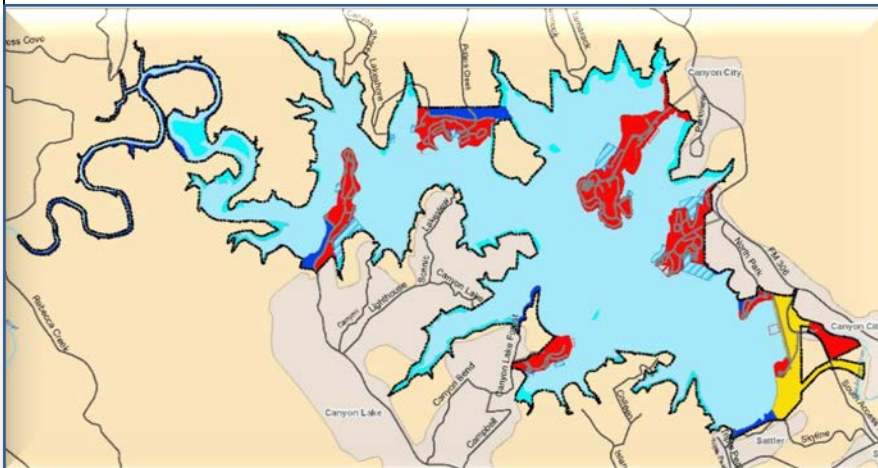


CANYON LAKE MASTER PLAN

December 2017

GUADALUPE RIVER BASIN Comal County, Texas



US Army Corps of Engineers

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DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

CESWF-PEC

04 December 2017

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers (USACE), Fort Worth District (SWF)

SUBJECT: Canyon Lake and Dam, Texas Master Plan Revision (December 2017)

1. PURPOSE: Enclosed subject Master Plan is submitted for review and approval in accordance with Engineering Regulations (ER) 1130-2-550, Change 7 and Engineering Pamphlet (EP) 1130-2-550, Change 5.
2. BACKGROUND/DISCUSSION: In accordance with ER 1130-2-550 Change 07, dated 30 January 2013 and EP 1130-2-550 Change 05, dated 30 January 2013, Lake Project master plans are required for most USACE water resources development projects having a federally-owned land base. This revision of the Canyon Lake Master Plan is intended to bring the master plan up to date to reflect ecological, socio-demographic, and outdoor recreation trends that are currently affecting the lake, as well as those anticipated to occur within the planning period of 2017 to 2042, a 25-year period.
3. SUMMARY OF CHANGES: The revision resulted in the preparation of new resource management objectives and the following changes to land use classifications:

Prior (1970) Land Classifications	Acres	New Land Classifications	Acres
Operation and Maintenance	333	Project Operations	333
Recreational Areas (Priority 1, 2, 3, & 4)	1,550	High Density Recreation	1,405
		Environmentally Sensitive Areas	430
Aesthetic and Multiple Use Recreation	1,382	Multiple Resource Management – Low Density Recreation	1,097

a. The above changes were the result of public and stakeholder review and comment, review of regional trends in outdoor recreation and resource protection, and compliance with Federal policies and mandates governing Federal land use. Environmentally Sensitive Areas were identified for the protection of threatened and endangered species and their habitat, as well as culturally significant sites and unique views and landscapes.

b. In accordance with the National Environmental Policy Act of 1969, including guidelines in 33 Code of Federal Regulations Part 230, an Environmental Assessment (EA) was prepared to assess the potential impacts that the alternative management scenarios set forth in the 2017 Canyon Lake Master Plan (2017 Master Plan) would have on the natural, cultural, and human environments. The EA evaluated and analyzed two alternatives: a No Action Alternative

CESWF-PEC

SUBJECT: Canyon Lake and Dam, Texas Master Plan Revision (Dec 2017)

(continued use of the 1970 Master Plan) and the implementation of the 2017 Master Plan. Based on the findings of the EA, the implementation of the 2017 Master Plan would not result in significant adverse impacts on the environment or constitute a major Federal action significantly affecting the quality of the human environment.

c. The Master Plan and EA have been reviewed by the Regional Planning and Environmental Center, SWF Operations, and SWF Office of Counsel. The final version of the documents went through a 30-day public and agency review. All comments from the reviews have been addressed.

4. RECOMMENDATION: The Project Delivery Team members have reviewed and approved the Master Plan revision. The team recommends approval by each signatory, as well as approval and signature of the Findings of No Significant Impact by the commander.

