.

4.3.12 Socioeconomics and Environmental Justice

The Proposed Action would not result in the displacement of persons (minority, low-income, children, or otherwise) as a result of implementing the revised land classifications. Therefore, the effects of the Proposed Action on environmental justice and the protection of children, when combined with other ongoing and proposed projects in the Sam Rayburn Dam and Reservoir area, are anticipated to be negligible.

4.3.13 Recreation

Sam Rayburn Dam and Reservoir is beneficial to the local visitors and also offers a variety of free recreation opportunities. Some of the popular recreation activities at Sam Rayburn Reservoir are, on a national basis, either static or declining in participation. For example, developed camping activity, power boating, hunting, and fishing have experienced small to moderate declines in recent years. In contrast to these declines, significant increases in hiking, walking, sightseeing, wildlife viewing and canoeing/kayaking have occurred in recent years. Even though the amount of acreage available for HDR and LDR would decrease with implementation of the 2017 Master Plan, these land reclassifications reflect changes in land management and land uses that have occurred since 1970 at Sam Rayburn Reservoir. The conversion of these lands would have no effect on current or projected public use. Therefore, the effects of the Proposed Action, when combined with other existing and proposed projects in the region, would not result in major cumulative impacts on area recreational resources and are anticipated to be negligible.

4.3.14 Aesthetics

Actions that cause the permanent loss of the characteristics that make an area aesthetically pleasing, visually unique, or sensitive would be considered to cause a major impact. No major impacts on visual resources would occur from implementation of the 2017 Master Plan. The Proposed Action, in conjunction with other projects in the region, would result in minor beneficial cumulative impacts on the aesthetics in the Sam Rayburn Dam and Reservoir area. Specific actions beneficial to aesthetics include the reclassification of USACE lands to ESA and MRML-VM along with resource objectives that call for maintaining and improving the aesthetic appeal of Sam Rayburn Dam and Reservoir.

4.3.15 Hazardous Materials and Solid Waste

Major impacts would occur if an action creates a public hazard, if a project is implemented in an area that is considered a hazardous waste site that poses health risks, or if the action would impair the implementation of an adopted emergency response or evacuation plan.

4.3.16 Health and Safety

No health or safety risks would be created by the Proposed Action. The effects of implementing the 2017 Master Plan, when combined with other ongoing and proposed projects in the Sam Rayburn Reservoir area, are anticipated to be negligible.

SECTION 5: COMPLIANCE WITH ENVIRONMENTAL LAWS

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

Fish and Wildlife Coordination Act of 1958, as amended – Because no construction or change in operation of the reservoir is proposed, there is no plan to coordinate under the Act; however, information provided by USFWS and TPWD on fish and wildlife resources has been utilized in the development of this assessment.

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

EO 13186 (Migratory Bird Habitat Protection) – Sections 3a and 3e of EO 13186 direct Federal agencies to evaluate the impacts of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative impacts on migratory birds. The Master Plan revision will not result in adverse impacts on migratory bird habitat.

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

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

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

Clean Air Act of 1977 – The USEPA established nationwide air quality standards to protect public health and welfare. Existing operation and management of the reservoir is compliant with the Clean Air Act and will not change with the Master Plan revision.

Farmland Protection Policy Act (FPPA) of 1980 and 1995 – The FPPA's purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. Prime Farmland is present within and adjacent to Sam Rayburn Dam and Reservoir. The Proposed Action would not impact Prime Farmland present on Sam Rayburn Dam and Reservoir project lands.

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

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

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

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

SECTION 6: IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

NEPA requires that Federal agencies identify "any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented" (42 USC § 4332). An irreversible commitment of resources occurs when the primary or secondary impacts of an action result in the loss of future options for a resource. Usually, this is when the action affects the use of a nonrenewable resource or it affects a renewable resource that takes a long time to renew. The impacts for this project from the reclassification of land would not be considered an irreversible commitment because much of the land could be converted back to prior use at a future date. An irretrievable commitment of resources is typically associated with the loss of productivity or use of a natural resource (e.g., loss of production or harvest). No irreversible or irretrievable impacts on Federally protected species or their habitat is anticipated from implementing revisions to the Sam Rayburn Dam and Reservoir Master Plan.

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SECTION 7: PUBLIC AND AGENCY COORDINATION

In accordance with 40 CFR §§1501.7, 1503, and 1506.6, the USACE initiated public involvement and agency scoping activities to solicit input on the Master Plan revision process, as well as identify reclassification proposals, and identify significant issues related to the Proposed Action. The first actions were two public meetings, one in Lufkin, Texas on April 28, 2015 and one in Brookeland, Texas on April 29, 2015, to provide an avenue for the public and agency stakeholders to ask questions and provide comments. The Fort Worth District placed commercial advertisements on the USACE webpage, social media, and ads published in the local news outlet. Appendix A includes the news release. Distribution lists for approximately 85 stakeholders are available at the District office and were notified via email. Additionally, the following agencies were notified of the public meeting via email: TPWD, USFWS, EPA, TCEQ, State Historic Preservation Office, and Caddo Tribe of Oklahoma. Please refer to Section 7.1 and Appendix G of the 2017 Master Plan for a summary of comments received at the public meeting. The EA was coordinated with the aforementioned agencies, stakeholders, and general public having requested to receive notification via a Notice of Availability (NOA). At the release of the draft Master Plan two Public Meetings are to be held in Lufkin, Texas and Jasper, Texas on January 31, 2017 and February 2, 2017, respectively. The USACE Fort Worth District placed commercial advertisements on the USACE webpage and social media prior to the Public Meeting. Appendix A includes the notices published in the local newspapers. A copy of the correspondence from the agencies that provided comments and planning assistance for preparation of the EA is included in Appendix A. USACE responses to comments can be found in Appendix G of the 2017 Master Plan.

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SECTION 9: ACRONYMS/ABBREVIATIONS

2017 Master Plan	2017 Sam Rayburn Dam and Reservoir Master Plan
A.D.	Anno domini
B.P.	before present
CAP	Climate Action Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO2	carbon dioxide
CO2e	carbon dioxide-equivalent
E	Endangered
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EP	Engineer Pamphlet
ER	Engineering Regulations
ESA	Endangered Species Act
FM	Farm to Market
FPPA	Farmland Protection Policy Act
FY	fiscal year
GHG	greenhouse gas
Hg	mercury
IPaC	Information for Planning and Conservation
ICRMP	Integrated Cultural Resources Management Plan
K	potassium
kW	kilowatt
LNVA	Lower Neches Valley Authority
MBTA	Migratory Bird Treaty Act
MRML	Multiple Resource Management Lands
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NO2	nitrogen dioxide
NO3	nitrate
NOx	oxides of nitrogen
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRM	Natural Resources Management
NSRE	National Survey on Recreation and Environment
NVCS	National Vegetation Classification System
O3	ozone
OAQPS	Office of Air Quality Planning and Standards
OMBIL	Operations and Maintenance Business Link
Pb	lead
PL	Public Law
PM-10	particulate matter less than10 microns
RCW	Red-cockaded Woodpecker
RPEC	Regional Planning and Environmental Center
SO2	sulfur dioxide
T	Threatened
TCAP	Texas Conservation Action Plan
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Services
TMDL	total maximum daily load
TORP	Texas Outdoor Recreation Plan
TPWD	Texas Parks and Wildlife Department
TSWQS	Texas Surface Water Quality Standards
TxDOT	Texas Department of Transportation
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compounds
VSS	volatile suspended solids
WPA	Works Progress Administration
Zn	zinc

SECTION 10: LIST OF PREPARERS

Carey Lynn Perry - NEPA Specialist, Gulf South Research Corporation; 10 years of experience.

Mandy McGuire - Environmental Resources Planner, Regional Planning and Environmental Center; 7 years of USACE experience.

Robert Morrow - Natural Resources Manager, Regional Planning and Environmental Center; 10 years of USACE experience.

Don Wiese - Natural Resources Manager, Regional Planning and Environmental Center; 41 years of USACE experience.

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APPENDIX A
PUBLIC AND AGENCY COORDINATION

News Release

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

For Immediate Release: NR15-007

Contact: Denisha Braxton 817-886-1435
denisha.l.braxton@usace.army.mil

Corps to host public meeting for the Sam Rayburn Reservoir Master Plan revision

FORT WORTH, Texas – The Fort Worth District, U.S. Army Corps of Engineers (USACE) will host two public meetings on April 28th and 29th to provide information and receive public input as it prepares to revise the Master Plan for Sam Rayburn Reservoir.

The two meetings will be identical and are being held at two separate locations for the convenience of the public. The meeting on April 28th will be held at the Ellen Trout Zoo in Lufkin at 402 Zoo Circle. The meeting will be held in the Jaguar meeting room. The meeting on April 29th will be at the Rayburn Country Banquet Room at 2376 Wingate Boulevard in Brookeland, Texas. Both meetings will have an open house beginning at 5:30 p.m. followed by a formal presentation at 6:00 p.m. At the conclusion of the presentation there will be time for the public to view maps, ask questions and provide comments about the project.

A Master Plan is defined by USACE as the strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the water resource development project. In general, it defines "how" the resources will be managed for public use and resource conservation. Revision of the Master Plan will not address in detail the technical operational aspects of the reservoir related to the water supply, flood risk management, navigation or hydroelectric power generation missions of the project.

The Master Plan study area will include Sam Rayburn Reservoir proper and all adjacent recreational and natural resources properties under USACE administration. Federal lands adjacent to the reservoir that are administered by the U.S. Forest Service will be noted in the Master Plan revision but will not be addressed in detail.

Sam Rayburn Reservoir, originally named McGee Bend Reservoir, was constructed in the late 1950's and early 1960's. The reservoir became fully operational on March 29, 1965. Sam Rayburn Reservoir is a multi-purpose reservoir constructed and managed for flood risk management, water supply, hydropower, navigation, fish and wildlife, and recreation. The current Master Plan for Sam Rayburn Reservoir was prepared in September 1970 and is in need of revision to address changes in regional land use, population, outdoor recreation trends and USACE management policy. Key topics to be addressed in the revised Master Plan include revised land classifications, new natural and recreational resource management objectives, recreation facility needs and special topics such as invasive species management. Public participation is critical to the successful revision of the Master Plan.

Questions pertaining to the proposed revision can be addressed to: Nekisha McGill, CESWF-PEC-PM, U.S. Army Corps of Engineers, Fort Worth District, P.O. Box 17300, Fort Worth, TX 76102-0300, (817) 886-1793.

About the Fort Worth District: The Fort Worth District, U.S. Army Corps of Engineers was established in 1950. The District is responsible for water resources development in two-thirds of Texas, and design and construction at military installations in Texas and parts of Louisiana and New Mexico. Visit the Fort Worth District Web site at: www.swf.usace.army.mil and SWF Facebook at: http://www.facebook.com/pages/Fort-Worth-District-US-Army-Corps-of-Engineers/188083711219308.

DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

JANUARY 17, 2017

NOTICE OF AVAILABILITY
DRAFT SAM RAYBURN DAM AND RESERVOIR MASTER PLAN, FINDING OF NO SIGNIFICANT IMPACT, AND ENVIRONMENTAL ASSESSMENT - ANGELINA, JASPER, NACOGDOCHES, SABINE, AND SAN AUGUSTINE COUNTIES, TEXAS

The public is hereby notified of the availability of the Draft Sam Rayburn Dam and Reservoir Master Plan (hereafter Plan), Finding of No Significant Impact (FONSI), and Environmental Assessment (EA). The Plan is a vital tool produced and used by the U.S. Army Corps of Engineers (USACE) to guide the responsible stewardship of USACE-administered resources for the benefit of present and future generations. The Plan provides direction for appropriate management, use, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources at Sam Rayburn Dam and Reservoir. The Plan presents an inventory and analysis of land resources; resource management objectives; land use classifications; resource use plan for each land use classification; current and projected park facility needs; an analysis of existing and anticipated resource use; and anticipated influences on overall management. Prior to this proposed Plan revision, the original Plan for Sam Rayburn Dam and Reservoir was approved in May 1957 and updated in June 1967 and September 1970.

The Draft Plan, FONSI, and EA will be available for review at the following locations starting January 31, 2017:

USACE, Sam Rayburn Dam and Reservoir Lake Office
7696 RR 255 West
Jasper, Texas 75951

Kurth Memorial Library
706 South Raguet Street
Lufkin, Texas 75904

Jasper Public Library
175 East Water Street
Jasper, Texas 75951

The Draft Plan, FONSI, and EA will also be available via the Internet on the USACE, Fort Worth District's website at the following address:

http://www.swf.usace.army.mil/About/Lakes-and-Recreation-Information/Master-Plan-Updates/Sam-Rayburn-Lake/

A 30-day-long public comment period will begin January 31, 2017. Please address any comments to Mr. Don Wiese, CESWF-PEC-TP, Natural Resources Manager, Regional Planning and Environmental Center, Master Planning Section, P.O. Box 17300, Fort Worth, Texas 76102-0300 or at the following email: donald.n.wiese@usace.army.mil.

In addition to the public comment period and availability of the Draft Plan, FONSI, and EA, USACE will host two public meetings, one in Lufkin, Texas on January 31, 2017 and one in Jasper, Texas on February 2, 2017 to present the Draft Sam Rayburn Dam and Reservoir Master Plan Revision and supporting documents. The public meeting locations are as follows:

Lufkin Public Meeting – January 31, 2017
Ellen Trout Zoo
402 Zoo Circle
Lufkin, Texas 75904

Jasper Public Meeting – February 2, 2017
Jasper County Courthouse Annex
271 East Lamar Street
Jasper, Texas 75951

For both meetings, a formal presentation will begin at 6:00 p.m. followed by an open house forum for individual one-on-one discussion with USACE representatives.

Douglas C. Sims, RPA
Chief, Environmental Compliance Branch
Regional Planning and Environmental Center

News Release

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

For Immediate Release: NR17-007

Contact: Edward Rivera 817-886-1313
edward.rivera@usace.army.mil

Corps to host public meetings for the Sam Rayburn Reservoir Master Plan revision

FORT WORTH, Texas – Fort Worth District, U.S. Army Corps of Engineers representatives will host public meetings on January 31 and February 2 to provide information and receive public input on the Draft Master Plan revision for Sam Rayburn Reservoir.

The meetings will be identical and are being held at two separate locations for public convenience. The January 31 meeting will be held in the Jaguar Meeting Room at the Ellen Trout Zoo, 402 Zoo Circle, Lufkin Texas. The February 2 meeting will be at the Jasper County Courthouse Annex, 271 East Lamar Street, Jasper, Texas. Both meetings will have a formal presentation beginning at 6 p.m., followed by an open house forum for individual one-on-one discussion with Corps representatives. The public can view maps, ask questions and provide comments about the project.

A Master Plan is defined by Corps as the strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the water resource development project. In general, it defines "how" the resources will be managed for public use and resource conservation. Revision of the Master Plan will not address in detail the technical operational aspects of the reservoir related to the water supply, flood risk management, navigation or hydroelectric power generation missions of the project.

The Master Plan study area will include Sam Rayburn Reservoir proper and all adjacent recreational and natural resources properties under Corps administration. Federal lands adjacent to the reservoir that are administered by the U.S. Forest Service will be noted in the Master Plan revision but will not be addressed in detail.

The current Master Plan for Sam Rayburn Reservoir was prepared in September 1970 and is in need of revision to address changes in regional land use, population, outdoor recreation trends and USACE management policy. Key topics to be addressed in the revised Master Plan include revised land classifications, new natural and recreational resource management objectives, recreation facility needs and special topics such as invasive species management. Public participation is critical to the successful revision of the Master Plan. The Draft Master Plan will be available for download on the USACE website: http://www.swf.usace.army.mil/About/Lakes-and-Recreation-Information/Master-Plan-Updates/Sam-Rayburn-Lake/

Questions pertaining to the proposed revision can be addressed to: Eric Irwin, CESWF-PEC-TM, U.S. Army Corps of Engineers, Fort Worth District, P.O. Box 17300, Fort Worth, TX 76102-0300, (817) 886-1870.

About the Fort Worth District: The Fort Worth District, U.S. Army Corps of Engineers was established in 1950. The District is responsible for water resources development in two-thirds of Texas, and design and construction at military installations in Texas and parts of Louisiana and New Mexico. Visit the Fort Worth District Web site at: www.swf.usace.army.mil and SWF Facebook at: http://www.facebook.com/pages/Fort-Worth-District-US-Army-Corps-of-Engineers/188083711219308.

APPENDIX D – WILDLIFE HABITAT APPRAISAL PROCEDURE (WHAP)/ FLORISTIC SURVEY

FINAL

Existing Habitat Conditions for the Sam Rayburn Dam and Reservoir Master Plan Revision

Angelina River
Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties, Texas

December 2016

US Army Corps of Engineers ®
Fort Worth District

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Attachment B — Sam Rayburn Dam and Reservoir WHAP and FQI Results Summary

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1.0 INTRODUCTION

A habitat assessment for the Sam Rayburn Dam and Reservoir Master Plan Revision was conducted on August 22-24, 2016, at Sam Rayburn Reservoir using the Texas Parks and Wildlife Department's (TPWD) Wildlife Habitat Appraisal Procedure (WHAP). WHAP site locations were preselected based on aerial imagery from existing Geographical Information Systems (GIS) data. A total of 66 WHAP sites around the reservoir were selected (Figure 1). The major habitat types that were selected and assessed were Pine Forest, Pine-Oak Forest, Longleaf Pine Savannah, Bottomland Hardwoods, and Forested Wetland. At each of the 66 sites, all vegetative species present within survey plots were also recorded for analysis using a Floristic Quality Assessment (FQA) established for Sam Rayburn Reservoir.

The purpose of this report is to describe wildlife habitat quality and floristic quality within the U.S. Army Corps of Engineers' (USACE) Sam Rayburn Reservoir fee-owned property in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties, Texas. This report is being prepared by the USACE as part of a Master Plan Revision for Sam Rayburn Dam and Reservoir.

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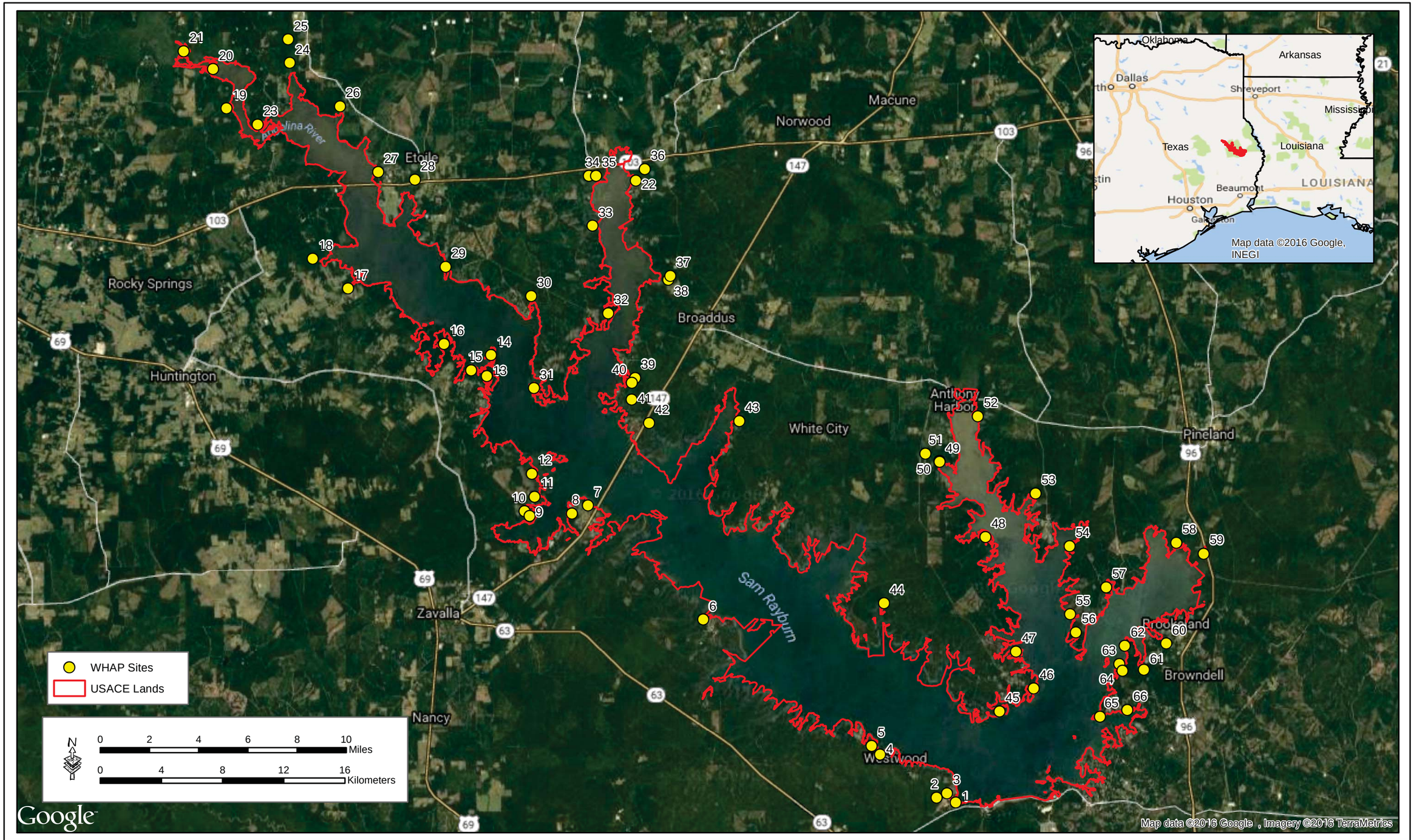

Figure 1. Sam Rayburn Dam and Reservoir WHAP Site Locations

GSRC

September 2016

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2.0 STUDY AREA

2.1 LOCATION

Sam Rayburn Dam and Reservoir are located in east Texas approximately 10 miles northwest of the City of Jasper at river mile 25.2 on the Angelina River, a tributary of the Neches River. The reservoir is located in portions of five counties: Angelina, Jasper, Nacogdoches, Sabine, and San Augustine. The study area for this report consists of all USACE fee-owned land surrounding Sam Rayburn Reservoir (see Figure 1). Spatial data provided by the USACE indicate that the study area encompasses approximately 17,992 acres.