Approve ✓
Disapprove _____
Date 4 Dec 17



ARNOLD R. NEWMAN
Acting Director, Regional Planning &
Environmental Center

Approve ✓
Disapprove _____
Date 7 Dec 17



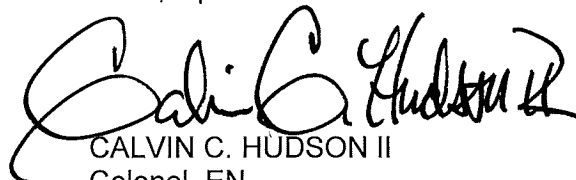
ROCKY D. LEE
Chief, Real Estate Division

Approve ✓
Disapprove _____
Date 7 Dec 17



TIMOTHY L. MACALLISTER
Chief, Operations Division

Approve ✓
Disapprove _____
Date 26 MAR 18



CALVIN C. HUDSON II
Colonel, EN
Commanding

**FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT FOR THE
CANYON LAKE MASTER PLAN
GUADALUPE RIVER BASIN
COMAL COUNTY, TEXAS**

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

The revised Master Plan will provide guidance for stewardship of natural resources and management for long-term public access to, and use of, the natural resources of Canyon Lake, 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 land uses would not be revised. With this alternative, no new resources analysis or land-use classifications would occur. The operation and management of Canyon Lake 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 classification changes associated with the Proposed Action include the following:

Proposal	Description	Justification
Project Operations (PO)	No Project Operations Lands were reclassified.	
High Density Recreation (HDR)	Lands under the prior classification of Recreational Areas were converted to the new and similar classification of High Density Recreation but were reduced from 1,550 to 1,405 acres through the following reclassifications:	The 145 park acres that were reclassified to ESA Historically, these lands have been managed for the benefit of wildlife and are places where GCWA habitat exists. These lands are more appropriately classified as ESA lands. The conversion of these lands will have no effect on current

Proposal	Description	Justification
	<ul style="list-style-type: none"> ○ 10 acres in North Park to ESA for scenic quality and GCWA habitat to ESA ○ 43 acres in Cranes Mill Park from HDR to ESA from crappie dock to the Cranes Mill Park boundary for GCWA habitat conservation ○ 92 acres north of Potters Creek park to ESA for scenic area, habitat, and buffer zone 	<p>or projected public use.</p>
<p>Environmentally Sensitive Areas (ESA)</p>	<p>The classification of 430 acres as Environmentally Sensitive Areas resulted from the following land classification changes:</p> <ul style="list-style-type: none"> ○ Renaming the existing 285 acres of Aesthetics to ESA for unique aesthetics and cultural sites ○ Reclassifying 145 acres of HDR to ESA due to areas designated by U.S. Fish and Wildlife Service (USFWS) as important habitat for the endangered Golden-cheeked Warbler (GCWA) 	<p>These classification changes were necessary to recognize those areas at the project having the highest ecological value, including areas of high value for protection of important habitat for the endangered GCWA as designated by the USFWS, to protect unique views, and cultural and archeological sites, specifically the spillway and gorge.</p> <p>The conversion of lands will have little to no effect on current or projected public use. Lands classified as ESA are given the highest order of protection among possible land.</p>
<p>MRML – Low Density Recreation (LDR)</p>	<p>The 1,097 acres designated as Low Density Recreation were acres of the former classification of Aesthetic</p>	<p>The land areas in the former classification of Aesthetic were retained as Low Density Recreation in areas where the historic land use patterns supported that retention. The conversion of these lands will have no effect on current or projected public use.</p>

Proposal	Description	Justification
Water Surface	<p>The classification of 8,306 acres of water surface of the lake at the conservation pool elevation is as follows:</p> <ul style="list-style-type: none"> ○ 31 acres of Restricted water surface at Canyon Lake include the water surface in front of the intake structure at the control tower at Canyon Dam and designated swimming areas in the parks around Canyon Lake (swim beaches at Joint Base San Antonio Rec Area, Canyon Park, Potters Creek, and Comal). Buoys mark the line in front of the dam. Keep-out buoys and floating barrier pipes mark the designated swimming areas in each park. ○ 178 acres of Designated No-Wake areas are in place near the 23 boat ramps and two marina areas at Canyon Lake. ○ There are 8,097 acres of Open Recreation water surface at Canyon Lake. 	<p>Previous master plans for Canyon Lake did not specify different classifications on the water surface, though these classifications were recognized in practice. This master plan revision recognizes and specifies these uses. The classification of water surfaces will have no effect on current or projected public use</p>

(1)The land classification changes described in this table are the result of changes to several 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.