Sam Rayburn Dam and Reservoir were authorized and constructed for the primary purposes of flood risk management, generation of hydroelectric power, and conservation of water for municipal, industrial, and agricultural uses. A major secondary use of project lands and waters is public outdoor recreation and environmental stewardship of natural and cultural resources. The reservoir area is heavily utilized by visitors from Beaumont, Port Arthur, Houston, Lufkin, and other large nearby population centers in Texas.

2.2 ECOLOGY, CLIMATE, AND TOPOGRAPHY

Sam Rayburn Dam and Reservoir is located in the South Central Plains Level III Ecoregion and Southern Tertiary Uplands Level IV Ecoregion, as mapped and described by the U.S. Environmental Protection Agency (EPA). The 2012 Texas Conservation Action Plan (TCAP) refers to this ecoregion as the Western Gulf Coastal Plain Ecoregion and locally, the ecoregion is often called the Pineywoods of east Texas. The vegetation of the South Central Plains Level III Ecoregion is sometimes described as the western edge of the southern coniferous forest belt of the continental United States.

The Southern Tertiary Uplands Ecoregion generally covers the remainder of longleaf pine range north of the Flatwoods Ecoregion on Tertiary sediments. Longleaf pine (*Pinus palustris*) forests often occur on sand ridges and uplands, with open forests found on other soil types and locations in the Southern Tertiary Uplands and the Flatwoods. On more mesic sites, some American beech (*Fagus grandifolia*) or magnolia (*Magnolia grandifolia*)-beech-loblolly pine (*Pinus taeda*) forests occur. The ecoregion is more hilly and dissected than the Flatwoods to the south, and soils are generally better drained over the more permeable sediments. Large parts of the ecoregion are public National Forest land, including the 153,179-acre Angelina National Forest, which lies on the north and south shores of Sam Rayburn Reservoir.

The climate of the Angelina watershed is considered to be generally mild, with an annual normal temperature of 66 degrees Fahrenheit throughout the watershed. However, sharp extremes are occasionally recorded, as short duration freezes and

snowfall occur occasionally throughout the winter. The summers are hot and fairly humid. Southerly winds prevail during the spring, summer, and fall months.

USACE land associated with Sam Rayburn Dam and Reservoir varies from hilly and rolling to broad slopes and flat terrain. In general, upland areas are moderately to sharply dissected, while lowlands are relatively flat. There are a number of tributary streams with valleys that have formed major embankments and numerous coves that are of value to the scenic interest of visitors to the reservoir.

3.0 EXISTING TERRESTRIAL HABITATS

Using habitat types and descriptions from the EPA ecoregion and TCAP descriptions, the following are the major habitat types found on USACE fee-owned lands at Sam Rayburn Dam and Reservoir. Species listed are representative of dominant species found in each habitat type but should not be considered a comprehensive listing.

Pine Forest

Generally on drier sites, this is a dominant habitat type on USACE lands at Sam Rayburn Dam and Reservoir, covering approximately 6,005 acres. Pine forests are generally closed tree canopy forests dominated by loblolly pine (*Pinus taeda*), shortleaf pine (*Pinus echinata*), or a mixture of these two species. Most of the pine forest on USACE lands is naturally occurring but there are a few remnant pine plantations that were established prior to Federal ownership. Where these remnant plantations exist, slash pine (*Pinue elliottii*) may be present. These forests will generally have a minor component of deciduous trees including sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), post oak (*Quercus stellata*), white oak (*Quercus alba*), southern red oak (*Quercus falcata*), mockernut hickory (*Carya tomentosa*), shagbark hickory (*Carya ovata*), American elm (*Ulmus americana*), winged elm (*Ulmus alata*), and eastern red cedar (*Juniperus virginiana*).

Pine-Oak Forest

Typically occurring on more mesic sites, this habitat type covers 5,000 acres. Dominant and co-dominant tree species include loblolly and shortleaf pine, white oak, southern red oak, cherrybark oak (*Quercus pagoda*), Shumard oak (*Quercus shumardii*), hickories (*Carya* spp.), black walnut (*Juglans nigra*), sweetgum, magnolia (*Magnolia* sp.), and black gum.

Longleaf Pine Savannah

Typically on dry, sandy upland sites, this is a minor habitat type on USACE land and exists primarily in the vicinity of Ebenezer Park and a few other isolated locations. The dominant vegetation is a longleaf pine (*Pinus palustris*)-little bluestem (*Shizachyrium scoparium*) mix.

Bottomland Hardwoods

Located along flat riverine corridors, primarily in the Attoyac River and Ayish Bayou Arms of Sam Rayburn Reservoir, this habitat type covers 5,939 acres. Dominant and co-dominant species include water oak (*Quercus nigra*), willow oak (*Quercus phellos*), overcup oak (*Quercus lyrata*), nuttall oak (*Quercus nutalli*), swamp

chestnut oak (*Quercus michauxii*), red maple (*Acer rubrum*), water tupelo (*Nyssa aquatica*), river birch (*Betula nigra*), and green ash (*Fraxinus pennsylvanica*).

Forested Wetland

Located along flat shoreline areas of the reservoir, this habitat type covers 2,032 acres and is dominated by buttonbush (*Cephalanthus occidentalis*) flats with occasional stands of baldcypress (*Taxodium distichum*).

3.1 HABITAT EVALUATION METHODS

A team of biologists was convened to conduct a habitat evaluation of selected areas within the study area. The TPWD's WHAP and a project-specific FQA were used to analyze and describe the various existing habitats. The team collected field data on August 22-24, 2016. A total of 66 sites (see Figure 1) were randomly selected within the five major terrestrial habitat types delineated within the study area.

WHAP

The TPWD developed the WHAP to allow a qualitative, holistic evaluation of wildlife habitat for particular tracts of land statewide without imposing significant time requirements in regard to field work and compilation of data (TPWD 1995). The WHAP was not designed to evaluate habitat quality in relation to specific wildlife species.

The WHAP is based on the following assumptions:

1. that vegetation structure including species composition and physiognomy is itself sufficient to define the habitat suitability for wildlife;

2. that a positive relationship exists between vegetation diversity and wildlife species diversity;

3. that vegetation composition and primary productivity directly influence population densities of wildlife species.

As designed, the WHAP is intended to be used for the following applications:

1. Evaluating impacts upon wildlife populations from specific development project alternatives.

2. Establishing baseline data prior to anticipated or proposed changes in habitat conditions for specific areas.

3. Comparing tracts of land that are candidates for land acquisition or mitigation.

4. Evaluating general habitat quality and wildlife management potential for tracts of land over large geographical areas, including wildlife planning units.

The WHAP requires evaluating representative sites of each cover type present within an area of interest. For this project, a search area of 0.5 acre (circle with radius of 83 feet [28 yards]) was used at each WHAP site to compile a list of plant species occurring at each site and to complete the Biological Components Field Evaluation Form (https://tpwd.texas.gov/publications/pwdpubs/media/pwd_rp_w7000_0145.pdf). Field data collected on the form at each WHAP site included the following components:

1. Site Potential
2. Temporal Development of Existing Successional Stage
3. Uniqueness and Relative Abundance
4. Vegetation Species Diversity
5. Vertical Vegetation Stratification
6. Additional Structural Diversity
7. Condition of Existing Vegetation

At each site, points were assigned to all applicable components based on field conditions. A habitat quality score, where values range from 0.0 (low quality) to 1.0 (high quality), was then calculated for each site by adding together all points and multiplying by 0.01. An average habitat quality score was determined for all sites within the same habitat type.

Photographs were taken at each site and are included as Attachment A.

FQA

The FQA is a tool to assist environmental consultants, scientists, natural resource managers, land stewards, environmental decision-makers, and restoration scientists in assessing the floristic, and implicitly, natural significance of an area. Applications of this system include the identification of remnant habitats of native floristic significance, comparisons between different sites, long-term monitoring of floristic quality, monitoring the progress of habitat restoration, and the use of National Wetland Categories to assist in the identification of wetlands. It can also be used to help make permitting decisions and to develop performance standards and mitigation criteria (Wilhelm 1991, 1992, and 1993, Andreas and Lichvar 1995, Herman 1994). The FQA helps to give meaning to a group of plant species, beyond their presence on a list, by providing the mean coefficient of conservatism (CC) and the floristic quality index (FQI). In this instance, the FQA was used to provide a comparison of floristic quality among different habitats and sampling sites at Sam Rayburn Dam and Reservoir.

To develop the FQA for Sam Rayburn Reservoir and Dam, an interagency team consisting of the USACE, U.S. Forest Service, TPWD, and private botanical experts compiled a thorough list of the vascular plants known to occur in the area. This list is not to be regarded as a definitive flora list, but as a utility database, only to be used as a reference for applications of the Sam Rayburn FQA.

The concept of species conservatism is the foundation for the FQA. Each species on the list generated by the interagency team was assigned a CC, following the methodology and philosophy detailed in Swink and Wilhelm (1994) and Wilhelm and Masters (1995). Values for CC ranged from -3 to 10 and represented an estimated probability that a plant was likely to occur in a landscape relatively unaltered from what is believed to be pre-European settlement condition. Negative CC values were utilized for non-native species, with lower values assigned to more invasive species. A CC of -3, for example, was given to Chinese tallow (*Triadica sebifera*). A CC of 1 was given to species that demonstrated little fidelity to any natural community and may be found almost anywhere, such as yellow nutsedge (*Cyperus esculentus*). Intermediate CC values were assigned to taxa such as wiregrass (*Sporobolus junceus*) and longleaf pine when it was certain that the species was within a remnant natural community but the community was degraded. A CC closer to 10 was applied to those plants like planer tree (*Planera aquatica*; CC = 7) or nuttall oak (CC =8) that were almost always restricted to high quality natural areas.

The FQA was applied by calculating a mean CC and an FQI from the comprehensive list of plant species observed from a particular site. This was done by summing the CC values of all the plant species observed at a site and dividing by the total number of plant observed at the site, yielding an average or the mean CC. The mean CC was then multiplied by the square root of the total number of plant species observed at the site to yield the FQI. The square root is used as a multiplier to transform the mean CC and allow for better comparison of the FQI between large sites with a high number of species and small sites with fewer species. Sites with the same CC may have different FQIs, and sites with the same FQI may have different CCs (Goforth et al. 2001, Taft et al. 1997).

In general, an FQI of 1 through 19 indicates low vegetative quality; 20-35 indicates high vegetative quality, and an FQI above 35 indicates “Natural Area” quality (Wilhelm and Masters 1999). Wetlands with a FQI of 20 or greater are considered high-quality aquatic resources (Wilhelm and Masters 1999).

3.2 HABITAT DESCRIPTIONS AND HABITAT SCORES

Attachment B provides a summary of the WHAP and FQI results at all Sam Rayburn Dam and Reservoir sites.

Pine Forest

There were 39 Pine Forest sites assessed. WHAP habitat quality scores ranged from a low of 0.30 to a high of 0.85. The average WHAP habitat quality score for this habitat type was 0.61 (Attachment B). Generally the pine forests observed around Sam Rayburn Reservoir were in fair to good condition. The dominant woody species were loblolly pine, sweetgum, and southern red oak. The most commonly observed herbaceous species were little bluestem and wiregrass (*Sporobolus junceus*). Floristic

quality values ranged from 2.5 to 12.0, with an average FQI of 7.7 for Pine Forest sites (Attachment B).

Pine-Oak Forest

There were 11 Pine-Oak Forest sites assessed that had WHAP habitat quality scores that ranged from a low of 0.46 to a high of 0.79. The average WHAP score for this habitat type was 0.62 (Attachment B). Generally the pine-oak forests observed around Sam Rayburn Reservoir were in fair to good condition. The dominant woody species were loblolly pine, American beautyberry (*Callicarpa americana*), sweetgum, cherrybark oak, and white oak. The most commonly observed herbaceous species were little bluestem, longleaf woodoats (*Chasmanthium sessiliflorum*), and slender woodoats (*Chasmanthium laxum*). Floristic quality values ranged from 3.1 to 14.2, with an average FQI of 11.0 for Pine-Oak Forest sites (Attachment B).

Longleaf Pine Savannah

Only one Longleaf Pine Savannah site was assessed. The site had a WHAP habitat quality score of 0.68 (Attachment B). Longleaf pine savannah habitat is rare and often degraded in areas around Sam Rayburn Reservoir; however, the area sampled for the WHAP was in very good condition. The dominant woody species were longleaf pine, American beautyberry, common persimmon (*Diospyros virginiana*), and sweetgum. The dominant herbaceous species were little bluestem, wiregrass, and flowering spurge (*Euphorbia corollata*). The floristic quality value for the Longleaf Pine Savannah site was 11.5 (Attachment B).

Bottomland Hardwoods

There were nine Bottomland Hardwoods sites assessed that had WHAP habitat quality scores that ranged from a low of 0.50 to a high of 0.82. The average WHAP score for this habitat type was 0.69 (Attachment B). Generally, the bottomland hardwoods forests observed around Sam Rayburn Reservoir were in good condition. The dominant woody species were water oak, willow oak, buttonbush, baldcypress, black hickory (*Carya texana*), and climbing hemp vine (*Mikania scandens*). The most commonly observed herbaceous species were lizard's tail (*Saururus cernuus*), smartweed (*Polygonum sagittatum*), Scribner's rosette grass (*Dichanthelium oligosanthes*), and longleaf woodoats. Floristic quality values ranged from 5.7 to 13.6, with an average FQI of 10.2 for Bottomland Hardwoods sites (Attachment B).

Forested Wetland

There were six Forested Wetland sites assessed that had WHAP habitat quality scores that ranged from a low of 0.71 to a high of 0.94. The average WHAP score for this habitat type was 0.78 (Attachment B). Generally forested wetlands observed around Sam Rayburn Reservoir were in good condition. The dominant woody species were planer tree (*Planera aquatica*), baldcypress, and buttonbush. Most Forested

Wetland sites lacked an herbaceous vegetation layer; the only herbaceous species observed was torpedograss (*Panicum repens*). Floristic quality values ranged from 4.9 to 11.5, with an average FQI of 8.3 for Forest Wetland sites (Attachment B).

Surveys were conducted in sub-optimum conditions due to previous weather events, including recent historical flooding in 2015. Therefore, the habitat quality, particularly the FQA scores, may not be reflected by the data collected.

4.0 SUMMARY

Even with planned and unplanned disturbances, there are numerous areas of valuable wildlife habitat remaining within the USACE land boundary in Angelina, Jasper, Nacogdoches, Sabine, and San Augustine Counties. The majority of wildlife habitat on USACE lands at Sam Rayburn Dam and Reservoir has been adversely affected by long-term inundation resulting from the periodic impoundment of floodwater. Added to these impacts have been the relatively recent effects from hurricanes Rita (2005) and Ike (2008), as well as historical flooding in 2015. The management response to these events has included the salvage of flood-killed and storm-damaged timber, the planting of flood-tolerant trees and shrubs in select areas prone to inundation, and the improvement of upland habitats through selective timber harvests, prescribed fire, and tree plantings, with an overall goal of increasing species diversity and maintaining forest vigor and health. Overall, this management response has proven effective in maintaining medium- to high-quality wildlife habitat on those USACE lands located at or above elevation 175 feet National Geodetic Vertical Datum (NGVD). Improvement of habitats in areas lying below the 175 feet NGVD elevation is difficult due to periodic long-term inundation and related wave action, but there has been some success in establishing flood-tolerant vegetation in low-lying areas.

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ATTACHEMENT A
WHAP SITE PHOTOGRAPHS

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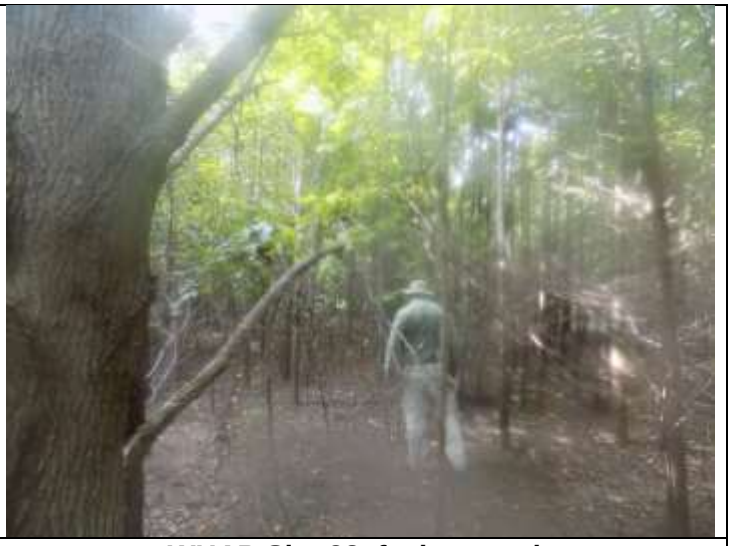

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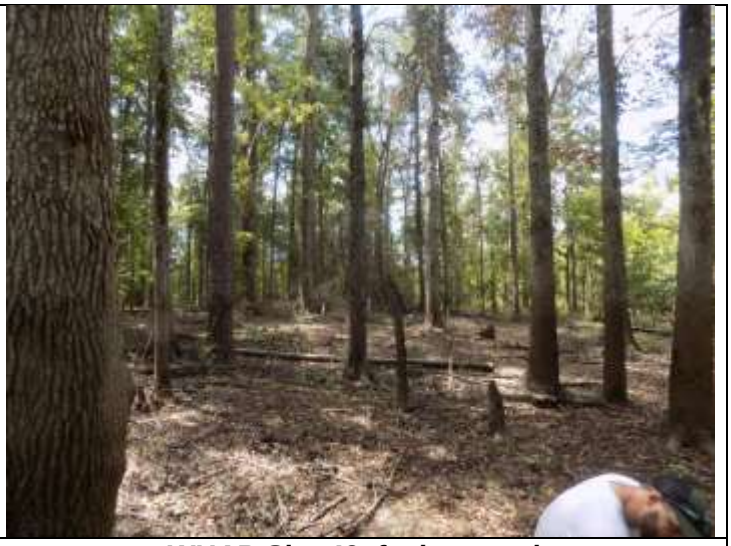

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ATTACHMENT B
SAM RAYBURN DAM AND RESERVOIR WHAP AND FQI RESULTS SUMMARY

Sam Rayburn Dam and Reservoir WHAP and FQI Results Summary

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
1	Pine Forest	0.53	9.3	Winged sumac Huckleberry Longleaf pine Loblolly pine Sweetgum Wax myrtle	Bosc's mille graines Slender woodoats Little bluestem Vervain Milkweed Wiregrass
2	Pine Forest	0.69	10.0	Dewberry American beautyberry Sassafras Wax myrtle Deer pea Blackjack oak Willow oak Southern red oak Sweetgum Loblolly pine	Little bluestem Small Nuttall's wild indigo Wiregrass Needleleaf rosettegrass
3	Longleaf Savannah	0.68	10.7	American Beautyberry Common persimmon Sweet Gum Poison oak Deer pea Longleaf pine	Little bluestem Ragweed Wiregrass Smallhead doll's daisy Yellow nutsedge St. John's wort Flowering spurge Eastern purple coneflower
4	Pine Forest	0.67	9.2	Green ash Sweetbay magnolia Flowering dogwood Yaupon Planer tree White oak Red oak Blackjack oak Longleaf pine	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
5	Pine Forest	0.60	9.2	Common persimmon Deciduous holly Chinese tallow Post oak Red oak Water Oak Green ash Loblolly pine Sweetgum Button bush Peppervine Greenbrier Yellow jasmine	Slender wood oats Flowering spurge Milkweed Englemann's milkvetch Spanish moss
6	Pine Forest	0.47	3.0	Common persimmon Chinese tallow Water oak Willow oak Loblolly pine Sweetgum Peppervine Trumpet creeper Japanese honeysuckle	No herbaceous species observed
7	Pine-Oak Forest	0.58	13.3	Summer grape Chinese tallow American elm Sweetgum Cherrybark oak American beautyberry Water oak Florida maple Shumard oak Planer tree Button bush American black elderberry Japanese honeysuckle	Smartweed Morning glory Soft thistle Jumpseed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
8	Pine-Oak Forest	0.61	14.2	Southern hackberry American beautyberry Yaupon Rattan vine Poison ivy Southern red oak Blackjack oak Pignut hickory American hop hornbeam Florida maple American elm Green ash Sweetgum	Slender wood oats Carolina lilly
9	Pine-Oak Forest	0.60	10.0	Common persimmon Tupelo gum Chinese tallow Rattlebox Southern red oak White oak Cherrybark oak Green ash Sweetgum	Baldwin's flatsedge Bosc's mille graines Slender wood oats Yellow jasmine
10	Pine Forest	0.64	11.6	Yaupon American beautyberry Chinese tallow Muscadine Cherrybark oak Southern red oak American hop hornbeam American elm Green ash Loblolly pine Sweetgum	Slender wood oats St. John's wort Dog fennel Wiregrass Atlantic pigeonwings Dropseed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
11	Pine Forest	0.63	12.0	Common persimmon Muscadine Southern dewberry Shumard oak Southern red oak Florida maple Loblolly pine Witch hazel Sweetgum	Slender wood oats Dog fennel Needleleaf rosettegrass Atlantic pigeonwings Sea myrtle
12	Pine Forest	0.61	11.6	Black gum Southern red oak Water oak Water hickory Florida maple American elm Baldcypress Longleaf pine Button bush Sweetgum Dwarf palmetto	Heliotrope Lizard's tail Giant salvinia Yellow jasmine
13	Pine Forest	0.53	2.5	Chinese tallow Water oak Shortleaf pine Loblolly pine	No herbaceous species observed
14	Pine-Oak Forest	0.46	3.1	Sassafras Green ash Sycamore Sweetgum Chinese tallow	No herbaceous species observed
15	Pine Forest	0.49	4.9	Yaupon Dogwood Poison ivy Chinese tallow Water oak Loblolly pine Sweetgum Longleaf pine	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
16	Pine Forest	0.55	6.5	Yaupon Post oak Water oak Loblolly pine Sycamore	Cherokee nutsedge
17	Pine-Oak Forest	0.57	5.4	Greenbrier Peppervine Muscadine Chinese tallow Water oak Cottonwood Sweetgum	Prairie milkvine Lizard's tail Heliotrope
18	Bottomland Hardwoods	0.61	12.2	American elm Green ash Willow oak Chinese tallow Southern hackberry Honey locust Dwarf palmetto Greenbrier Horse sugar Sweetgum Button bush Arrowwood Peppervine	Sensitive fern Lizard's tail Salvinia Smartweed Switch cane Scribner's rosette grass
19	Forested Wetland	0.72	10.5	Honey locust Planer tree Baldcypress Button bush	No herbaceous species observed
20	Forested Wetland	0.71	7.8	Planer tree Button bush	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
21	Bottomland Hardwoods	0.82	11.5	Common persimmon Chinese privet Honey locust Water oak Willow oak Nuttal oak Black Hickory River birch Planer tree Sweetgum Button bush Summer grape Climbing hemp vine	Giant salvinia
22	Forested Wetland	0.78	11.5	Nuttal oak Planer tree Black willow Button bush	No herbaceous species observed
23	Bottomland Hardwoods	0.78	8.0	Persimmon Chinese privet Water oak Planer tree Baldcypress Loblolly pine Button bush Sweetgum Climbing hemp vine	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
24	Bottomland Hardwoods	0.74	13.6	Common persimmon Chinese tallow Common grape Swamp chestnut oak Water oak Black hickory American elm Baldcypress Sweetgum Button bush Longleaf wood oats Yellow nutsedge False nettle Peppervine Climbing hemp vine Dwarf palmetto	Cutgrass Milkweed Cat greenbrier Cherokee sedge
25	Pine-Oak Forest	0.66	14.7	Common persimmon American beautyberry Southern dewberry Water oak Cow oak Cherrybark oak Pignut hickory American hop hornbeam Boxelder Green ash Sweetgum	Slender wood oats Switch cane Fragrant flatsedge Bosc's mille graines
26	Bottomland Hardwoods	0.82	9.8	Persimmon Greenbrier Honey locust Water oak Nuttal oak Willow oak American hornbeam Sweetgum Button bush Chinese tallow	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
27	Pine-Oak Forest	0.57	14.3	Summer Grape Greenbrier Yaupon Sassafras American holly Flowering dogwood Tupelo Common persimmon American beautyberry Cherrybark oak Swamp chestnut oak White oak Winged elm American elm Red maple Loblolly pine Sweetgum Peppervine Virginia creeper Poison ivy Crossvine	Longleaf wood oats Frostweed Dog fennel
28	Bottomland Hardwoods	0.60	8.0	American beautyberry Chinese tallow Water oak Pignut Hickory Loblolly pine American elm Trumpet vine	Jumpseed Lizard's tail

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
29	Pine Forest	0.66	9.4	Greenbrier Summer grape American beautyberry Yaupon Saint andrews cross Sparkleberry White oak Cherrybark oak Walnut Sugar maple American elm Loblolly pine Sweetgum Japanese honeysuckle	No herbaceous species observed
30	Pine-Oak Forest	0.79	8.2	Virginia creeper Peppervine Greenbrier Saint andrews cross Water oak Pignut Hickory American hop hornbeam American elm Chinese tallow Sweetgum	No herbaceous species observed
31	Forested Wetland	0.94	8.9	Black gum Peppervine Willow oak Water oak Baldcypress American elm Red maple Sweetgum Chinese tallow Button bush	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
32	Pine-Oak Forest	0.66	14.1	American holly Sassafras Pawpaw Yaupon American beautyberry Summer grape Saw greenbrier Common greenbrier White oak Swamp chestnut oak Southern red oak Water oak Mockernut hickory Black hickory American elm Sweetgum Chinese tallow American beech	False nettle Longleaf wood oats
33	Pine Forest	0.85	11.4	American holly Honey locust Water oak Swamp chestnut oak Willow oak Loblolly pine Baldcypress Sweetgum Chinese tallow Button bush Climbing hemp vine Crossvine	Smartweed Yellow nutsedge Rice cutgrass False nettle Floating primrose Heliotrope Dollar weed Ragweed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
34	Bottomland Hardwoods	0.75	11.9	Common persimmon Greenbrier Chinese privet Summer Grape Honey locust American hornbeam Carolina ash Planer tree Baldcypress Button bush Sweetgum Chinese tallow Climbing hemp vine Crossvine	Heliotrope Longleaf wood oats Peppervine Scribner's rosette grass Smartweed
35	Pine Forest	0.60	10.8	Yaupon Flowering dogwood American beautyberry Summer Grape Water oak Southern red oak Wax myrtle American elm Green ash Red maple Loblolly pine Sweetgum	Longleaf wood oats Cherokee sedge Crossvine
36	Forested Wetland	0.73	6.3	Planer tree Honey locust Loblolly pine Button bush	Torpedo grass

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
37	Pine-Oak Forest	0.69	11.3	Chines tallow Muscadine American beautyberry Persimmon Cherrybark oak Water oak Cow oak Willow oak Water hickory American hop hornbeam Slippery elm Sweetgum	No herbaceous species observed
38	Bottomland Hardwoods	0.62	11.0	Greenbrier Persimmon Chinese tallow White oak Black hickory Winged elm Baldcypress Sweetgum Coral vine Crossvine Climbing hemp vine Crossvine Southern dewberry	False nettle

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
39	Pine Forest	0.72	10.8	Black gum American beautyberry Chinese tallow Yaupon Greenbrier Flowering dogwood Southern red oak Willow oak White oak Hickory American hop hornbeam Loblolly pine Shortleaf pine Green ash Sweetgum	Yellow nutsedge
40	Pine Forest	0.30	7.5	American beautyberry Summer Grape Yaupon Post oak Water oak Loblolly pine Shortleaf pine Eastern baccharis	Dog fennel Slender wood oats Dwarf plantain Woolly croton
41	Pine Forest	0.69	11.4	Yaupon Flowering dogwood Black gum American beautyberry Southern red oak White oak Hickory Red maple Loblolly pine Sweetgum	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
42	Pine Forest	0.60	8.1	Chinese tallow Yaupon Red mulberry Huckleberry Greenbrier Summer grape White oak Southern red oak American hop hornbeam Loblolly pine Sweetgum	Scribner's rosette grass
43	Forested Wetland	0.78	4.9	Summer grape Black cherry Yaupon Water oak Green ash Sweetgum Chinese tallow Button bush	No herbaceous species observed
44	Bottomland Hardwoods	0.50	5.7	Button bush Black willow	No herbaceous species observed
45	Pine Forest	0.59	6.4	American beautyberry Yaupon Chinese tallow Muscadine Southern dewberry Greenbrier Southern red oak Wax myrtle Loblolly pine Sassafras Hickory	Scribner's rosette grass

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
46	Pine Forest	0.62	5.1	Sweetgum Chinese tallow American beautyberry Yaupon Muscadine Honey locust Water oak Carolina buckthorn Loblolly pine	Yellow nutsedge
47	Pine Forest	0.64	6.1	Sweetgum Chinese tallow Common persimmon Greenbrier Black gum Water oak Willow oak Longleaf pine	Yellow nutsegde Ragweed Johnson grass Longleaf wood oats Woolly croton
48	Pine-Oak Forest	0.68	12.3	Deciduous holly Sweetgum Common persimmon Yaupon American beautyberry Muscadine Greenbrier White oak Black walnut American hornbeam American elm Sassafras	Dog fennel Paspalum Yellow nutsedge Curly dock Baldcypress Longleaf wood oats

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
49	Pine Forest	0.71	8.9	Summer grape Greenbrier Persimmon Chinese tallow Water oak Willow oak Southern red oak Cherrybark oak American elm Winged elm Loblolly pine Baldcypress Sweetgum	No herbaceous species observed
50	Pine Forest	0.69	8.4	Summer grape Greenbrier Persimmon Chinese tallow Water oak Willow oak Water hickory American elm Loblolly pine Sweetgum	Slender wood oats
51	Pine Forest	0.74	9.7	Summer grape Greenbrier Black gum Water oak Willow oak American hornbeam River birch Slippery elm Loblolly pine Sweetgum Cottonwood	Woolly croton Giant cane

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
52	Pine Forest	0.50	7.7	Yaupon American holly Sweetgum Greenbrier Muscadine Willow oak American elm Loblolly pine Florida maple	No herbaceous species observed
53	Pine Forest	0.49	4.9	Deciduous holly Muscadine Peppervine Post oak Willow oak Loblolly pine	No herbaceous species observed
54	Pine Forest	0.48	6.0	Sweetgum Chinese tallow Deciduous holly Water oak Greenbrier Black gum Loblolly pine	Cherokee nutsedge Lizard's tail
55	Pine Forest	0.60	3.7	Sweetgum Yaupon American beautyberry Muscadine Water oak Loblolly pine	No herbaceous species observed
56	Pine Forest	0.71	6.7	Greenbrier American beautyberry Black gum Sweetgum Southern red oak Dewberry Loblolly pine Sassafras Winged sumac	Cherokee nutsedge Torpedo grass Little bluestem Goldenrod

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
57	Pine Forest	0.71	11.2	Yaupon American holly Muscadine Sassafras American beautyberry White oak Cherrybark oak Willow oak Wax myrtle Loblolly pine Black gum Flowering dogwood Shortleaf pine	Little bluestem Dog fennel Scribner's rosette grass Ragweed
58	Pine Forest	0.73	4.1	Chinese tallow Black gum Greenbrier Water oak Willow oak Winged elm Loblolly pine Sweetgum Button bush	Alligator weed
59	Pine Forest	0.71	5.3	Chinese tallow Summer grape Willow oak Water oak Loblolly pine Baldcypress Sweetgum	No herbaceous species observed
60	Pine Forest	0.72	8.8	Chinese tallow Swamp chestnut oak Water oak Willow oak Slippery elm Loblolly pine Baldcypress Button bush	No herbaceous species observed

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
61	Pine Forest	0.71	9.6	Chinese tallow Button bush Summer grape Persimmon White oak Post oak Water oak Willow oak Loblolly pine Baldcypress Longleaf pine Sweetgum	Little bluestem Alligator weed
62	Pine Forest	0.56	7.2	Sweetgum Water oak Loblolly pine Red maple American elm	No herbaceous species observed
63	Pine Forest	0.59	3.9	Sweetgum Sparkleberry Greenbrier Chinese tallow Southern red oak Water oak Loblolly pine Dog fennel	Bermuda grass Cherokee nutsedge Scribner's rosette grass
64	Pine Forest	0.54	4.7	Sweetgum Black gum Huckleberry Chinese tallow Muscadine Water Oak Loblolly pine	Cherokee nutsedge Ragweed
65	Pine Forest	0.45	6.7	Sweetgum American beautyberry Yaupon Southern red oak Loblolly pine	Paspalum Cherokee nutsedge Scribner's rosette grass

Site	Habitat Type	WHAP Score	FQI Value	Woody Species	Herbaceous Species
66	Pine Forest	0.58	5.7	American beautyberry Yaupon Southern red oak Blackjack oak Loblolly pine	Little bluestem Dog fennel Woolly croton

APPENDIX E – ENVIRONMENTAL DOCUMENTS

USFWS IPaC REPORT

TPWD COUNTY LISTS OF RARE SPECIES

TPWD LIST OF SPECIES OF GREATEST CONSERVATION NEED PINEYWOODS ECOREGION

TPWD WESTERN GULF COASTAL PLAINS LIST OF RARE COMMUNITIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arlington Ecological Services Field Office
2005 NE GREEN OAKS BLVD, SUITE 140
ARLINGTON, TX 76006
PHONE: (817)277-1100 FAX: (817)277-1129
URL: www.fws.gov/southwest/es/arlingtontexas/;
www.fws.gov/southwest/es/EndangeredSpecies/lists/

Consultation Code: 02ETAR00-2017-SLI-0503 January 19, 2017
Event Code: 02ETAR00-2017-E-00862
Project Name: Sam Rayburn Reservoir Master Plan Revision

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

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

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under section 7(a)(1) of the Act, Federal agencies are directed to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Under and 7(a)(2) and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether their actions may affect threatened and endangered species and/or designated critical habitat. A Federal action is an activity or program authorized, funded, or carried out, in whole or in part, by a Federal agency (50 CFR 402.02).

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

After evaluating the potential effects of a proposed action on federally listed species, one of the

following determinations should be made by the Federal agency:

1. *No effect* - the appropriate determination when a project, as proposed, is anticipated to have no effects to listed species or critical habitat. A "no effect" determination does not require section 7 consultation and no coordination or contact with the Service is necessary. However, the action agency should maintain a complete record of their evaluation, including the steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information.
2. *May affect, but is not likely to adversely affect* - the appropriate determination when a proposed action's anticipated effects are insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of a listed species occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects, or expect discountable effects to occur. This determination requires written concurrence from the Service. A biological evaluation or other supporting information justifying this determination should be submitted with a request for written concurrence.
3. *May affect, is likely to adversely affect* - the appropriate determination if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed action, and the effect is not discountable or insignificant. This determination requires formal section 7 consultation.

The Service recommends that candidate species, proposed species, and proposed critical habitat be addressed should consultation be necessary. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

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

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

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

For additional information concerning migratory birds and eagle conservation plans, please contact the Service's Migratory Bird Office at 505-248-7882.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Sam Rayburn Reservoir Master Plan Revision

Official Species List

Provided by:

Arlington Ecological Services Field Office
2005 NE GREEN OAKS BLVD
SUITE 140
ARLINGTON, TX 76006
(817) 277-1100
http://www.fws.gov/southwest/es/arlingtontexas/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

Expect additional Species list documents from the following office(s):

Texas Coastal Ecological Services Field Office
17629 EL CAMINO REAL, SUITE 211
HOUSTON, TX 77058
(281) 286-8282
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Consultation Code: 02ETAR00-2017-SLI-0503
Event Code: 02ETAR00-2017-E-00862

Project Type: LAND - MANAGEMENT PLANS

Project Name: Sam Rayburn Reservoir Master Plan Revision
Project Description: The USACE Master Plan for Sam Rayburn Reservoir is a land use and recreation management plan. The current plan was published in 1970 and is being revised. The revised plan will reclassify USACE-administered Federal lands at Sam Rayburn Reservoir and establish new Resource Objectives.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-94.44149781949821 31.19541719998062, -94.73208629060537 31.484424930105877, -94.44204721134157 31.419756871165358, -94.35415658634157 31.300613608644856, -94.33547986205669 31.41506904661678, -94.28604138549419 31.396315405928537, -94.29043584968896 31.27995927001477, -94.23660290893169 31.267752318175166, -94.2377015249804 31.22454576172231, -94.13333132397385 31.190718181583144, -94.1355287237093 31.277142426845995, -94.09048471134157 31.274325463730463, -94.02786267455669 31.183199302699926, -94.01797487866135 31.233000783907567, -93.97842419799419 31.230182539179232, -93.96743786986919 31.160639047216076, -94.08499142155051 31.028459941102916, -94.44149781949821 31.19541719998062)))

Project Counties: Angelina, TX | Jasper, TX | Nacogdoches, TX | Sabine, TX | San Augustine, TX

Endangered Species Act Species List

There are a total of 5 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	**Status**	**Has Critical Habitat**	**Condition(s)**
Least tern *(Sterna antillarum)* Population: interior pop.	Endangered		Wind Energy Projects
Piping Plover *(Charadrius melodus)* Population: except Great Lakes watershed	Threatened	Final designated	Wind Energy Projects
Red Knot *(Calidris canutus rufa)* Population: Wherever found	Threatened		Wind Energy Projects
Red-Cockaded woodpecker *(Picoides borealis)* Population: Wherever found	Endangered		
Reptiles			
Louisiana Pine snake *(Pituophis ruthveni)* Population: Wherever found	Proposed Threatened		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 EL CAMINO REAL, SUITE 211
HOUSTON, TX 77058
PHONE: (281)286-8282 FAX: (281)488-5882
URL: www.fws.gov/southwest/es/TexasCoastal/;
www.fws.gov/southwest/es/ES_Lists_Main2.html

Consultation Code: 02ETTX00-2017-SLI-0510 January 19, 2017
Event Code: 02ETTX00-2017-E-00759
Project Name: Sam Rayburn Reservoir Master Plan Revision

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The U.S. Fish and Wildlife Service (Service) field offices in Clear Lake, Tx, and Corpus Christi, Tx, have combined administratively to form the Texas Coastal Ecological Services Field Office. A map of the Texas Coastal Ecological Services Field Office area of responsibility can be found at: http://www.fws.gov/southwest/es/TexasCoastal/Map.html. All project related correspondence should be sent to the field office responsible for the area in which your project occurs. For projects located in southeast Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; 17629 El Camino Real Ste. 211; Houston, Texas 77058. For projects located in southern Texas please write to: Field Supervisor; U.S. Fish and Wildlife Service; P.O. Box 81468; Corpus Christi, Texas 78468-1468.

The enclosed species list identifies federally threatened, endangered, and proposed to be listed species; designated critical habitat; and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list is provided by the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information from updated surveys, changes in the abundance and distribution of species, changes in habitat conditions, or other factors could change the list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website http://ecos.fws.gov/ipac/ at regular intervals during project planning and implementation for updates to species list and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Candidate species have no protection under the Act but are included for consideration because they could be listed prior to the completion of your project. The other species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if the activity results in the death or injury of wildlife by removing essential habitat components or significantly alters essential behavior patterns, including breeding, feeding, or sheltering.