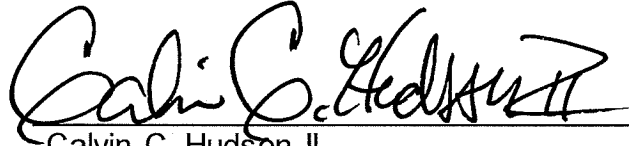
The Environmental Assessment (EA) and comments received from other agencies have been used to determine whether the Proposed Action requires the preparation of an Environmental Impact Statement (EIS). All environmental, social, and economic factors that are relevant to the recommended alternative were 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, health and safety, 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 Canyon Lake will have no significant adverse impact on the environment and will not constitute a major Federal action significantly affecting the quality of the human or natural environment. Therefore, an EIS will not be prepared.

26 MAR 18

Date



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

EXECUTIVE SUMMARY

Canyon Lake Master Plan

U.S. Army Corps of Engineers

Prepared by the Regional Planning and Environmental Center (RPEC)

November 2017

PURPOSE

The revision of the *Canyon Lake Master Plan* (hereafter Plan or Master Plan) is a framework built collaboratively to guide appropriate stewardship of U.S. Army Corps of Engineers (USACE) administered resources at Canyon Lake over the next 25 years. The current 1970 Master Plan for Canyon Lake was an update of the original 1962 Master Plan and has served well past its intended 25-year planning horizon. In addition to the inherent mission of environmental stewardship, the lake and dam's primary purposes are flood risk management, water supply, and hydroelectric power generation at non-federal expense. Currently, Canyon Lake encompasses 3,265 acres of land and 8,306 acres of surface water and has 80 miles of shoreline. The reservoir protects nearly 250 square miles of land downstream from Canyon Dam in the Guadalupe River basin through flood mitigation. Additionally, the reservoir provides 90,000-acre feet of water for municipal and industrial customers through the Guadalupe–Blanco River Authority, and generates 25 million kilowatt hours (KWh) of electricity annually, as well as encompassing habitat for fish and wildlife conservation and public outdoor recreation, creating a dynamic regional economic engine. This Plan and supporting documentation provides an inventory, analysis, goals, objectives and recommendations for USACE lands and waters at Canyon Lake, Texas.

PUBLIC INPUT

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

Approximately 36 individuals, not including USACE personnel, attended the public scoping meeting held at the onset of the process on 18 March 2016 for the Canyon Lake Master Plan Revision. During the initial 30-day comment period, 346 comments were received, with the majority of the comments coming from local landowners. The comments received were dominated by concerns related to shoreline management issues focused on private uses of Federal lands and were not directly related to the master plan. While comments directly related to land use changes were addressed, the remaining comments will be valuable going forward as future operations and management plans are updated.

The final draft with the EA was made available to the public on 10 July 2017. A final 30-day public comment period follows the public meeting held on 20 July 2017, of

which 51 people attended and 9 written comments were received. All comments and USACE responses will be recorded in Chapter 7 of the Plan.

RECOMMENDATIONS

The following land classifications changes (detailed in Chapter 8, Table 8.1) were a result of the inventory, analysis, and synthesis of data, documents, and public and agency input. In general, 1,189 total acres were reclassified, with fee and conservation pool acreage changes due in part to siltation and improvements in measurement using Geographical Information System (GIS) technology. This software allows for more finely tuned measurements and thus stated acres may vary from official land acquisition records and acreage figures published in the 1970 Master Plan. A more detailed summary of changes and rationale can be found in Chapter 8.

Prior Land Classifications (1970)	Acres	New Land Classifications	Acres
Operation and Maintenance	333	Project Operations	333
Recreational Areas (Priority 1, 2, 3, & 4)	1,550	High Density Recreation	1,405
		Environmentally Sensitive Areas	430
Aesthetic and Multiple Use Recreation	1,382	Multiple Resource Management – Low Density Recreation	1,097
Permanent pool	8,306	Permanent pool	8,306
Flowage Easement	3,620	Flowage Easement	3,620

PLAN ORGANIZATION

Chapter 1 of the Master Plan presents an overall introduction of Canyon Lake. Chapter 2 consists of an inventory and analysis of project resources. Chapters 3 and 4 lay out management goals, resource objectives, and land allocation and classification. Chapter 5 is the resource plan that identifies how project lands will be managed through a resource use plan for each land use classification. This includes current and projected park facility needs, an analysis of existing and anticipated resource use, and anticipated influences on overall project operation and management. Chapter 6 details topics that are unique to Canyon Lake. Chapter 7 identifies the public involvement efforts and stakeholder input gathered for the development of the Master Plan, and Chapter 8 gives a summary of the changes in land classification from the previous master plan to the present one. Finally, the appendices include information and supporting documents for this Master Plan revision, including Land Classification and Park Plate Maps (Appendix A).