Section 7

Section 7 of the Act requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species. If a "may affect" determination is made, the Federal agency shall initiate the section 7 consultation process by writing to the office that has responsibility for the area in which your project occurs.

Is not likely to adversely affect - the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The Federal agency or the designated non-Federal representative should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect - adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires the Federal action agency to initiate formal section 7 consultation with this office.

No effect - the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No further coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel

conducting the evaluation, habitat conditions, site photographs, and any other related articles.

Please be advised that while a Federal agency may designate a non-Federal representative to conduct informal consultations with the Service, assess project effects, or prepare a biological assessment, the Federal agency must notify the Service in writing of such a designation. The Federal agency shall also independently review and evaluate the scope and contents of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Act requirements for your projects at: http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

Section 10

If there is no federal involvement and the proposed project is being funded or carried out by private interests and/or non-federal government agencies, and the project as proposed may affect listed species, a section 10(a)(1)(B) permit is recommended. The Habitat Conservation Planning Handbook is available at http://www.fws.gov/midwest/endangered/permits/hcp/hcphandbook.html.

Service Response

Please note that the Service strives to respond to requests for project review within 30 days of receipt, however, this time period is not mandated by regulation. Responses may be delayed due to workload and lack of staff. Failure to meet the 30-day timeframe does not constitute a concurrence from the Service that the proposed project will not have impacts to threatened and endangered species.

Candidate Species

Several species of freshwater mussels occur in Texas and five are candidates for listing under the ESA. The Service is also reviewing the status of six other species for potential listing under the ESA. One of the main contributors to mussel die offs is sedimentation, which smothers and suffocates mussels. To reduce sedimentation within rivers, streams, and tributaries crossed by a project, the Service recommends that that you implement the best management practices found at: http://www.fws.gov/southwest/es/TexasCoastal/FreshwaterMussels.html.

Candidate Conservation Agreements (CCAs) or Candidate Conservation Agreements with Assurances (CCAAs) are voluntary agreements between the Service and public or private entities to implement conservation measures to address threats to candidate species. Implementing conservation efforts before species are listed increases the likelihood that simpler, flexible, and more cost-effective conservation options are available. A CCAA can provide participants with assurances that if they engage in conservation actions, they will not be required to implement additional conservation measures beyond those in the agreement. For additional information on CCAs/CCAAs please visit the Service's website at http://www.fws.gov/endangered/what-we-do/cca.html.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals or eggs. If project activities must be conducted during this time, we recommend surveying for active nests prior to commencing work. A list of migratory birds may be viewed at http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtandx.html.

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the Act on August 9, 2007. Both the bald eagle and the goden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For more information on bald and golden eagle management guidlines, we recommend you review information provided at http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf

The construction of overhead power lines creates threats of avian collision and electrocution. The Service recommends the installation of underground rather than overhead power lines whenever possible. For new overhead lines or retrofitting of old lines, we recommend that project developers implement, to the maximum extent practicable, the Avian Power Line Interaction Committee guidelines found at http://www.aplic.org/.

Meteorological and communication towers are estimated to kill millions of birds per year. We recommend following the guidance set forth in the Service Interim Guidelines for Recommendations on Communications Tower Siting, Constructions, Operation and Decommissioning, found online at: http://www.fws.gov/habitatconservation/communicationtowers.html, to minimize the threat of avian mortality at these towers. Monitoring at these towers would provide insight into the effectiveness of the minimization measures. We request the results of any wildlife mortality monitoring at towers associated with this project.

We request that you provide us with the final location and specifications of your proposed towers, as well as the recommendations implemented. A Tower Site Evaluation Form is also available via the above website; we recommend you complete this form and keep it in your files. If meteorological towers are to be constructed, please forward this completed form to our office.

More information concerning sections 7 and 10 of the Act, migratory birds, candidate species, and landowner tools can be found on our website at: http://www.fws.gov/southwest/es/TexasCoastal/ProjectReviews.html.

Wetlands and Wildlife Habitat

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to

ood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the oodplain and/or wetland area during construction to prevent possible contamination of water and soils.

Wetlands and riparian areas are high priority fish and wildlife habitat, serving as important sources of food, cover, and shelter for numerous species of resident and migratory wildlife. Waterfowl and other migratory birds use wetlands and riparian corridors as stopover, feeding, and nesting areas. We strongly recommend that the selected project site not impact wetlands and riparian areas, and be located as far as practical from these areas. Migratory birds tend to concentrate in or near wetlands and riparian areas and use these areas as migratory yways or corridors. After every effort has been made to avoid impacting wetlands, you anticipate unavoidable wetland impacts will occur; you should contact the appropriate U.S. Army Corps of Engineers office to determine if a permit is necessary prior to commencement of construction activities.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping (42 C.F.R. 26961), where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), 4200 Smith School Road, Austin, Texas 78744 (telephone 512/389-8021) for information concerning fish, wildlife, and plants of State concern or visit their website at: http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/.

If we can be of further assistance, or if you have any questions about these comments, please contact 281/286-8282 if your project is in southeast Texas, or 361/994-9005 if your project is in southern Texas. Please refer to the Service consultation number listed above in any future correspondence regarding this project.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Sam Rayburn Reservoir Master Plan Revision

Official Species List

Provided by:

Texas Coastal Ecological Services Field Office
17629 EL CAMINO REAL, SUITE 211
HOUSTON, TX 77058
(281) 286-8282
http://www.fws.gov/southwest/es/TexasCoastal/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Expect additional Species list documents from the following office(s):

Arlington Ecological Services Field Office
2005 NE GREEN OAKS BLVD
SUITE 140
ARLINGTON, TX 76006
(817) 277-1100
http://www.fws.gov/southwest/es/arlingtontexas/
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/

Consultation Code: 02ETTX00-2017-SLI-0510
Event Code: 02ETTX00-2017-E-00759

Project Type: LAND - MANAGEMENT PLANS

Project Name: Sam Rayburn Reservoir Master Plan Revision
Project Description: The USACE Master Plan for Sam Rayburn Reservoir is a land use and recreation management plan. The current plan was published in 1970 and is being revised. The revised plan will reclassify USACE-administered Federal lands at Sam Rayburn Reservoir and establish new Resource Objectives.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-94.44149781949821 31.19541719998062, -94.73208629060537 31.484424930105877, -94.44204721134157 31.419756871165358, -94.35415658634157 31.300613608644856, -94.33547986205669 31.41506904661678, -94.28604138549419 31.396315405928537, -94.29043584968896 31.27995927001477, -94.23660290893169 31.267752318175166, -94.2377015249804 31.22454576172231, -94.13333132397385 31.190718181583144, -94.1355287237093 31.277142426845995, -94.09048471134157 31.274325463730463, -94.02786267455669 31.183199302699926, -94.01797487866135 31.233000783907567, -93.97842419799419 31.230182539179232, -93.96743786986919 31.160639047216076, -94.08499142155051 31.028459941102916, -94.44149781949821 31.19541719998062)))

Project Counties: Angelina, TX | Jasper, TX | Nacogdoches, TX | Sabine, TX | San Augustine, TX

Endangered Species Act Species List

There are a total of 8 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	**Status**	**Has Critical Habitat**	**Condition(s)**
Least tern *(Sterna antillarum)* Population: interior pop.	Endangered		Wind related projects within migratory route.
Piping Plover *(Charadrius melodus)* Population: except Great Lakes watershed	Threatened	Final designated	Wind related projects within migratory route.
Red Knot *(Calidris canutus rufa)* Population: Wherever found	Threatened		Wind related projects within migratory route.
Red-Cockaded woodpecker *(Picoides borealis)* Population: Wherever found	Endangered		
Flowering Plants			
Navasota ladies'-tresses *(Spiranthes parksii)* Population: Wherever found	Endangered		
Texas Golden Gladecress *(Leavenworthia texana)* Population: Wherever found	Endangered	Final designated	

White bladderpod *(Lesquerella pallida)* Population: Wherever found	Endangered		
Reptiles			
Louisiana Pine snake *(Pituophis ruthveni)* Population: Wherever found	Proposed Threatened		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

Last Revision: 7/25/2016 4:52:00 PM

ANGELINA COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bachman's Sparrow	*Aimophila aestivalis*		T

open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Sprague's Pipit	*Anthus spragueii*		

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

ANGELINA COUNTY

BIRDS

Federal Status State Status

Swallow-tailed Kite *Elanoides forficatus* T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

Wood Stork *Mycteria americana* T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

CRUSTACEANS

Federal Status State Status

A crayfish *Procambarus nechesae*

simple burrows in temporary or semi permanent pools in roadside ditches

Texas prairie crayfish *Fallicambarus devastator*

grasslands:form extensive burrows in prairie grasslands

FISHES

Federal Status State Status

American eel *Anguilla rostrata*

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Creek chubsucker *Erimyzon oblongus* T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

Orangebelly darter *Etheostoma radiosum*

Red through Angelina River basins; just headwaters ranging from high gradient streams to more sluggish lowland streams, gravel and rubble riffles preferred; eggs buried in gravel and riffle raceways, post-larvae live in quiet water, move into progressively faster water as they mature, young feed mostly on copepods and cladocerans, adults on mayfly and fly larvae, spawn late February through mid-April in eastern Texas

Paddlefish *Polyodon spathula* T

prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

ANGELINA COUNTY

MAMMALS

		Federal Status	State Status
Black bear	*Ursus americanus*		T
bottomland hardwoods and large tracts of inaccessible forested areas			
Louisiana black bear	*Ursus americanus luteolus*	DL	T
possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas			
Plains spotted skunk	*Spilogale putorius interrupta*		
catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie			
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T
roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures			
Red wolf	*Canis rufus*	LE	E
extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies			
Southeastern myotis bat	*Myotis austroriparius*		
roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures			

MOLLUSKS

		Federal Status	State Status
Louisiana pigtoe	*Pleurobema riddellii*		T
streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins			
Sandbank pocketbook	*Lampsilis satura*		T
small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River			
Southern hickorynut	*Obovaria jacksoniana*		T
medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins			
Texas heelsplitter	*Potamilus amphichaenus*		T
quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins			
Texas pigtoe	*Fusconaia askewi*		T
rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River			
Triangle pigtoe	*Fusconaia lananensis*		T
mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina branch and possibly Village Creek			

ANGELINA COUNTY

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Louisiana pine snake	*Pituophis ruthveni*	C	T

mixed deciduous-longleaf pine woodlands; breeds April-September

Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Boynton's oak	*Quercus boyntonii*		

Loblolly pine-oak forests on deep, sandy soils in creek bottoms; possibly also in shallower soils of upland prairies; flowering in the spring

Incised groovebur *Agrimonia incisa*

Sandy soils in dry to mesic pine or mixed pine-oak forests and forest borders; usually in fire-maintained longleaf pine savannas but also in more mesic habitats; Perennial; Flowering July-September

Large beakrush *Rhynchospora macra*

GLOBAL RANK: G3; Found in ombotropic quaking peat bogs; Perennial; Flowering/Fruiting Aug-Oct

Mohlenbrock's sedge *Cyperus grayioides*

GLOBAL RANK: G3; Deep sand and sandy loam in dry, almost barren openings in upland longleaf pine savannas, mixed pine-oak forests, and post oak woodlands; Occurs primarily in deep, periodically disturbed sandy soils in open areas maintained by factors such as wind, erosion, or fire. This species does not occur in shaded areas or in areas of high competition with other herbaceous species. Habitats include remnant sand prairies, sandy fields, sand "blow outs", sandhill woodlands, pine barrens, and open barrens in which the slope is sufficient to produce sand erosion. May also occur in areas where the soils have been disturbed by logging or road construction; Perennial

Panicled indigobush *Amorpha paniculata*

A stout shrub, 3 m (9 ft) tall that grows in acid seep forests, peat bogs, wet floodplain forests, and seasonal wetlands on the edge of Saline Prairies in East Texas. It is distinguished from other Amorpha species by its fuzzy leaflets with prominent raised veins underneath, and the flower panicles, which are 8 to 16 inches long and slender, held above the foliage. Perennial; Flowering summer

Texas screwstem *Bartonia texana*

in and around acid seeps in Pine-Oak forests on gentle slopes and baygall shrub thickets at spring heads; often on clumps of bryophytes at tree bases, on roots, and on logs; flowering September-November, can be identified in mid to late October when its in fruit

ANGELINA COUNTY

PLANTS

Federal Status State Status

Texas trillium *Trillium texanum*

in or along the margins of hardwood forests on wet acid soils of bottoms and lower slopes, strongly associated with forested seeps and baygalls; flowering March-May

Yellow fringeless orchid *Platanthera integra*

GLOBAL RANK: G3G4; Currently known only from a few bog sites in Angelina, Jasper and Newton counties; Perennial; Flowering/Fruiting Aug

JASPER COUNTY

AMPHIBIANS

		Federal Status	State Status
Southern Crawfish Frog	*Lithobates areolatus areolatus*		

The Southern Crawfish Frog can be found in abandoned crawfish holes and small mammal burrows. This species inhabits moist meadows, pasturelands, pine scrub, and river flood plains. This species spends nearly all of its time in burrows and only leaves the burrow area to breed. Although this species can be difficult to detect due to its reclusive nature, the call of breeding males can be heard over great distances. Eggs are laid and larvae develop in temporary water such as flooded fields, ditches, farm ponds and small lakes. Habitat: Shallow water, Herbaceous Wetland, Riparian, Temporary Pool, Cropland/hedgerow, Grassland/herbaceous, Suburban/orchard, Woodland – Conifer.

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bachman's Sparrow	*Aimophila aestivalis*		T

open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

JASPER COUNTY

BIRDS

		Federal Status	State Status
Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Sprague's Pipit	*Anthus spragueii*		

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Swallow-tailed Kite	*Elanoides forficatus*		T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Blue sucker	*Cycleptus elongatus*		T

larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles

Creek chubsucker	*Erimyzon oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

JASPER COUNTY

FISHES

		Federal Status	State Status
Ironcolor shiner	*Notropis chalybaeus*		

Big Cypress Bayou and Sabine River basins; spawns April-September, eggs sink to bottom of pool; pools and slow runs of low gradient small acidic streams with sandy substrate and clear well vegetated water; feeds mainly on small insects, ingested plant material not digested

Orangebelly darter	*Etheostoma radiosum*		

Red through Angelina River basins; just headwaters ranging from high gradient streams to more sluggish lowland streams, gravel and rubble riffles preferred; eggs buried in gravel and riffle raceways, post-larvae live in quiet water, move into progressively faster water as they mature, young feed mostly on copepods and cladocerans, adults on mayfly and fly larvae, spawn late February through mid-April in eastern Texas

Paddlefish	*Polyodon spathula*		T

prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

Western sand darter	*Ammocrypta clara*		

Red and Sabine River basins; clear to slightly turbid water of medium to large rivers that have moderate to swift currents, primarily over extensive areas of sandy substrate

INSECTS

		Federal Status	State Status
A mayfly	*Plauditus gloveri*		

NY, SC, TX; mayflies distinguished by aquatic larval stage; adult stage generally found in bankside vegetation

MAMMALS

		Federal Status	State Status
Black bear	*Ursus americanus*		T

bottomland hardwoods and large tracts of inaccessible forested areas

Louisiana black bear	*Ursus americanus luteolus*	DL	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*Myotis austroriparius*		

JASPER COUNTY

MAMMALS

		Federal Status	State Status

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

		Federal Status	State Status
Louisiana pigtoe	*Pleurobema riddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*		T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Southern hickorynut	*Obovaria jacksoniana*		T

medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins

Texas heelsplitter	*Potamilus amphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Triangle pigtoe	*Fusconaia lananensis*		T

mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina branch and possibly Village Creek

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Louisiana pine snake	*Pituophis ruthveni*	C	T

mixed deciduous-longleaf pine woodlands; breeds April-September

Northern scarlet snake	*Cemophora coccinea copei*		T

mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September

Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

JASPER COUNTY

PLANTS

Federal Status State Status

Arkansas oak *Quercus arkansana*

GLOBAL RANK: G3; At the Cass County location, it occurs with Quercus stellata, Q. marilandica and Q. incana in a young pine plantation on deep sandy soils; Perennial; Flowering spring

Cypress knee sedge *Carex decomposita*

GLOBAL RANK: G3G4; Occurs in shallow water or on baldcypress stumps and logs in wooded ponds or swamps; Perennial; Flowering/Fruiting April-May

Incised groovebur *Agrimonia incisa*

Sandy soils in dry to mesic pine or mixed pine-oak forests and forest borders; usually in fire-maintained longleaf pine savannas but also in more mesic habitats; Perennial; Flowering July-September

Indianola beakrush *Rhynchospora indianolensis*

GLOBAL RANK: G3Q; Locally abundant in cattle pastures in some areas (at least during wet years), possibly becoming a management problem in such sites; Perennial; Flowering/Fruiting April-Nov

Large beakrush *Rhynchospora macra*

GLOBAL RANK: G3; Found in ombotropic quaking peat bogs; Perennial; Flowering/Fruiting Aug-Oct

Long-sepaled false dragon-head *Physostegia longisepala*

relatively open areas on poorly drained, acid loams on level terrain over Beaumont, Deweyville, and Montgomery formations; probably originally found in fire-maintained wetland pine savannas or in the transition zone between such flatwoods and adjacent coastal prairies, now found primarily in secondary habitats, such as wet borrow ditches along roadsides and moist areas in human-made clearings in pine woodlands; flowering early May-early July

Navasota ladies'-tresses *Spiranthes parksii* LE E

Texas endemic; openings in post oak woodlands in sandy loams along upland drainages or intermittent streams, often in areas with suitable hydrologic factors, such as a perched water table associated with the underlying claypan; flowering populations fluctuate widely from year to year, an individual plant does not flower every year; flowering late October-early November (-early December)

Neches River rose-mallow *Hibiscus dasycalyx* T

Texas endemic; open marshy habitats in seasonally wet alluvial soils, most often near standing rather than flowing water; flowering June-August

Nodding yucca *Yucca cernua*

Texas endemic; openings in and margins of pine-hardwood forests on brownish acid clays of the Redco Series; flowering/fruiting June-November

Panicled indigobush *Amorpha paniculata*

A stout shrub, 3 m (9 ft) tall that grows in acid seep forests, peat bogs, wet floodplain forests, and seasonal wetlands on the edge of Saline Prairies in East Texas. It is distinguished from other Amorpha species by its fuzzy leaflets with prominent raised veins underneath, and the flower panicles, which are 8 to 16 inches long and slender, held above the foliage. Perennial; Flowering summer

JASPER COUNTY

PLANTS

Federal Status State Status

Texas screwstem *Bartonia texana*

in and around acid seeps in Pine-Oak forests on gentle slopes and baygall shrub thickets at spring heads; often on clumps of bryophytes at tree bases, on roots, and on logs; flowering September-November, can be identified in mid to late October when its in fruit

Texas sunnybell *Schoenolirion wrightii*

GLOBAL RANK: G3; Rocky barrens in the Post Oak region near College Station, with a few disjunct populations on the Catahoula Formation of southeast Texas; Perennial; Flowering March-April; Fruiting March

Texas trillium *Trillium texanum*

in or along the margins of hardwood forests on wet acid soils of bottoms and lower slopes, strongly associated with forested seeps and baygalls; flowering March-May

Yellow fringeless orchid *Platanthera integra*

GLOBAL RANK: G3G4; Currently known only from a few bog sites in Angelina, Jasper and Newton counties; Perennial; Flowering/Fruiting Aug

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NACOGDOCHES COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bachman's Sparrow	*Aimophila aestivalis*		T

open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Sprague's Pipit	*Anthus spragueii*		

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

NACOGDOCHES COUNTY

BIRDS

		Federal Status	State Status
Swallow-tailed Kite	*Elanoides forficatus*		T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
Blackside darter	*Percina maculata*		T

Red, Sulfur and Cypress River basins; clear, gravelly streams; prefers pools with some current, or even quiet pools, to swift riffles

Creek chubsucker	*Erimyzon oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

Orangebelly darter	*Etheostoma radiosum*		

Red through Angelina River basins; just headwaters ranging from high gradient streams to more sluggish lowland streams, gravel and rubble riffles preferred; eggs buried in gravel and riffle raceways, post-larvae live in quiet water, move into progressively faster water as they mature, young feed mostly on copepods and cladocerans, adults on mayfly and fly larvae, spawn late February through mid-April in eastern Texas

Paddlefish	*Polyodon spathula*		T

prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

MAMMALS

		Federal Status	State Status
Black bear	*Ursus americanus*		T

bottomland hardwoods and large tracts of inaccessible forested areas

Louisiana black bear	*Ursus americanus luteolus*	DL	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

NACOGDOCHES COUNTY

MAMMALS

		Federal Status	State Status
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat *Myotis austroriparius*

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

		Federal Status	State Status
Louisiana pigtoe	*Pleurobema riddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*		T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Southern hickorynut	*Obovaria jacksoniana*		T

medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins

Texas heelsplitter	*Potamilus amphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Triangle pigtoe	*Fusconaia lananensis*		T

mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina branch and possibly Village Creek

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Louisiana pine snake	*Pituophis ruthveni*	C	T

mixed deciduous-longleaf pine woodlands; breeds April-September

NACOGDOCHES COUNTY

REPTILES

		Federal Status	State Status
Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

		Federal Status	State Status
Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Bristle nailwort	*Paronychia setacea*		

Flowering vascular plant endemic to eastern southcentral Texas, occurring in sandy soils

Goldenwave tickseed *Coreopsis intermedia*

GLOBAL RANK: G3; In deep sandy soils of sandhills in openings in or along margins of post oak woodlands and pine-oak forests of east Texas; Perennial; Flowering/Fruiting May-Aug

Mohlenbrock's sedge *Cyperus grayioides*

GLOBAL RANK: G3; Deep sand and sandy loam in dry, almost barren openings in upland longleaf pine savannas, mixed pine-oak forests, and post oak woodlands; Occurs primarily in deep, periodically disturbed sandy soils in open areas maintained by factors such as wind, erosion, or fire. This species does not occur in shaded areas or in areas of high competition with other herbaceous species. Habitats include remnant sand prairies, sandy fields, sand "blow outs", sandhill woodlands, pine barrens, and open barrens in which the slope is sufficient to produce sand erosion. May also occur in areas where the soils have been disturbed by logging or road construction; Perennial

Nixon's dwarf hawthorn *Crataegus nananixonii*

Found in open upland post oak-bluejack oak, scrubby woodland, or shortleaf pine-oak woodland on the Carrizo Sands and other formations.