An Environmental Assessment analyzed alternative management scenarios for Canyon Lake and 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 is a separate document that informs this Master Plan and can be found in its entirety in Appendix B.

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

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CANYON LAKE MASTER PLAN

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CHAPTER 1 - INTRODUCTION

1.1 GENERAL OVERVIEW

Canyon Lake is a multipurpose water resources project constructed and operated by the U.S. Army Corps of Engineers (USACE), Fort Worth District. The lake and associated federal lands are located in Comal County, Texas (TX). Situated on the Guadalupe River about twelve miles northwest of the town of New Braunfels, TX, the Canyon Lake Dam and associated infrastructure, as well as all lands acquired for the Canyon Lake project, are federally owned and administered by the USACE.

The Master Plan is intended to serve as a comprehensive land and recreation management guide with an effective life of approximately 25 years. The focus of the Plan is to guide the stewardship of natural and cultural resources, and make provision for outdoor recreation facilities and opportunities on federal land associated with Canyon Lake. The Plan does not address the flood risk management, hydropower, or water supply purposes of Canyon Lake (see the USACE Water Control Manual for Canyon Lake for a description of these project purposes). The Canyon Lake Master Plan was last updated in 1970, which is well past the intended planning horizon.

1.2 PROJECT AUTHORIZATION

Canyon Lake, formerly designated as Canyon Reservoir, was authorized by the River and Harbor Act of March 02, 1945 (Public Law 14, 79th Congress, 1st Session) and modified by the Flood Control Act of September 3, 1945 (Public Law 780, 83rd Congress, 2nd Session) to provide local cash contributions during construction and to permit the construction of hydroelectric power facilities at non-Federal expense. Authority for the recreation program was provided under the Flood Control Act of December 22, 1944 (58 Stat. 889) as amended, authority for the fish and wildlife program was granted under the Fish and Wildlife Coordination Act of 1958 as amended. In October of 1957, the Federal Government contracted with the Guadalupe-Blanco River Authority granting them the right to use storage space between 909.0 National Geodetic Vertical Datum (NGVD), the top of the conservation pool, and 800.0 NGVD.

1.3 PROJECT PURPOSE

Canyon Lake is a multipurpose water resources project operated by USACE that includes balancing the needs of the surrounding population, visitors, and the ecological system. The primary purposes of the project are flood risk management, municipal and industrial water supply, and hydroelectric power generation. The lake

also is managed for public recreation and environmental stewardship, including fish and wildlife conservation. The floodplains below the dam are protected from floods occurring above the dam and reservoir in the Guadalupe River watershed, based on a conservation pool elevation of 909.0 NGVD.

1.4 MASTER PLAN PURPOSE AND SCOPE

The Canyon Lake Master Plan is the living, flexible, long-term strategic land-use management document that guides the comprehensive management and development of all the project's recreational, natural, and cultural resources. Under the guidance of Engineering Regulation (ER)1130-2-550 Change 7, the Plan guides the efficient and cost-effective development, management, and use of project lands. It is a dynamic tool that provides for the responsible stewardship and sustainability of the project's resources for the benefit of present and future generations. The Plan works in tandem with the Operational Management Plan (OMP), which is the implementation tool for the resource objectives and development needs identified in the Master Plan. The Master Plan guides and articulates the USACE responsibilities pursuant to federal laws. The USACE vision for the future management of the natural resources and recreation program at Canyon Lake is set forth as follows:

“The land, water and recreational resources of Canyon Lake 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.”

It is important to note what the Master Plan does not address. Details of design; management and administration; and implementation are not addressed here, but are covered in the Canyon Lake Operational Management Plan. In addition, the Master Plan does not address the specifics of regional water quality, shoreline management, or water level management, nor does it address the operation and maintenance of project operations facilities. The 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. Additionally, the Plan does not address the flood risk management or water conservation purposes of Canyon Lake (see the USACE Water Control Manual for Canyon Lake for a description of these project purposes.)