Panicled indigobush *Amorpha paniculata*

A stout shrub, 3 m (9 ft) tall that grows in acid seep forests, peat bogs, wet floodplain forests, and seasonal wetlands on the edge of Saline Prairies in East Texas. It is distinguished from other Amorpha species by its fuzzy leaflets with prominent raised veins underneath, and the flower panicles, which are 8 to 16 inches long and slender, held above the foliage. Perennial; Flowering summer

Soxman's milkvetch *Astragalus soxmaniorum*

GLOBAL RANK: G3; Primarily in deep sandy soils of sandhills, fallow fields, and open scrub oak-pine woodlands; Perennial; Flowering March-June; Fruiting April-June

Texas screwstem *Bartonia texana*

in and around acid seeps in Pine-Oak forests on gentle slopes and baygall shrub thickets at spring heads; often on clumps of bryophytes at tree bases, on roots, and on logs; flowering September-November, can be identified in mid to late October when its in fruit

NACOGDOCHES COUNTY

PLANTS	Federal Status	State Status

Texas trillium *Trillium texanum*

in or along the margins of hardwood forests on wet acid soils of bottoms and lower slopes, strongly associated with forested seeps and baygalls; flowering March-May

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SABINE COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bachman's Sparrow	*Aimophila aestivalis*		T

open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Sprague's Pipit	*Anthus spragueii*		

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

SABINE COUNTY

BIRDS

		Federal Status	State Status
Swallow-tailed Kite	*Elanoides forficatus*		T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
Blue sucker	*Cycleptus elongatus*		T

larger portions of major rivers in Texas; usually in channels and flowing pools with a moderate current; bottom type usually of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles

Creek chubsucker	*Erimyzon oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

Ironcolor shiner *Notropis chalybaeus*

Big Cypress Bayou and Sabine River basins; spawns April-September, eggs sink to bottom of pool; pools and slow runs of low gradient small acidic streams with sandy substrate and clear well vegetated water; feeds mainly on small insects, ingested plant material not digested

Orangebelly darter *Etheostoma radiosum*

Red through Angelina River basins; just headwaters ranging from high gradient streams to more sluggish lowland streams, gravel and rubble riffles preferred; eggs buried in gravel and riffle raceways, post-larvae live in quiet water, move into progressively faster water as they mature, young feed mostly on copepods and cladocerans, adults on mayfly and fly larvae, spawn late February through mid-April in eastern Texas

Paddlefish	*Polyodon spathula*		T

prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

Western sand darter *Ammocrypta clara*

Red and Sabine River basins; clear to slightly turbid water of medium to large rivers that have moderate to swift currents, primarily over extensive areas of sandy substrate

SABINE COUNTY

INSECTS

		Federal Status	State Status
Texas emerald dragonfly	*Somatochlora margarita*		

East Texas pineywoods; springfed creeks and bogs; small sandy forested streams with moderate current

MAMMALS

		Federal Status	State Status
Black bear	*Ursus americanus*		T

bottomland hardwoods and large tracts of inaccessible forested areas

Louisiana black bear	*Ursus americanus luteolus*	DL	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*Myotis austroriparius*		

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

		Federal Status	State Status
Louisiana pigtoe	*Pleurobema riddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*		T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Southern hickorynut	*Obovaria jacksoniana*		T

medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins

Texas heelsplitter	*Potamilus amphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

SABINE COUNTY

MOLLUSKS

		Federal Status	State Status
Triangle pigtoe	*Fusconaia lananensis*		T

mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina branch and possibly Village Creek

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Louisiana pine snake	*Pituophis ruthveni*	C	T

mixed deciduous-longleaf pine woodlands; breeds April-September

Northern scarlet snake	*Cemophora coccinea copei*		T

mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September

Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Incised groovebur	*Agrimonia incisa*		

Sandy soils in dry to mesic pine or mixed pine-oak forests and forest borders; usually in fire-maintained longleaf pine savannas but also in more mesic habitats; Perennial; Flowering July-September

Texas golden gladecress	*Leavenworthia texana*	E	

Texas endemic; edaphically influenced herbaceous communities on shallow calcareous soils in vernally moist to wet glades on glauconite or ironstone outcrops of the Weches Formation; flowering or fruiting late February to April or May

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SAN AUGUSTINE COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bachman's Sparrow	*Aimophila aestivalis*		T

open pine woods with scattered bushes and grassy understory in Pineywoods region, brushy or overgrown grassy hillsides, overgrown fields with thickets and brambles, grassy orchards; remnant grasslands in Post Oak Savannah region; nests on ground against grass tuft or under low shrub

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Sprague's Pipit	*Anthus spragueii*		

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

SAN AUGUSTINE COUNTY

BIRDS

		Federal Status	State Status
Swallow-tailed Kite	*Elanoides forficatus*		T

lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall tree in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
Creek chubsucker	*Erimyzon oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

Orangebelly darter	*Etheostoma radiosum*		

Red through Angelina River basins; just headwaters ranging from high gradient streams to more sluggish lowland streams, gravel and rubble riffles preferred; eggs buried in gravel and riffle raceways, post-larvae live in quiet water, move into progressively faster water as they mature, young feed mostly on copepods and cladocerans, adults on mayfly and fly larvae, spawn late February through mid-April in eastern Texas

Paddlefish	*Polyodon spathula*		T

prefers large, free-flowing rivers, but will frequent impoundments with access to spawning sites; spawns in fast, shallow water over gravel bars; larvae may drift from reservoir to reservoir

INSECTS

		Federal Status	State Status
Texas emerald dragonfly	*Somatochlora margarita*		

East Texas pineywoods; springfed creeks and bogs; small sandy forested streams with moderate current

MAMMALS

		Federal Status	State Status
Black bear	*Ursus americanus*		T

bottomland hardwoods and large tracts of inaccessible forested areas

Louisiana black bear	*Ursus americanus luteolus*	DL	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

SAN AUGUSTINE COUNTY

MAMMALS

		Federal Status	State Status
Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Corynorhinus rafinesquii*		T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*Myotis austroriparius*		

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

		Federal Status	State Status
Louisiana pigtoe	*Pleurobema riddellii*		T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*		T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

Southern hickorynut	*Obovaria jacksoniana*		T

medium sized gravel substrates with low to moderate current; Neches, Sabine, and Cypress river basins

Texas heelsplitter	*Potamilus amphichaenus*		T

quiet waters in mud or sand and also in reservoirs. Sabine, Neches, and Trinity River basins

Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Triangle pigtoe	*Fusconaia lananensis*		T

mixed mud, sand, and fine gravel substrates; Neches River basin in the Angelina branch and possibly Village Creek

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

SAN AUGUSTINE COUNTY

REPTILES

		Federal Status	State Status
Louisiana pine snake	*Pituophis ruthveni*	C	T

mixed deciduous-longleaf pine woodlands; breeds April-September

Northern scarlet snake	*Cemophora coccinea copei*		T

mixed hardwood scrub on sandy soils; feeds on reptile eggs; semi-fossorial; active April-September

Timber rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Mohlenbrock's sedge	*Cyperus grayioides*		

GLOBAL RANK: G3; Deep sand and sandy loam in dry, almost barren openings in upland longleaf pine savannas, mixed pine-oak forests, and post oak woodlands; Occurs primarily in deep, periodically disturbed sandy soils in open areas maintained by factors such as wind, erosion, or fire. This species does not occur in shaded areas or in areas of high competition with other herbaceous species. Habitats include remnant sand prairies, sandy fields, sand "blow outs", sandhill woodlands, pine barrens, and open barrens in which the slope is sufficient to produce sand erosion. May also occur in areas where the soils have been disturbed by logging or road construction; Perennial

Texas golden gladecress	*Leavenworthia texana*	E	

Texas endemic; edaphically influenced herbaceous communities on shallow calcareous soils in vernally moist to wet glades on glauconite or ironstone outcrops of the Weches Formation; flowering or fruiting late February to April or May

Texas screwstem	*Bartonia texana*		

in and around acid seeps in Pine-Oak forests on gentle slopes and baygall shrub thickets at spring heads; often on clumps of bryophytes at tree bases, on roots, and on logs; flowering September-November, can be identified in mid to late October when its in fruit

White bladderpod	*Physaria pallida*	LE	E

Texas endemic; natural openings or glades within pine-oak forests on calcareous sandy loam over glauconite or ironstone of the Weches Formation; these glades are seep moistened during the winter and spring, but become desiccated during the summer; flowering April-May

WESTERN GULF COASTAL PLAINS (PINEYWOODS, EAST TEXAS) SPECIES OF GREATEST CONSERVATION NEED						
Scientific Name	**Common Name**	**Status**		**Abundance Ranking**		**General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place**
		Federal	**State**	**Global**	**State**	
MAMMALS						
Blarina carolinensis	Southern short-tailed shrew			G5N5	S4	Forest, Woodland, Grassland
Corynorhinus rafinesquii	Rafinesque's big-eared bat		T	G3G4	S3	Forest, Artificial Refugia
Lutra canadensis	River otter			G5	S4	Riparian
Mustela frenata	Long-tailed weasel			G5	S5	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland
Myotis austroriparius	Southeastern myotis			G3G4	S3	Caves/Karst, Forest, Riparian
Puma concolor	Mountain lion			G5	S2	Forest, Woodland, Desert Scrub, Shrubland, Savanna/Open Woodland, Riparian
Spilogale putorius	Eastern spotted skunk			G4T	S4	Savanna/Open Woodland, Grassland
Sylvilagus aquaticus	Swamp rabbit			G5	S5	Riparian, Freshwater Wetland
Tadarida brasiliensis	Brazilian free-tailed bat			G5	S5	Cave/Karst, Artificial Refugia
Ursus americanus luteolus	Louisiana black bear	LT	T	G5T3	SNA	Forest, Woodland, Savanna/Open Woodland,Shrubland, Riparian
BIRDS						
Anas acuta	Northern Pintail			G5	S3B,S5N	Lacustrine, freshwater wetland, saltwater wetland, coastal, marine
Colinus virginianus	Northern Bobwhite			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
Meleagris gallopavo	Wild Turkey			G5	S5B	Shrubland, Savanna/Open Woodland, Forest, Riparian, Agricultural
Ixobrychus exilis	Least Bittern			G5	S4B	Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary
Egretta thula	Snowy Egret			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Cultural Aquatic
Egretta caerulea	Little Blue Heron			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Cultural Aquatic
Egretta tricolor	Tricolored Heron			G5	S5B	Riverine, Lacustrine, Freshwater Wetland, Saltwater Wetland, Estuary, Coastal, Cultural Aquatic
Butorides virescens	Green Heron			G5	S5B	Riparian, Riverine, Lacustrine, Freshwater Wetland, Cultural Aquatic
Plegadis chihi	White-faced Ibis		T	G5	S4B	Lacustrine, Freshwater Wetland, Agricultural
Mycteria americana	Wood Stork		T	G4	SHB,S2N	Riverine, Freshwater wetland
Elanoides forficatus	Swallow-tailed Kite		T	G5	S2B	Woodland, Forest, Riparian
Ictinia mississippiensis	Mississippi Kite			G5	S4B	Woodland, Forest, Riparian, Developed:Urban/Suburban/Rural
Haliaeetus leucocephalus	Bald Eagle			G5	S3B,S3N	Riparian, Lacustrine, Freshwater Wetland, Saltwater Wetland
Circus cyaneus	Northern Harrier			G5	S2B,S3N	Grassland, Shrubland
Buteo lineatus	Red-shouldered Hawk			G5	S4B	Woodland, Forest, Riparian, Freshwater Wetland
Falco sparverius	American Kestrel			G5	S4B	Grassland, Savanna/Open Woodland
Rallus elegans	King Rail			G4	S3B	Lacustrine, Freshwater Wetland
Pluvialis dominica	American Golden-Plover			G5	S3	Grassland, Freshwater Wetland, Agricultural
Scolopax minor	American Woodcock			G5	S2B,S3N	Woodland, Forest, Riparian
Caprimulgus carolinensis	Chuck-will's-widow			G5	S3S4B	Woodland, Forest, Riparian
Melanerpes erythrocephalus	Red-headed Woodpecker			G5	S3B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
Picoides borealis	Red-cockaded Woodpecker	LE	E	G3	S2B	Savanna/Open Woodland, Woodland, Forest
Dryocopus pileatus	Pileated Woodpecker			G5	S4B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
Tyrannus forficatus	Scissor-tailed Flycatcher			G5	S3B	Desert Scrub, Grassland, Shrubland, Agricultural, Developed
Lanius ludovicianus	Loggerhead Shrike			G4	S4B	Desert Scrub, Grassland, Shrubland, Savanna/Open Woodland, Agricultural, Developed
Poecile carolinensis	Carolina Chickadee			G5	S5B	Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
Thryomanes bewickii (bewickii)	Bewick's Wren			G5	S5B	Shrubland, Savanna/Open Woodland, Woodland, Developed: Urban/Suburban/Rural
Cistothorus platensis	Sedge Wren			G5	S4	Grassland, Freshwater Wetland
Hylocichla mustelina	Wood Thrush			G5	S4B	Woodland, Forest, Riparian

Scientific Name	Common Name	Status		Abundance Ranking		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place
		Federal	State	Global	State	
Dendroica dominica	Yellow-throated Warbler			G5	S4B	Woodland, Forest, Riparian
Protonotaria citrea	Prothonotary Warbler			G5	S3B	Woodland, Forest, Riparian, Lacustrine, Freshwater Wetland
Helmitheros vermivorum	Worm-eating Warbler			G5	S3B	Woodland, Forest
Limnothlypis swainsonii	Swainson's Warbler			G4	S3B	Woodland, Forest, Riparian
Seiurus motacilla	Louisiana Waterthrush			G5	S3B	Woodland, Forest, Riparian
Oporornis formosus	Kentucky Warbler			G5	S3B	Woodland, Forest
Aimophila aestivalis	Bachman's Sparrow		T	G3	S3B	Savanna/Open Woodland
Spizella pusilla	Field Sparrow			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
Ammodramus savannarum	Grasshopper Sparrow			G5	S3B	Grassland, Agricultural
Chondestes grammacus	Lark Sparrow			G5	S4B	Grassland, Shrubland, Savanna/Open Woodland
Ammodramus henslowii	Henslow's Sparrow			G4	S2S3N,SXB	Grassland, Savanna/Open Woodland
Ammodramus leconteii	Le Conte's Sparrow					Grassland
Piranga rubra	Summer Tanager			G5	S5B	Savanna/Open Woodland, Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural
Passerina ciris	Painted Bunting			G5	S4B	Shrubland, Agricultural
Spiza americana	Dickcissel			G5	S4B	Grassland, Agricultural
Sturnella magna	Eastern Meadowlark			G5	S5B	Grassland, Shrubland, Savanna/Open Woodland
Euphagus carolinus	Rusty Blackbird			G4	S3	Woodland, Forest, Riparian, Lacustrine, Freshwater Wetland
Icterus spurius	Orchard Oriole			G5	S4B	Shrubland, Savanna/Open Woodland, Woodland, Riparian
REPTILES AND AMPHIBIANS						
Apalone mutica	smooth softshell turtle					riparian, riverine, lacustrine, freshwater wetland
Apalone spinifera	spiny softshell turtle					riparian, riverine, lacustrine, freshwater wetland
Cemophora coccinea copei	Northern Scarlet Snake		T	G5T5	S3	forest, woodlands, grassland, riparian, barren, sparse vegeatation
Cheylydra serpentina	Common snapping turtle					riparina, riverine
Crotalus horridus	Timber (Canebrake) Rattlesnake		T	G4	S4	woodland, forest, riparian
Desmognathus auriculatus	Southern dusky salamander				S1	forest, freshwater wetland
Lithobates areolatus (Rana areolata)	Crawfish frog				SU	forest, grassland, freshwater wetlands, woodland
Macrochelys temminckii	alligator snapping turtle		T	G3G4	S3	riparian, riverine, cultural aquatic
Ophisaurus attenuatus	western slender glass lizard					grassland, savanna
Pituophis ruthveni	Louisiana pine snake	C	T	G5T3		forest, woodland, savanna
Pseudacris fouquettei (triseriata/feriarum)	Cajun chorus frog				SU	forest, woodland, riparian, cultural aquatic, freshwater wetland, savanna
Pseudacris streckeri	Strecker's Chorus Frog			G5	S3	grassland, savanna, woodland, riparian, cultural aquatic, freshwater wetland
Terrapene carolina	Eastern box turtle			G5	S3	grasslands, savanna, woodland
Terrapene ornata	Ornate box turtle			G5	S3	grassland, barren/sparse vegetation, deset scrub, savanna, woodland
Trachemys scripta	Red-eared slider					riparian, riverine, lacustrine, freshwater wetland, cultural aquatic
FRESHWATER FISHES						
Ammocrypta clara	Western sand darter					over sandy substrata
Anguilla rostrata	American eel			G4	S5	streams and reservoirs in drainages connected to marine environments
Atractosteus spatula	alligator gar					channel snag, pool-snag complex, pool-edge, and pool-vegetation habitat
Cycleptus elongatus	Blue sucker		T	G3G4	S3	large, deep rivers, and deeper zones of lakes
Erimyzon oblongus	Creek chubsucker		T	G5	S2S3	vegetation depending somewhat on age and stage of reproductive cycle; declines due to siltation
Etheostoma radiosum	Orangebelly darter					preferring riffle areas of gravel-bottoms streams with moderate to high currents
Hiodon alosoides	Goldeye					of large lakes; backwaters
Notropis atrocaudalis	Blackspot shiner					backwater and swiftest currents
Notropis bairdi	Red River shiner					streambeds with widely fluctuating flows subject to high summer temperatures, high rates of evaporation,
Notropis chalybaeus	Ironcolor shiner					Plain streams and rivers of low to moderate gradient; often at the upstream ends of pools, with a moderate

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Notropis maculatus	Taillight shiner					Quiet, usually vegetated oxbow lakes, ponds, or backwaters; mud bottom
Notropis potteri	Chub shiner		T	G4	S3	turbid, flowing water with silt or sand substrate; tolerant of high salinities
Notropis sabinae	Sabine shiner					Small creeks and rivers having slight to moderate current, primarily sand bottom
Notropis shumardi	Silverband shiner					channel with moderate to swift current velocities and moderate to deep depths; associated with turbid
Percina maculata	Blackside darter		T	G5	S1	variable in location; mostly in clear waters, with gravel and boulder substrates
Polyodon spathula	Paddlefish		T	G4	S3	sized rivers, sluggish pools, backwaters, bayous, and oxbows with abundant zooplankton; large reservoirs if
Pteronotropis hubbsi	Bluehead shiner		T	G3	S1	substrate; water typically tannin-stained, and heavy growth of submergent or semi-emergent vegetation
Scaphirhynchus platorynchus	Shovelnose sturgeon		T	G4	S2	Bottom of main channels and embayments of large, turbid rivers
INVERTEBRATES						
Arkansia wheeleri	Ouachita rock pocketbook	LE		G1	SH*	Riverine
Bombus pensylvanicus	American bumblebee			GU	SU*	Grassland, Savanna/Open Woodland
Cheumatopsyche morsei	A caddisfly			G1G3	S1	Riparian, Riverine
Chimarra holzenthali	Holzenthal's Philopotamid caddisfly			G1G2	S1	Riparian, Riverine
Cisthene conjuncta	A lichen moth			G1Q	S1Q*	Forest, Savanna/Open Woodland
Fallicambarus houstonensis	Houston burrowing crayfish			G2G3*	S2S3*	Freshwater Wetland, Grassland
Fallicambarus kountzeae	Big Thicket burrowing crayfish			G2	S2*	Freshwater Wetland, Grassland
Faxonella blairi	Blair's fencing crayfish			G2	S2*	Freshwater Wetland
Fusconaia askewi	Texas pigtoe		T	G2G3	S2S3*	Riverine
Fusconaia lananensis	Triangle pigtoe		T	G1Q	S1	Riverine
Hydroptila ouachita	A caddisfly			G1G2	S1	Riparian, Riverine
Isoperla sagittata	Arrowhead Stripetail			G1	S1*	Riparian, Riverine
Lampsilis satura	Sandbank pocketbook		T	G2	S1	Riverine
Neotrichia mobilensis	A caddisfly			G1G2	S1?*	Riparian, Riverine
Obovaria jacksoniana	Southern hickorynut		T	G2	S1*	Riverine
Orconectes maletae	Kisatchie painted crayfish			G2	S2*	Riparian, Riverine
Phylocentropus harrisi	A caddisfly			G1G2	S1	Riparian, Riverine
Pleurobema riddellii	Louisiana pigtoe		T	G1G2	S1	Riverine
Pogonomyrmex comanche	Comanche harvester ant			G2G3*	S2*	Barren/Sparse Vegetation
Potamilus amphichaenus	Texas heelsplitter		T	G1G2	S1	Riverine
Procambarus brazoriensis	Brazoria crayfish			G1	S1	Riverine, Riparian
Procambarus nechesae	Neches crayfish			G2	S1S2	Riverine, Riparian
Procambarus nigrocinctus	Blackbelted crayfish			G1G2	S1	Riverine, Riparian
Somatochlora magarita	Texas emerald			G2	S2	Freshwater Wetland
Sparbarus coushatta	A mayfly			G1G2	S1?*	Riverine, Riparian
Tricorythodes curvatus	A mayfly			G1G3	S2?*	Riparian, Riverine
PLANTS						
Agalinis navasotensis	Navasota false foxglove			G1	S1	Savanna/Open Woodland (sandstone outcrops)
Agrimonia incisa	incised groovebur			G3	S3	Forest; Savanna/Open Woodland (Longleaf Pine)
Amorpha laevigata	smooth indigobush			G3	S1	Savanna/Open Woodland
Amorpha paniculata	panicled indigobush			G2G3	S2	Freshwater Wetland
Astragalus reflexus	Texas milk vetch			G3	S3	Savanna/Open Woodland
Bartonia texana	Texas screwstem			G2	S2	Freshwater Wetland
Calopogon oklahomensis	Oklahoma grass pink			G3	S1S2	Savanna/Open Woodland; Grassland; Freshwater Wetland
Carex decomposita	cypress knee sedge			G3	S1	Freshwater Wetland
Clematis carrizoanus	Carrizo sands leather-flower			G2	S2	Savanna/Open Woodland
Coreopsis intermedia	goldenwave tickseed			G3	S3	Savanna/Open Woodland

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Crataegus anamesa	Fort Bend hawthorn			G3Q	S3	Grasslands; woodlands?
Crataegus nananixonii	Nixon's dwarf hawthorn			G1	S1	Savanna/Open Woodland; Forest (Shortleaf Pine)
Crataegus stenosepala	narrow-sepal hawthorn			G3Q	S3	Woodland? Riparian?
Crataegus warneri	Warner's hawthorn			G3Q	S3	Savanna/Open Woodland; Woodland; Forest
Cuscuta attenuata	marsh-elder dodder			G3	S2	Grassland
Cyperus grayioides	Mohlenbrock's sedge			G3G4	S3S4	Savanna/Open Woodland (sandhills)
Cypripedium kentuckiense	Southern lady's-slipper			G3	S1	Forest (mesic)
Echinacea atrorubens	Topeka purple-coneflower			G3	S3	Savanna/Open Woodland
Eriocaulon koernickianum	small-headed pipewort			G2	S1	Freshwater Wetland (bogs)
Gaillardia aestivalis var. winkleri	white firewheel			G5T2	S2	Savanna/Open Woodland (Longleaf Pine Savanna; Sandhills)
Geocarpon minimum	earth fruit	LT	T	G2	S1	Barren/Sparse Vegetation (slick spots) within Grassland (saline prairie) matrix
Hibiscus dasycalyx	Neches River rose-mallow	C		G1	S1	Riparian (oxbows, swamps)
Lachnocaulon digynum	tiny bog button			G3	S1	Freshwater Wetland (bogs)
Leavenworthia texana	Texas golden gladecress	C		G1	S1	Savanna/Open Woodland (glades)
Liatris tenuis	slender gay-feather			G3	S3	Savanna/Open Woodland (Longleaf Pine savanna, sandstone barrens)
Paronychia setacea	bristle nailwort			G3	S3	Savanna/Open Woodland
Phlox nivalis subsp. texensis	Texas trailing phlox	LE	E	G4T2	S2	Savanna/Open Woodland (Longleaf Pine savanna, sandhills)
Physaria pallida	white bladderpod	LE	E	G1	S1	Savanna/Open Woodland (glades); Grassland
Physostegia longisepala	long-sepaled false dragon-head			G2G3	S2	Savanna/Open Woodland (Longleaf Pine savanna); Freshwater Wetland
Platanthera chapmanii	Chapman's orchid			G2	S1	Freshwater Wetland; Savanna/Open Woodland (Longleaf Pine savanna)
Platanthera integra	yellow fringeless orchid			G3G4	S1	Freshwater Wetland (bogs); Savanna/Open Woodland (Longleaf Pine Savanna)
Prenanthes barbata	barbed rattlesnake-root			G3	S3	Forest (mesic)
Quercus arkansana	Arkansas oak			G3	S1	Savanna/Open Woodland; Woodland; Forest
Quercus boyntonii	Boynton's oak			G1	SH	Grassland?; Forest (loblolly pine-oak)?
Rhododon ciliatus	Texas sandmint			G3	S3	Savanna/Open Woodland (sandhills)
Rhynchospora macra	large beakrush			G3	S2	Freshwater Wetland (bogs)
Schoenolirion wrightii	Texas sunnybell			G3	S3	Savanna/Open Woodland (sandstone barrens); Forest
Silene subciliata	scarlet catchfly			G3	S3	Savanna/Open Woodland (Longleaf Pine Savanna; Sandhills)
Spiranthes brevilabris var. brevilabris	Texas ladies'-tresses orchid			G1T1	S1	Grassland
Spiranthes longilabris	giant spiral ladies'-tresses			G3	S1	Freshwater Wetland (swamp)
Spiranthes parksii	Navasota ladies'-tresses	LE	E	G3	S3	Savanna/Open Woodland; Woodland
Streptanthus maculatus subsp. maculatus	clasping twistflower			G3T2T3	S2	Savanna/Open Woodland; Forest; Grassland (glades)
Symphyotrichum puniceum var. scabricaule	rough-stem aster			G5T2	S2	Freshwater Wetland (Bogs)
Thalictrum arkansanum	Arkansas meadow-rue			G2Q	S2	Forest; Riparian (bottomland forest)
Trillium texanum	Texas trillium			G2	S2	Forest; Freshwater Wetland (forested seeps and baygalls)
Triphora trianthophora var. texensis	Texas three-birds orchid			G3G4T1Q	S1	Forest (mesic)
Xyris chapmanii	Chapman's yellow-eyed grass			G2	S2	Freshwater Wetland (bogs)
Xyris drummondii	Drummond's yellow-eyed grass			G3	S2	Freshwater Wetland (bogs)
Xyris scabrifolia	roughleaf yellow-eyed grass			G3	S2	Freshwater Wetland (bogs)
Yucca cernua	nodding yucca			G1	S1	Savanna/Open Woodland; Forest (calcareous openings)

WGCP RARE COMMUNITIES

Common Name	Scientific Name	G RANK	S RANK (Provisional)	ECOLOGICAL SYSTEM *added where relationship can be made at this scale*	ECOREGIONS (Note: other ecoregions are included for cross reference and conservation action coordination if needed)												Known COUNTIES	Endemic	Known PROTECTED AREAS	TERR	WETL	AQU	Comments
					WGCP	*TBPR*	*ECPL*	*GCPM*	*AZNM*	*CHIH*	*HIPL*	*SWTB*	*CGPL*	*CRTB*	*EDPT*	*STPL*							
Caddo Lake Bottomland Oak Flat	Quercus phellos - (Quercus lyrata) / Carex joorii - Saccharum baldwinii Floodplain Forest	G3G4	S3S4	West Gulf Coastal Plain Large River Floodplain Forest CES203.488	WGCP												Anderson, Angelina, Gregg, Harrison, Marion, Nacogdoches, Panola, Polk, Smith, Wood	N	Caddo Lake WMA (TPWD), Caddo Lake and Little Sandy NWR (USFWS), Old Sabine Bottom WMA (TPWD), Pineywoods Mitigation Bank		X		
East Texas Catahoula Barrens	Bigelowia nuttallii - Krameria lanceolata - Aristida dichotoma - Sporobolus silveanus Herbaceous Vegetation	G1	S1	West Gulf Coastal Plain Catahoula Barrens CES203.364	WGCP												Angelina, Jasper, Newton and Tyler	Y	Angelina NF (USFS), Little Rocky Preserve (TNC)	X			
East Texas Catahoula Barrens Post Oak Woodland	Quercus stellata - Carya texana - (Pinus palustris) / Chasmanthium sessiliflorum - Ranunculus fascicularis Woodland	G2	S2	West Gulf Coastal Plain Catahoula Barrens CES203.364	WGCP												Angelina and Jasper	Y	Angelina NF and Upland Island Wilderness Area (USFS)	X			
Eastern Gammagrass - (Switchgrass) Floodplain Herbaceous Vegetation	Tripsacum dactyloides - (Panicum virgatum) Herbaceous Vegetation	G1	S1	Texas Blackland Tallgrass Prairie CES205.684	WGCP	TBPR	ECPL										Austin, Delta, Franklin, Hopkins, Hunt, Smith, Titus and Tyler	Y?	Cowleech Prairie (TNC)		X		Newly defined association including prairies dominated by lowland gammagrass in frequently flooded bottomlands of E Tx. In examples in the upper Sabine watershed, P. virgatum is unimportant or absent. Though widely distributed, examples are rare and small in spatial extent. This community is unrelated to the Tripsacum dactyloides - Panicum virgatum - Sorghastrum nutans - Helianthus maximiliani Herbaceous Assn. and the gammagrass may be genetically distinct.
Morse Clay Calcareous Prairie	Schizachyrium scoparium - Marshallia caespitosa - Nemastylis geminiflora Herbaceous Vegetation	G1G2	S1Q	West Gulf Coastal Plain Southern Calcareous Prairie CES203.379	WGCP												Bowie and Red River	N	No documented protected areas	X			Vegetation not confirmed in Texas, but soils are present.
Red River Pimplemound Terrace Depression Oak Forest	Quercus lyrata - Quercus phellos - Ulmus americana / Rhynchospora spp. Forest	G2G3	S1S2	West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods CES203.548	WGCP												Bowie, Harrison, Marion and Red River	N	No documented protected areas		X		
Texas Upper West Gulf Coastal Plain Southern Magnolia Forest	Magnolia grandiflora / Prunus caroliniana - Carpinus caroliniana / Arundinaria gigantea Forest	G3	S2S3	West Gulf Coastal Plain Mesic Hardwood Forest CES203.280	WGCP												Hardin, Harris, Liberty, Montgomery, San Jacinto and Walker	N	Sam Houston NF and Big Creek Scenic Area (USFS), Big Thicket National Preserve (NPS), Trinity River NWR (USFWS)	X			Defined narrowly in NatureServe as stands with M. grandiflora as a dominant lacking Fagus grandifolia. We have defined this assn. more broadly to include flatwoods communities in SE Texas where M. grandiflora is frequent and Fagus is relatively unimportant, reflected in the lower G-rank.
Upper West Gulf Coastal Plain Diamondleaf Oak Flatwoods Forest	Quercus laurifolia - Quercus phellos - Quercus nigra / Viburnum dentatum - (Sebastiania fruticosa) / Carex glaucescens Upper West Gulf Flatwoods Forest	G3G4	S3S4	West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods CES203.548	WGCP												Angelina, Hardin, Jasper, Newton, Polk, San Jacinto and Tyler	N	Angelina National Forest (USFS), Sam Houston National Forest (USFS) and Winters Bayou Preserve (TLC)		X		Widespread and common, but high quality examples are less frequent. Like other bottomland hardwood forest types, important wildlife habitat.
Upper West Gulf Coastal Plain Mesic Calcareous Woodland	Quercus shumardii - Carya myristiciformis - (Quercus muehlenbergii) / Carex cherokeensis - Sorghastrum nutans Woodland	G1	S1	West Gulf Coastal Plain Northern Calcareous Prairie CES203.377	WGCP												Bowie	N	Brinkle Lake Park (City of Texarkana)	X			Described in Ark. Recently observed in TX
Upper West Gulf Coastal Plain Xeric Sand Barrens	(Quercus incana) / Schizachyrium scoparium - Bouteloua hirsuta - Dalea villosa var. grisea - Selaginella arenicola ssp. riddellii Xeric Sand Barrens Woodland	G2	S1	West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland CES203.056	WGCP												Cass and Marion	N	No documented protected areas	X			
Upper West Gulf Coastal Plain Xeric Sandhill Complex (Mixed Oak Type)	Quercus (incana, margarettiae, arkansana) - (Pinus echinata) / Schizachyrium scoparium Woodland	G2	S1	West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland CES203.056	WGCP												Cass and Marion	N	No documented protected areas	X			
Weches Glade	Sedum pulchellum - Clinopodium arkansanum - Sporobolus vaginiflorus Herbaceous Vegetation	G1	S1	West Gulf Coastal Plain Weches Glade CES203.277	WGCP												Nacogdoches, Sabine and San Augustine	Y	No documented protected areas	X			
West Gulf Coastal Plain Bald-cypress Pondshore	Taxodium distichum West Gulf Coastal Plain Lakeshore Woodland	G2G3	S1S2		WGCP												Angelina, Harrison, Jasper, Marion, and Tyler	N	Angelina National Forest (USFS), Angelina-Neches WMA (TPWD), Caddo Lake WMA (TPWD), Pineywoods Mitigation Bank			X	As defined in NatureServe, also applies to natural vegetation along artificial lakes, which are much more extensive.
West Gulf Coastal Plain Beech - Magnolia Forest	Fagus grandifolia - Magnolia grandiflora - Quercus alba / Carpinus caroliniana - Ostrya virginiana - Ilex opaca var. opaca Forest	G3G4	S2	Fagus grandifolia - Quercus alba / Acer (barbatum, leucoderme) / Solidago auriculata Forest	WGCP												Angelina, Jasper, Liberty, Newton, Polk, San Augustine, Sabine, Shelby, and Tyler	N	Alabama and Coushatta Indian Reservation (BIA), Angelina and Sabine NF (USFS), Big Thicket National Preserve (NPS), Mill Creek Cove RNA (USFS), Martin Dies, Jr. and Village Creek SP (TPWD)	X			
West Gulf Coastal Plain Beech - White Oak Forest (Subcalcareous Type)	Fagus grandifolia - Quercus alba / Acer (barbatum, leucoderme) / Solidago auriculata Forest	G2G3	S1S2	West Gulf Coastal Plain Mesic Hardwood Forest CES203.280	WGCP												Nacogdoches, Sabine, San Augustine and Shelby	N	Sabine National Forest and Indian Mounds Wilderness Area (USFS)	X			NatureServe also defines a related assn. which lacks F. grandifolia, the Pinus taeda - (Pinus echinata) - Quercus alba - Carya alba / Acer barbatum - (Acer leucocerme) Forest assn. They overlap in range and it's unclear whether multiple assns. containing Q. alba and A. leucoderme are redundant.
West Gulf Coastal Plain Calcareous Clay Longleaf Pine Glade	Pinus palustris / Quercus marilandica / Schizachyrium scoparium - Silphium laciniatum - Ruellia humilis Woodland	G1G2	S1S2	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												Angelina, Jasper, Newton, Sabine and Tyler	N	Angelina and Sabine NF and Upland Island Wilderness Area (USFS), Little Rocky Preserve (TNC)	X			
West Gulf Coastal Plain Carolina Ash Swamp	Fraxinus caroliniana Seasonally Flooded Forest	G2G3	S2	West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods CES203.548	WGCP												Angelina, Chambers, Hardin, Jasper, Jefferson, Liberty, Montgomery, Newton, Orange and Sabine	N	Pineywoods Mitigation Bank, Sabine National Forest (USFS) and Trinity River NWR (USFWS)		X		
West Gulf Coastal Plain Catahoula Sandstone Glade	(Pinus palustris) / Schizachyrium scoparium - Bigelowia nuttallii / Cladonia spp. Herbaceous Vegetation	G1G2	S1S2	West Gulf Coastal Plain Catahoula Barrens CES203.364	WGCP												Angelina, Jasper, Newton, Polk, Sabine, San Jacinto, Tyler and Walker	N	Angelina NF (USFS), Big Thicket National Preserve (NPS) and Little Rocky Preserve (TNC)	X			
West Gulf Coastal Plain Cherrybark Oak Small Stream Bottomland Forest	Quercus pagoda - Liquidambar styraciflua - Pinus taeda Forest	G3?	S2S3	West Gulf Coastal Plain Small Stream and River Forest CES203.487	WGCP												Angelina and Jasper	N			X		A similar community is Quercus michauxii - Quercus nigra - Pinus taeda / Carpinus caroliniana Forest. Both types occur in E Texas, but it may be appropriate to merge them into a single assn.
West Gulf Coastal Plain Clayey Longleaf Pine Woodland (Dry Type)	Pinus palustris / Quercus marilandica / Ilex vomitoria / Schizachyrium scoparium Woodland	G2	S1	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												San Jacinto and Walker	N	No documented protected areas	X			
West Gulf Coastal Plain Fleming Calcareous Prairie	Schizachyrium scoparium - Rudbeckia missouriensis - Grindelia lanceolata - (Liatris mucronata) Herbaceous Vegetation	G1	S1	West Gulf Coastal Plain Southern Calcareous Prairie CES203.379	WGCP												Jasper, Newton, Polk, San Jacinto, Tyler and Walker	N	Spencer Family (GRP easement), Campbell Group, Hancock Forest Management and Weyerhauser Timber Corp.	X			
West Gulf Coastal Plain Forested Seep (Northern Type)	Magnolia virginiana - Nyssa (biflora, sylvatica) - Acer rubrum / Morella caroliniensis - Woodwardia aureolata Forest	G4?	S3S4?	West Gulf Coastal Plain Seepage Swamp and Baygall CES203.372	WGCP												Cass, Franklin, Harrison, Marion, Morris, Nacogdoches, Panola, Rusk, Smith, Upshur and Wood	N			X		
West Gulf Coastal Plain Forested Seep (Southern Type)	Nyssa (biflora, sylvatica) - Magnolia virginiana - Quercus laurifolia / Cyrilla racemiflora - Ilex coriacea - Rhododendron oblongifolium Forest	G3?	S2	West Gulf Coastal Plain Seepage Swamp and Baygall CES203.372	WGCP												Hardin, Jasper, Liberty, Newton, Polk and Tyler	N	Big Thicket National Preserve (NPS), Big Thicket Bogs and Sandylands Preserve (TNC)		X		
West Gulf Coastal Plain High Terrace Wooded Flatwoods Pond	Nyssa biflora - Crataegus opaca - (Fraxinus caroliniana) / Rhynchospora mixta Woodland	G2	S2	West Gulf Coastal Plain Flatwoods Pond CES203.547	WGCP												Hardin, Jasper, Montgomery and Orange	N	Angelina NF (USFS), Big Thicket National Preserve (NPS), Martin Dies Jr. State Park (TPWD)			X	
West Gulf Coastal Plain Intermediate Flatwoods Pond	Aristida palustris - Panicum virgatum - Eriocaulon compressum - Eleocharis equisetoides Herbaceous Vegetation	G2	S1S2	West Gulf Coastal Plain Flatwoods Pond CES203.547	WGCP												Hardin, Jasper, Newton, Sabine and Tyler	N	Sandylands Preserve (TNC), Turkey Creek Forest Legacy Easement			X	
West Gulf Coastal Plain Mesic Upland Longleaf Pine Woodland	Pinus palustris / Schizachyrium scoparium - Liatris pycnostachya Woodland	G2G3	S1S2	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												Polk, San Jacinto, Trinity and Tyler	N	No documented protected areas	X			
West Gulf Coastal Plain Quaternary Sand Ridge Flatwoods Pond	Panicum hemitomon - Ludwigia sphaerocarpa Herbaceous Vegetation	G1G2	S1S2	West Gulf Coastal Plain Flatwoods Pond CES203.547	WGCP												Hardin, Jasper, Newton, Sabine and Tyler	Y	Sabine National Forest (USFS)			X	
West Gulf Coastal Plain Rich Bottomland	Quercus pagoda / Ulmus crassifolia - Celtis laevigata / Carex cherokeensis Forest	G1G2	S1S2	West Gulf Coastal Plain Small Stream and River Forest CES203.487	WGCP												San Jacinto and Walker	Y	Sam Houston National Forest (USFS), Russell property (TLC easement)		X		Calcareous mesic hardwood assemblage - unclear how broadly defined this assn. should be.
West Gulf Coastal Plain Salt Glade	Bigelowia nuttallii - Aristida dichotoma - Houstonia rosea / Cladonia spp. Herbaceous Vegetation	G1	S1	West Gulf Coastal Plain Catahoula Barrens CES203.364	WGCP												Anderson, Harrison and Panola	N	Caddo Lake SP (TPWD)	X			
West Gulf Coastal Plain Seepage Bog	Sarracenia alata - Rhynchospora gracilenta - Rudbeckia scabrifolia - Schoenolirion croceum Herbaceous Vegetation	G2G3	S2	West Gulf Coastal Plain Herbaceous Seep and Bog CES203.194	WGCP												Angelina, Jasper, Newton, Sabine and Tyler	N	Angelina and Sabine National Forest and Upland Island Wilderness (USFS), Little Rocky Preserve (TNC)		X		
West Gulf Coastal Plain Seepage Slope Shrub Thicket	(Magnolia virginiana) / Ilex coriacea - Morella caroliniensis Shrubland	G2G3	S2	West Gulf Coastal Plain Seepage Swamp and Baygall CES203.372	WGCP												Angelina, Jasper, Newton, Polk and Tyler	N	Angelina and Sabine National Forests and Upland Island Wilderness Area (USFS), Little Rocky Preserve (TNC)		X		
West Gulf Coastal Plain Shallow Flatwoods Pond	Aristida palustris - Panicum virgatum - Eriocaulon decangulare var. decangulare - Rhynchospora elliottii Herbaceous Vegetation	G2G3	S1	West Gulf Coastal Plain Flatwoods Pond CES203.547	WGCP												Hardin, Jasper and Newton	N	Big Thicket National Preserve - Village Creek Corridor (NPS)		X		