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

- Regional and ecosystem needs
- Project resource capabilities and suitabilities

- Expressed public interests that are compatible with Canyon Lake's authorized purposes
- Environmental sustainability elements

The Canyon Lake Master Plan, originally published in 1962 as Design Memorandum (DM) 9B, then revised as DM 9C in 1970, was sufficient for prior land use planning and management, but many changes are affecting the region. Outdoor recreation trends, regional land use, population, current legislative requirements and USACE management policy have evolved. Increased urbanization, fragmentation of wildlife habitat, impacts of climate change, and the growing demand for recreational access and natural resources management has affected the region and Canyon Lake. In response to these escalating pressures, a full revision of the 1970 Master Plan is required. The Master Plan revision will update land classifications, plan for the modernization of existing parks, and inform the management of wildlife and other resource lands for the next 25 years.

1.5 BRIEF WATERSHED AND PROJECT DESCRIPTION

Canyon Lake is located in the Guadalupe River watershed in Central Texas and is entirely within the Edwards physiographic province of Texas in Comal County. Canyon Lake is located 12 miles northwest of New Braunfels, on the Guadalupe River. At conservation pool elevation the reservoir extends approximately 20 miles upstream in the Guadalupe River Valley, having a drainable area of approximately 1,432 square miles. The area is characterized by rocky, rugged hills and narrow valleys, accentuated by the steep hills and limestone bluffs of the Balcones Escarpment. This escarpment is the dividing line between the plateau area to the west and the coastal plains physiographic region to the east. The topography adjacent to the conservation pool level varies from rolling to steep.

The dam and reservoir construction began in 1958 and was completed in 1964, and then was classified as 100% complete as of June 30, 1970, with the exception of additional recreation facilities. A contract for the embankment was awarded in the summer of 1960, and deliberate impoundment was initiated on June 16, 1964, reaching the top of the conservation pool level (909.0 National Geodetic Vertical Datum (NGVD) in April 1968.

The dam consists of a rolled earthfill dam, 6,830 feet long, 224 feet high, with an uncontrolled spillway, 1,260 feet wide saddle, one 10-foot diameter conduit controlled by 5 feet 8 inch x 10 feet slide gates, and flood control storage of 354,600 acre-feet (ac-ft.). The dam is the tallest earth embankment built by USACE in Texas. The project also has fifteen recreation areas consisting of eight USACE managed recreation areas and five leased areas consisting of two Park and Recreation Leases, which operate 4 recreation areas, two Commercial Concession Leases, and one Private Yacht Club consisting of 1,854 total acres.

1.6 DESCRIPTION OF RESERVOIR

Canyon Lake is one of the deepest lakes in Texas. With an average depth of 43 feet, it features 95 miles of scenic shoreline and covers 8,306 surface acres of water. The USACE has its headquarters for the lake near the uncontrolled spillway along Corps of Engineers (C.O.E) Road, which connects to State Highway 306.