Common Name	Scientific Name	G RANK	S RANK (Provisional)	ECOLOGICAL SYSTEM *added where relationship can be made at this scale*	ECOREGIONS (Note: other ecoregions are included for cross reference and conservation action coordination if needed)												Known COUNTIES	Endemic	Known PROTECTED AREAS	TERR	WETL	AQU	Comments
					WGCP	TBPR	ECPL	GCPM	AZNM	CHIH	HIPL	SWTB	CGPL	CRTB	EDPT	STPL							
West Gulf Coastal Plain Shortleaf Pine - Oak Rich Mesic Forest	Pinus echinata - Quercus alba / Viburnum (dentatum, acerifolium) Forest	G2G3	S2	West Gulf Coastal Plain Pine-Hardwood Forest CES203.378	WGCP												Grimes, Hardin, Jasper, Liberty, Montgomery, Newton, Polk, Sabine, San Augustine, San Jacinto, Smith, Tyler and Walker	N	Angelina National Forest (USFS), Camp Allen (private camp), Huntsville State Park and Sam Houston NF (USFS)	X			Mesic slope forests with Q. alba are widespread in E TX but in most stands Pinus taeda is more dominant than P. echinata. As with most forest types in E Tx, high quality examples are relatively uncommon.
West Gulf Coastal Plain Subcalcareous Pine - Hardwood Slope and Stream Bottom Forest	Pinus taeda - (Pinus echinata) - Quercus alba - Carya alba / Acer barbatum - (Acer leucoderme) Forest	G3G4	S3	West Gulf Coastal Plain Pine-Hardwood Forest CES203.378	WGCP												Nacogdoches, Sabine, San Augustine and Shelby	N	Sabine National Forest and Indian Mounds Wilderness Area (USFS)	X			
West Gulf Coastal Plain Subcalcareous White Oak Forest	Quercus alba / Acer leucoderme - Ostrya virginiana / Solidago auriculata Forest	G2	S1S2	West Gulf Coastal Plain Mesic Hardwood Forest CES203.280	WGCP												Nacogdoches, Sabine, San Augustine and Shelby	N	Sabine National Forest (USFS)	X			As described in NatureServe, applies to sites within range of Fagus grandifolia that lack Fagus but where Acer leucoderme is present. It's unclear whether this represents distinct conditions or simply result of disturbance or chance.
West Gulf Coastal Plain Wet Flatwoods Pond Forest	Taxodium distichum - Nyssa biflora - Magnolia virginiana - Acer rubrum Forest	G2	S1S2	West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods CES203.548	WGCP												Newton and Orange	N	No documented protected areas			X	
West Gulf Coastal Plain Wet Longleaf Pine Savanna (High Terraces Type)	Pinus palustris / Eryngium integrifolium - Rhynchospora spp. - (Ctenium aromaticum) Woodland	G2G3	S1	West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods CES203.191	WGCP												Jasper and Newton	N	No documented protected areas		X		
West Gulf Coastal Plain Xeric Longleaf Pine Sandhill	Pinus palustris / Quercus incana - Quercus margarettiae / Vaccinium arboreum / Cnidoscolus texanus - Stylisma pickeringii var. pattersonii Woodland	G2G3	S1	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												Angelina, Jasper, Newton, Sabine, San Augustine, Shelby, and Tyler	N	Angelina and Sabine NFs and Upland Island Wilderness Area (USFS)	X			
West Gulf Coastal Plain Xeric Post Oak Woodland	(Pinus palustris) - Quercus stellata - Quercus incana / Tetragonotheca ludoviciana Woodland	G2	S2	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												Angelina, Jasper, San Augustine, and Shelby; maybe Newton, Sabine or Tyler	N	Angelina National Forest and Upland Island Wilderness (USFS)	X			
West Gulf Coastal Plain Xeric Upland Shortleaf Pine - Oak Woodland	Pinus echinata - Quercus (incana, stellata, margarettiae) / Cnidoscolus texanus Woodland	G1	S1	West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland CES203.056	WGCP												Houston, Nacogdoches, Rusk, San Augustine and Smith	N	Sabine NF (USFS)	X			Sandhill vegetation with P. echinata sites could match a number of assns. defined in NatureServe, but this is probably the most widely applicable assn. More properly defined as Forest than Woodland.
West Gulf Coastal Subxeric Shortleaf Pine-Oak Woodland	Pinus echinata - (Pinus taeda) - Quercus (margarettiae, stellata, falcata) - Carya texana Woodland	G3	S3	West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland CES203.056	WGCP												Camp, Cass, Franklin, Harrison, Marion, Morris, Panola, Smith, Upshur and Wood	N	Atlanta SRA (TPWD), Brinkle Lake (City of Texarkana), Caddo Lake SP, Daingerfield SP, Lake Bob Sandlin, Tyler SP (TPWD), Lake of the Pines (COE), and Sheffs Woods Preserve (TNC)	X			Widely distributed and common, but high quality examples are much less common.
Western Mayhaw Pond	(Quercus laurifolia) / Crataegus opaca - Crataegus viridis Forest	G2G3	S2	West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods CES203.548	WGCP												Angelina, Jasper, Liberty, Newton, Polk and Tyler	N	Pineywoods Mitigation Bank	X			
Western Upland Longleaf Pine Forest (Messer Pimple Mound Type)	Pinus palustris / Schizachyrium scoparium - Schizachyrium tenerum - Silphium gracile Woodland	G2	S1	West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods CES203.191	WGCP												Jasper, Hardin, Newton, and Orange	N	No documented protected areas	X			Higher elevations adjacent to longleaf pine wetland savannas.
Western Upland Longleaf Pine Forest (Stream Terrace Sandy Woodland Type)	Pinus palustris / Quercus incana / Schizachyrium scoparium - Liatris elegans - Opuntia humifusa var. humifusa Woodland	G1	S1	West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland CES203.293	WGCP												Hardin, Newton, and Tyler	N	Sandylands Preserve (TNC), Big Thicket National Preserve (NPS) and Village Creek State Park (TPWD)	X			
Western Wet Longleaf Pine Savanna (Prairie Terraces Acidic Silt Loam Type)	Pinus palustris / Rhynchospora elliottii - Lobelia flaccidifolia - Platanthera nivea - (Helenium drummondii) Woodland	G2G3	S1	West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods CES203.191	WGCP												Hardin, Jasper, Newton, Orange and Tyler	N	Big Thicket National Preserve (NPS), Big Thicket Bogs and Sandylands Preserve (TNC)		X		

APPENDIX F – FORT WORTH DISTRICT NOTICE TO SEAPLANE PILOTS

CESWF-OD-R

17 Mar 00
Wiese/bw/2707

MEMORANDUM FOR O&M Distribution #2
Number (POL: 00-06)

SUBJECT: Notice to Seaplane Pilots

1. The enclosed Notice to Seaplane Pilots has been updated to correct a few omissions (Waco Lake had been omitted from the last update in Feb 1998) and to include the District's Web Site address.

2. The Notice includes a reference to our Lake Recreation Visitor's Guide pamphlet for additional information. When the Notice is given to a member of the public, the Guide pamphlet should be attached.

3. When printing a copy of the Notice, it should be printed on a Corps of Engineers letterhead.

Dwight L. Quarles

Encl

DWIGHT L. QUARLES
Chief, Operations Division

NOTICE TO SEAPLANE PILOTS
U.S. Army Corps of Engineers, Fort Worth District
Prohibitions and Restrictions Governing the Use of Seaplanes

POLICY

In accordance with Title 36, Chapter III, Part 328 of the Code of Federal Regulations, it is the objective of the Corps of Engineers natural resources management mission to maximize public enjoyment and use of Corps lakes, consistent with their aesthetic and biological values. Within that context, the following restrictions governing the use of seaplanes have been developed.

DISTRICT-WIDE PROHIBITIONS AND RESTRICTIONS

1. Pilots are responsible for knowing the rules and regulations pertaining to aircraft as set forth in Title 36, Chapter III, Part 327.4 of the Code of Federal Regulations. Copies are available from any Corps of Engineers Lake Office.

2. Seaplanes may not be operated between sunset and sunrise. Where not specifically restricted or prohibited, recreational seaplane operations are allowed seven days a week.

3. Aircraft larger than 5,000 pounds gross weight are prohibited from landing without special permission from the District Engineer.

4. Commercial seaplane operations are prohibited unless authorized by the District Engineer. Commercial operations, if authorized, will be limited to the hours of 10 a.m. to 5 p.m., Monday through Friday, from November 1 to April 1.

5. Individual letter permits may be issued for seaplanes to operate in prohibited areas on a one-time-only basis.

6. The operation of a seaplane at Corps of Engineers lakes is at the risk of the plane's owner, operator, and passenger(s). All lakes in the Fort Worth District are operated as flood control reservoirs with widely fluctuating pool elevations. Pilots are encouraged to contact each lake project office for current pool elevation information. Addresses and phone numbers of each lake are listed in the attached Visitor's Guide. Information may also be obtained from the Corps of Engineers web site at www.swf.usace.army.mil

7. Where landings and takeoffs are not totally prohibited at a given lake, a minimum distance of 500 feet from shore or structures must be maintained during landing and takeoffs.

8. The attached information lists specific restrictions and prohibitions for each lake in the Fort Worth District.

SEAPLANE OPERATIONS ARE PROHIBITED ON THE FOLLOWING LAKES
Lake Georgetown Grapevine Lake Hords Creek Lake O.C. Fisher Lake B.A. Steinhagen Lake Waco Lake

SPECIFIC RESTRICTIONS ON SEAPLANE OPERATION	
AQUILLA LAKE Seaplane operations are prohibited in all areas except on 'open water' areas of the lake from the dam northeast to the mouth of Hackberry Creek Branch and from the dam northwest to an East-West line extending from the north bank of the Old School branch.	**JIM CHAPMAN LAKE - COOPER DAM** Landings and takeoffs are prohibited in the uncleared portion of the lake west of a line running from the west end of South Sulphur State Park to the peninsula at the mouth of Doctors Creek and in the cove formed Doctors Creek.
BARDWELL LAKE Landings and takeoffs are prohibited north of Highway 34 and in all coves off the main body of the lake.	**GRANGER LAKE** Landings and takeoffs are prohibited in both major arms of the lake formed by Willis Creek and the San Gabriel River and in the large, shallow lake area north of a line from the outlet structure to the east tip of the San Gabriel Wildlife Area.
BELTON LAKE Landings and takeoffs are prohibited north of Highway 36, in the coves formed by Owl Creek and Cedar Creek, and in the arm of the lake formed by Cowhouse Creek upstream from the northwest end of the Fort Hood Recreation Area.	**JOE POOL LAKE** Landings and takeoffs are prohibited in all lake areas west of the Lakeridge Parkway bridges.
BENBROOK LAKE Landings and takeoffs are prohibited in the lake area south of the abandoned pump station on the east shore and in the coves formed by East and West Dutch Branch Creeks.	**LAKE O THE PINES** Landings and takeoffs are prohibited in all coves and bays off the main body of the lake and in uncleared and shallow areas of the lake.
CANYON LAKE Landings and takeoffs are prohibited upstream from Cranes Mill Park and in all coves and major bay areas off of the main body of the lake. (Including the large lake area east and west of Canyon Park.)	**LAVON LAKE** Landings and takeoffs are prohibited in lake areas north of Collin Park, north of Tickey Creek Park, and in all coves and bays off the main body of the lake.

SPECIFIC RESTRICTIONS ON SEAPLANE OPERATION	
LEWISVILLE LAKE Landings and takeoffs are prohibited in uncleared areas north of Crescent Oaks Park, the entire area west of IH 35 and north of Highway 720, and in large uncleared portions of the entire eastern half of the lake.	**SOMERVILLE LAKE** Landings and takeoffs are prohibited west of the west end of Birch Creek Unit of Somerville Lake State Park and in all coves and bays off the main body of the lake.
NAVARRO MILLS LAKE Landings and takeoffs are prohibited west of Wolf Creek Park 1.	**STILLHOUSE HOLLOW LAKE** Landings and takeoffs are prohibited west and south of Cedar Knob Road and in large shallow areas surrounding unnamed islands in the main body of the lake.
PROCTOR LAKE Landings and takeoffs are prohibited in all areas north and west of the eastern tip of Promontory Park and all areas west of the southwest tip of Promontory Park.	**WHITNEY LAKE** Seaplane operations are prohibited in areas downstream from a line drawn from the northern tip of Walling Bend park to the mouth of Frazier Creek and upstream from a line drawn from the mouth of Cedar Creek southwest to the opposite undeveloped shoreline. The coves formed by King Creek and Cedron Creek are also prohibited
RAY ROBERTS LAKE Landings and takeoffs are prohibited north of Highway 3002 and in areas north and east of a line from the northeast tip of Johnson Park to the southwest tip of Jordan Park.	**WRIGHT PATMAN LAKE** Landings and takeoffs are prohibited in all coves and bays off main body of lake and in uncleared and shallow areas of the lake.
SAM RAYBURN RESERVOIR Landings and takeoffs are prohibited west of Highway 147, north of Highway 83, and in scattered uncleared areas of the reservoir.	

NOTE: The latest revision to this Notice to Seaplane Pilots was completed in March of 2000.

APPENDIX G – USACE RESPONSE TO PUBLIC COMMENTS RECEIVED FOLLOWING PUBLIC MEETINGS

Appendix G

SUMMARY OF COMMENTS RECEIVED AFTER PUBLIC SCOPING MEETINGS – APRIL 28-29, 2015

SAM RAYBURN RESERVOIR MASTER PLAN REVISION

GOVERNMENT AND STAKEHOLDER COMMENT

Southwestern Power Administration

Comments: The Master Plan (MP) Revision should not negatively affect current hydroelectric power operations; lake users need to be made aware of the possibility of water level fluctuations; a sufficient buffer of Project Operations lands should be allowed around current powerhouse and switchyard to allow for rehabilitation work and potential expansion.

USACE Response: Noted. The MP will have no effect on hydroelectric power operations. Information is included in the MP describing the amount of water storage space in Sam Rayburn Reservoir that is dedicated to hydroelectric power generation and describes in broad terms the key points related to hydroelectric power generation. Project Operations lands are sufficient to meet present and future hydropower needs.

Marina Operators/Concession Lessees

Comment: Operator at Jackson Hill Marina requests that timber harvests in Jackson Hill Park not disturb the natural appearance along FM 2851 where it serves as an entrance to the park.

Response: Noted. The harvest of timber takes into consideration park aesthetics, public safety, and the health and vigor of the forest. Careful attention is given to timber harvests that are bounded by park roads to preserve park landscape aesthetics.

Comment: Would like to have access to undeveloped portions of Jackson Hill Park. USACE should either lease or sell the area.

Response: The master plan revision proposes to reclassify the undeveloped portions of the park as a Future/Inactive Recreation Area. USACE has no intention of selling the land. Leasing of the land for recreational development is possible, but USACE believes that until the currently developed portion of Jackson Hill Park is fully developed there is little reason to consider leasing additional land.

GENERAL PUBLIC COMMENT

Note: The comments received from the general public originated primarily from adjacent landowners, with a small percentage of comments coming from other lake users. The comments and responses are grouped into related topic areas.

General Comments on Shoreline Management Issues (mowing, trimming, cleared paths, and private docks):

1. Comment: Several comments recommended that adjacent landowners be allowed to mow and remove underbrush on Federal land and to maintain an unobstructed view of the lake.

Response: Mowing and removal of vegetation by adjacent landowners is a Shoreline Management topic governed by the Sam Rayburn Shoreline Management Policy Statement (SMPS) published in 1975 and administratively updated in 2012. USACE carefully explained in news releases and at the two public meetings that the Shoreline Management Policy Statement is not being addressed in detail as part of the Master Plan revision. The Shoreline Management Policy is, however, described in general terms in Chapter 6 of the master plan. Adjacent landowners interested in mowing or other modification of vegetation are urged to contact the USACE lake office for a detailed explanation of the policy. The following paragraphs are an excerpt from the policy and may be helpful in understanding what is and is not allowed with respect to vegetation modification:

Mowing and Selective Removal of Vegetation*:*
When the original SMPS was prepared for Sam Rayburn Lake the intent was to continue issuing permits for limited vegetation modification where such activity would not result in unacceptable damage to natural resources. While this intent continues today, the potential for excessive negative effects on natural resources from ever-expanding mowing and clearing is very high as new private development surrounding Sam Rayburn Lake has increased substantially in recent years. Widespread and frequent mowing and removal of underbrush on Corps lands causes a direct loss of wildlife habitat value by reducing species diversity, disturbing nesting activity, and disrupting wildlife travel corridors. As a result, requests for new vegetation modification permits received after the date of this SMPS may be denied or will be issued only as needed to reduce the risk from wild fire in accordance with Texas Forest Service guidelines for a "defensible space" adjacent to residential property. In most cases there is adequate space on private land to establish a defensible space. In general, existing permits in good standing will continue to be renewed and new permits for mowing and limited clearing will continue to be issued in those areas where permits have been issued in the past unless there are other overriding concerns such as endangered species habitat or negative effects on water quality.

Mowing of federal land, if allowed, will be for the purpose of reducing the potential for wildfire, maintaining an identifiable line-of-sight property boundary, and to provide public access. No permits will be issued for the purpose of increasing the value of private

property or to enhance the aesthetics of private property. Limited removal of trees and shrubs, if allowed, is also done primarily for the purpose of fire hazard reduction. Mowing and selective removal of vegetation may also be authorized for the purpose of controlling invasive or exotic species. In no case will mowing or vegetation removal activities create the appearance of private ownership of public land. Mowing and removal of underbrush, if allowed through a permit, must adhere to the guidelines presented in Appendix A (of the SMPS).

2. Comment: Preserve and promote the natural scenic beauty of Sam Rayburn Reservoir.

Response: The majority of the USACE-administered land comprising the shoreline of Sam Rayburn Reservoir is proposed to be classified as "Multiple Resource Management Lands – Vegetation Management with a smaller, but significant portion classified as Environmentally Sensitive Area. The management objectives set forth in Chapter 3, and the Resource Plan set forth in Chapter 5 specify that USACE will give priority to maintaining an aesthetically pleasing, healthy, and fully forested shoreline to the extent possible within the constraints imposed by the primary project purposes of flood risk reduction and hydroelectric power generation. The SMPS, as of January 2012, allows previous mowing permits (issued to adjacent landowners) in good standing to be renewed, thus allowing mowing to continue. In these areas, the view of the shoreline from the water may not have a natural landscape appearance, and may appear as manicured lawns with homes in the background.

3. Comment: Allow residents to build private docks, both permanent and mobile or "rolling" docks, place fixed buoys and anchors in the water, and construct bulkheads and piers – same as other lakes in Texas.

Response: National USACE regulations (ER 1130-2-406) prohibit private docks and related facilities such as mooring buoys and piers at all lakes where such facilities did not exist when the regulation was first published in December, 1974. Such is the case with Sam Rayburn Reservoir and the SMPS for Sam Rayburn Reservoir explains the prohibition in more detail. Rolling docks are known to be in use at several locations on Sam Rayburn Reservoir and as time and funding allows, USACE is pursuing removal of these docks. Bulkheads are generally not allowed, but USACE will consider requests from adjacent landowners to control shoreline erosion through the use of vegetation, rip-rap, or other means where warranted. Any shoreline erosion control proposal require written authorization from USACE.

4. Comment: Continue the prohibition of permanent private docks.

Response: Noted. See response above for item 3.

5. Comment: Establish residential waterfront zoning guidelines to allow safe/convenient waterfront access for small vehicles, kayaks, small boats, rolling docks.

Response: Title 36 of the Code of Federal Regulations, Chapter III, Part 327, specifies the rules and regulations governing public use of USACE lands and waters. In accordance with Section 327.2, use of any vehicle off authorized roadways is prohibited unless specifically authorized by the District Commander. Rolling docks are also prohibited in accordance with the Sam Rayburn SMPS, which is the policy that implements Section 327.30 of the aforementioned Title 36. Kayaks, canoes and other small boats that can be carried to the shoreline by hand are allowed at virtually all locations on Sam Rayburn Reservoir except restricted access areas such as the dam and other prime facilities.

6. Comment: Allow adjacent landowners to place semi-permanent sheds on Corps property.

Response: Placement of personal property on USACE lands and waters for a period exceeding 24 hours is prohibited in accordance with Title 36, Section 327.15.

7. Comment: Allow homeowners to maintain a beach front.

Response: The Sam Rayburn SMPS specifies the activities that may be implemented by adjacent landowners after applying for a written permit. Development of a beach is not allowed.

General comments on land reclassification:

1. Comment: Concerned and opposed to reclassification of property around lake as it would chase people off of their own land for the sake of woodpeckers, eagles, land erosion.

Response: Reclassification of Federal land will have minimal effect on adjacent private land and will not prevent or “chase” people off their own land or affect the way they use their own land. This comment may be confusing the classification of Federal land with the flowage easement rights that USACE acquired over adjacent private land in many areas surrounding the lake. The flowage easement rights acquired by USACE allows USACE to temporarily store water on the land when the lake elevation rises above the conservation pool of 164.4 feet NGVD. The flowage easement rights were generally acquired up to a specific elevation that ranges from 179 feet NGVD in most areas, to 189 feet in the upper portion of the lake and major tributaries. The flowage easement empowers USACE to prevent the deposition of fill material on the flowage easement to protect flood storage capacity, prevent human habitation from taking place on the easement, and to approve most structures proposed for placement on the flowage easement that would not interfere with storage of floodwater. While classification of USACE land is intended to protect natural resources and provide public outdoor recreation opportunities, the management of flowage easements does not take these resources and activities into account with the exception of soil erosion which can have an adverse effect on the operation of Sam Rayburn Reservoir.

2. Comment: Changing "high recreational use" areas to "low recreational use" areas would make it easier for oil/gas exploration and production to occur.

Response: In general, USACE does not own the mineral estate beneath USACE land with the exception of the mineral estate beneath the dam and spillway area and a few other isolated tracts. Regardless of how USACE lands are classified, the owners of private minerals are, in general, allowed reasonable access to their minerals. As lands were acquired by USACE prior to construction of Sam Rayburn Dam, the mineral estate was generally “subordinated” by USACE to ensure that future mineral exploration and production activities do not unreasonably interfere with the operation of Sam Rayburn Reservoir. The deed for each parcel of land that was acquired must be examined to determine the exact nature of the subordinations placed on the mineral estate. In most cases, mineral owners are sensitive to the need to protect public lands and will cooperate with USACE to avoid and reduce negative impacts on natural resources and recreational activities.

3. Comment: Question about "undeveloped park" on new map. What is "Tiger Creek Park" going to be used for and what kind of park is it going to be?

Response: Tiger Creek Park is currently undeveloped and is classified as a High Density Recreation area where full recreational development could take place. The study team determined that Tiger Creek Park should remain classified for recreation development, but decided to classify the area as a “Future/Inactive Recreation Area”. When the need arises, the area could be developed to provide facilities typical of High Density Recreation Areas including, but not limited to a comprehensive resort (as defined in ER 1130-2-550), campgrounds, boat ramps, group shelters and swimming beaches.

4. Comment: Rayburn Country / Forest Hills needs public swim beach and playground for younger families.

Response: The USACE land adjoining Rayburn Country and Forest Hills subdivisions is proposed for classification as Multiple Resource Management Lands – Low Density Recreation. This classification would not allow development of high density recreation facilities such as a swim beach and playground. When the final draft of the Master Plan is reviewed, and if public interest is expressed in having such facilities in the area, the study team will take that into consideration. Placement of a public beach and playground, or other high density recreation facilities on USACE land by others, if supported by the land classification, would require a lease arrangement with a governmental entity.

5. Comment: Favor land classification change to allow economic development if property values are not harmed.

Response: Economic development generally entails commercial outdoor recreation enterprises which may be allowed in areas classified as High Density Recreation Areas

and Future/Inactive Recreation Areas. The study team examined each currently classified high density recreation area and determined that the amount of land under that classification is excessive. Reclassification of select, undeveloped high density recreation to another classification is proposed for approximately 2,263 acres, leaving approximately 1,598 acres for high density recreation development and 718 acres as Future/Inactive Recreation Areas. The study team believes there is significant opportunity for economic development activities throughout the lake area within those areas that would remain classified for High Density Recreation or Future/Inactive Recreation Area. It is important to note here that the type of recreation development on USACE land is governed by national policy set forth in ER 1130-2-550.

6. Comment: Will public have opportunity to comment on revised land classifications?

Response: Yes. When the final draft of the Master Plan is announced public meetings will be held and a public comment period will follow for a 30-day period. Proposed land and water surface classifications may be changed in response to public comment.

General Comments on Recreation Facilities and Development:

1. Comment: Allow continued use of Hanks Creek Park boat ramp by non-campers. Fisherman need access to remove trash fish from lake (carp, drum, gar).

Response: Noted. The master plan revision does not envision a change in the current public use of the Hanks Creek Park boat ramp.

2. Comment: Help Caney Creek Recreation Area.

Response: Caney Creek Recreation Area is owned and operated by the U.S. Forest Service and is therefore not addressed in the Master Plan revision. Questions on Caney Creek should be directed to the U.S. Forest Service office in Lufkin, Texas.

3. Comment: Would like to see improvement on northern end of lake (SH 147 and north). Repair and extend boat ramps for low water use (Etoile, Shirley Creek, Ralph McAlister) and consider making a boat lane. More boaters on northern end since Cassels Boykin constructed.

Response: Noted. The master plan revision will not affect the current operation of Etoile, Marion Ferry, Monterey, Shirley Creek or Ralph McAllister Parks, but does propose to reclassify all of them except Shirley Creek from High Density Recreation to Multiple Resource Management Land – Low Density Recreation. This reclassification recognizes the relatively undeveloped nature of these parks, but the Resource Plan in Chapter 5 specifies that the facilities in these parks will remain open and maintained. The suggestion to extend ramps for low water conditions and mark a boat lane will be considered by the study team.

4. Establish an area of Sam Rayburn perimeter as a Jasper County Park, managed by Jasper County, with use fees going to beautification/maintenance of SR.

Response: USACE welcomes recreation management partnerships with county and city governments. Currently, the Umphrey Pavilion is a direct park and recreation lease to Jasper County. Angelia County also leases land in Cassels Boykin Park and has provided a pavilion and support facilities to facilitate fishing tournaments and other events. These partnerships are very successful and USACE looks forward to additional initiatives.

5. Develop more small boat ramps for smaller crafts in Rayburn Country/Jasper County.

Response: Chapter 5 of the Master Plan states that USACE is proposing a new boat ramp complex in Ebeneezer Park on the south side of the spillway. A small craft boat launching complex on the Angelina River is also proposed for placement on USACE land in the area downstream from the dam. Placement of a ramp in other locations could be facilitated by lease agreements between USACE and county governments. Ramps thus proposed, may qualify for a TPWD Boating Access Grant. This grant program provides 75% matching grant funds for the construction of public boat ramp facilities throughout Texas. Local government sponsors must make an application, provide the land (via lease from USACE), provide access to the proposed boat ramp, supply 25% of the development costs, and accept operation and maintenance responsibilities for a minimum 25-year period.

6. Comment: Improve natural recreation opportunities, especially at Twin Dikes (kayaks, visitor center).

Response: The study team will take this recommendation under consideration. Passive recreation activities are growing at a fast pace in Texas and the nation, so development of trails, canoe/kayak launches and related facilities are needed. A visitor center is a significant investment but will be considered by the study team.

7. Comment: We need lakeside gas facilities at the north end of the lake (Shirley Creek fuel dock removed after Rita). Upgrade retaining wall at Shirley Creek Marina because wind and wave action continues to erode.

Response: USACE is aware of the unavailability of gasoline in the northern area of the lake and will work with the lessee at Shirley Creek Marina to remedy the problem. Refer to the USACE response #9 under General comments on natural resources and aesthetics for additional information on fuel service offered by marinas.

8. Comment: Fishing tournaments / gamblers take away from public and family use of lake. Tournament promoters should be charged a fee because they get 20% of the entry fees.

Response: Fishing tournaments are a very beneficial economic activity for the region surrounding Sam Rayburn Reservoir and will continue to be encouraged. Revenue generated by event organizers are governed by national policy. Currently, if an event is located on a non-outgranted (non-leased) area and collects funds in excess of the actual costs, all excess fees shall be paid to USACE for legal disposal unless surplus

proceeds are used for to benefit the project as determined by the Lake Manager. A receipt and expenditure statement shall be provided by the permittee with 30 days following the event. If the event is located on an outgranted (leased) area, all gross proceeds will be reported in accordance with applicable lease conditions. (this means it is included with their gross receipts for the month and payment made to USACE based on the graduated rental).

9. Comment: Increase economic development. Ex: Lake Conroe and Lake Livingston. Marina with restaurant, retail, RVs. Hotel/conference center on water to draw world class fishing and golf clients. Partner w/ Jasper County Development District for economic development and growth using hotel tax dollars.

Response: USACE welcomes proposals from counties and cities for development of comprehensive resort facilities. The High Density Recreation lands that are suitable for this type of development are sufficient to meet needs for the foreseeable future. A feasibility study would be required prior to approval of such a proposal. There are currently no proposals under consideration for a comprehensive resort. Existing concessionaires generally provide facilities and services for which a demand exists.

General comments on natural resources and aesthetics.

1. Comment: Keep lake natural.

Response: The proposed classification of the majority of USACE lands for Vegetation Management, coupled with the Natural Resource Management objectives in Chapter 3, will ensure that the majority of shorelines on Sam Rayburn Reservoir remain in a natural state. Those areas where adjacent landowners currently have permits to mow and remove vegetation will not appear natural when viewed from the water, but such areas do not exist on the majority of project lands.

2. Reduce noise pollution by prohibiting 2- stroke engines.

Response: Noise generated by vessel engines is regulated by Title 36, Section 327.3(j), which states “Except as authorized by the District Commander, no person shall operate any vessel or watercraft without a proper and effective exhaust muffler as defined by state and local laws, or with an exhaust muffler cutout open, or in any other manner which renders the exhaust muffler ineffective in muffling the sound of engine exhaust.” TPWD Game Wardens also enforce rules related to vessel engine noise.

3. Continue invasive species management.

Response: Noted. Contingent on available funding, USACE intends to aggressively control invasive species. USACE will continue to participate in cooperative efforts with TPWD and LNVA, in the control of aquatic plant species. The Master Plan describes these efforts in Chapter 2 and also lists relevant Natural Resource Management Objectives in Chapter 3.

4. Maintain / improve water quality, enforce CWA for construction.

Response: Noted. USACE maintains an environmental compliance program on its own operations and the operations of lessees. The Clean Water Act (CWA) rules and regulations are part of this program. USACE will work cooperatively with the Texas Commission on Environmental Quality and the EPA to monitor and resolve CWA violations and to implement best management practices focused on water quality.

5. Reduce, reuse, recycle litter - litter is huge problem at boat ramps and along RR 255 and FM 1007.

Response: Noted. Acquisition of materials and services by USACE follows sustainability guidelines to reduce waste, and promote reuse and recycling. Litter is a universal problem in Texas and will require the cooperation of many entities and all citizens to end this social blight.

6. "Dark sky" initiative - Reduce light pollution along shoreline and high use rec areas for beauty and astronomy.

Response: Noted. This is an excellent recommendation and will be addressed in the Resource Objectives in Chapter 3.

7. Erosion protection of recreation islands.

Response: Erosion control is addressed in the Natural Resource Management Objectives in Chapter 3. Contingent on funding, erosion control measures will be implemented in recreation areas on a priority basis. Erosion on islands, where important for boating-related recreation or protection of important natural or cultural resources will also be addressed.

8. Comment: Remove old trot lines and fishing noodles, possibly through coop program using TCEQ Special Environmental Project Funds.

Response: As noted under Comment 5 above, removal of litter, to include old trot lines and fishing noodles, will be addressed. Cooperative efforts with many entities, including TCEQ, will be pursued to address the problem.

9. Install fuel docks at all marinas so spillage from gas cans will not cause environmental concerns or inconvenience.

Response: Marina fueling facilities are inspected regularly for environmental compliance. While the decision to provide a fuel service facility as a public amenity rests with the concessionaire, USACE will work with concessionaires proposing fueling facilities and other amenities to ensure compliance with laws and regulations prior to proposed installation.

10. Conduct educational seminars for concerned citizens to help improve lake health.

Response: Noted. USACE will respond to requests for presentations on environmental topics that are relevant to management of the lake.

11. Comment: What is definition of "encroachment?" Is this an unauthorized occupation, like a building on Corps property?

Response: USACE regulations define “encroachment” as structure or improvement built, installed or established which interferes with a real estate interest of the United States, either a fee interest or an easement if such is prohibited in the deed. An encroachment has occurred where the structure or improvement extends over, across, in or upon lands in which the Government owns a real estate interest which would prohibit such, and the structure or improvement has not been approved.

General comments on public meeting process, need for better communication with the public and area communities.

1. Comment: Displeased with no questions at meeting. Asked USACE staff if future meeting would have Q & A and was told no. Feels animosity between public and Corps.

Response: USACE believes the workshop-style of public meeting provides all attendees the best opportunity to ask questions. This type of public meeting provides an introductory presentation and following the presentation, attendees are free to visit with USACE staff and ask questions. This process provides equal opportunity for all to engage in the process. USACE regrets any feelings of animosity that exist and is willing to work with all interested parties to develop good relationships.

2. Comment: Corps held public meeting because it had to, not because they are interested in what we have to say.

Response: USACE is interested in all public comment and will strive to be responsive to every comment. Public involvement in the master plan and related environmental assessment process is required, and USACE has endeavored to make that process robust, convenient and meaningful.

3. Comment: Post all submitted comments for all to see what others are thinking.

Response: Noted. This comment/response document is provided for that purpose. Comments that are very similar in content are consolidated for the purpose of providing a response.

4. Comment: Difficult to comment at this time with little information.

Response: The introductory presentation at the public meeting explained that the master plan revision would: examine how USACE lands are classified for future use; develop new management objectives, and present a resource management plan specifying in broad terms facilities or management actions that are planned for the future. The public meeting was a scoping meeting to request input on these tasks. Some attendees apparently were expecting a very definite proposed action that they could review, but the intent was to gather input for the development of actions that

would be proposed later in a final draft master plan. Many attendees did understand this and provided meaningful comment.

5. Comment: Improve local communication about high water levels and explain/advise water releases.

Response: Lake elevation and water release information is constantly updated and available by calling the USACE Sam Rayburn project office at 409-384-5716. Current and historic lake elevation water release information, as well as other pertinent operational data is available on the USACE website at www.swf.usace.army.mil. Select the “Lakes - Recreation” link, then select Sam Rayburn Lake. This website also provides links to local marinas and campsite reservation information.

6. Comment: Establish Community-Oriented Communication Committee (COCC), like white paper by Scott Hall of LNVA to improve communication and relationship between Corps and local, county, state, Congressional reps.

Response: This is an excellent suggestion and has been taken under advisement by the USACE Lake Manager. A semiannual “lake information exchange meeting” would be very useful to keep all governmental entities and elected representatives informed.

APPENDIX H - ACRONYMS

Appendix H – Acronyms

ADA	Americans with Disabilities Act
CAP	Climate Action Plan
CRMP	Cultural Resources Management Plan
DC	District Commander
EA	Environmental Assessment, NEPA Document
EC	Engineer Circular
EM	Engineering Manual
EP	Engineering Pamphlet
EPA	United States Environmental Protection Agency
ER	Engineering Regulation
ESA	Environmentally Sensitive Area
FONSI	Finding of No Significant Impact
GIS	Geographical Information Systems
HDR	High Density Recreation
HQ	USACE Headquarters
LEED	Leadership in Engineering and Environmental Design
LNVA	Lower Neches Valley Authority
MP	Master Plan or Master Planning
MRML	Multiple Resource Management Lands
NHPA	National Historic Preservation Act
NRRS	National Recreation and Reservation Service
NRHP	National Register of Historic Places
NSRE	National Survey on Recreation and the Environment
NGVD	National Geodetic Vertical Datum
NWI	National Wetland Inventory
NRCS	Natural Resources Conservation Service

NEPA	National Environmental Policy Act, 1970
NOA	Notice of Availability
O&M	Operations and Maintenance
OMB	Office of Management and Budget
OMBIL	Operations and Maintenance Business Information Link
OMP	Operational Management Plan for a specific lake Project
OPM	Operations Project Manager
PDT	Project Development Team
PM	Project Management or Project Manager
PMP	Project Management Plan
SGCN	Species of Greatest Conservation Need
SHPO	State Historical Preservation Office
SWF	U. S. Army Corps of Engineer's Fort Worth District Office
SWF-OD	Operations Division, U. S. Army Corps of Engineers, Fort Worth
SWF-RPEC	Regional Planning & Environmental Center located in Fort Worth
TCAP	Texas Conservation Action Plan
TCEQ	Texas Council on Environmental Quality
TXDOT	Texas Department of Transportation
TORP	Texas Outdoor Recreation Plan
TPWD	Texas Parks and Wildlife Department
USACE	United States Army Corps of Engineers
USACE-SWF	U. S. Army Corps of Engineer's Fort Worth District Office
USFWS	U. S. Fish and Wildlife Service
USFS	U.S. Forest Service