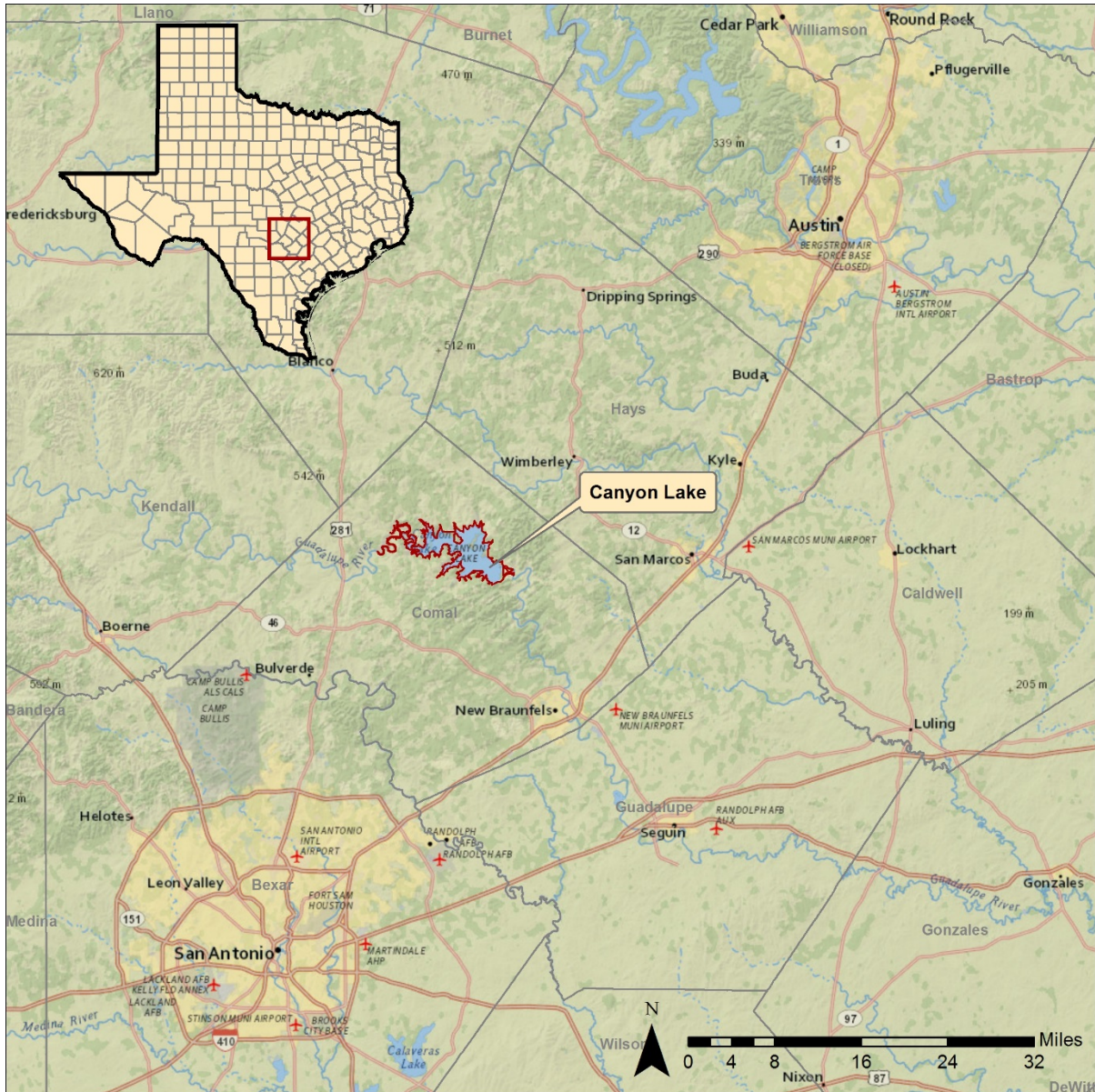


Figure 1.1 Vicinity Map of Canyon Lake

During extensive flooding of the Guadalupe River in 2002 a gorge measuring one mile long by hundreds of yards wide and up to 50 feet deep was cut out of the limestone when a large volume of water went over the spillway. The gorge was contained within the spillway channel and exposed rock strata as old as 100 million

years, containing fossils and dinosaur tracks, as well as creating a new ecosystem for wildlife with a series of pools fed by springs and waterfalls.

1.7 PROJECT ACCESS

Canyon Lake can be accessed by a number of primary, secondary and tertiary roads. The two main north-south roads include Interstate (I) 35 to the east of the lake and U.S. Route (US) 281 to the west of the lake. These two roads bring the majority of the visitors to Canyon Lake. Texas State Highway (SH) 46 runs east and west to the south of the lake connecting I35 and US 281. On the north side of the lake, Farm-to-Market (FM) 306 runs east and west connecting I35 and US 281. Additionally, parking areas exist for vehicles and boat trailers at the various park sites and near the dam. Currently, traffic and parking issues arise during peak use times, such as holidays and weekends.

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

The Alamo Area Metropolitan Planning Organization (AAMPO) is working to include Comal County-related projects on the agency’s short-term Transportation Improvement Plan (TIP). Comal County is seeking funding for an expansion of SH 46 at its intersection with US 281, as well as other projects in the county near San Antonio to relieve San Antonio commuting traffic.

1.8 PRIOR DESIGN MEMORANDA

Design Memorandums were prepared from 1956 thru 1970 setting forth design criteria for all aspects of the project including the prime flood risk management facilities, real estate acquisition, road and utility relocations, reservoir clearing, and the master plan for recreation development and land management. Table 1.1 lists the Design Memoranda for Canyon Lake.

Table 1.1 Design Memoranda

Design Memo	Title	Date Submitted	Date Approved
6	Relocations Part V – Highways (FM 306)		1960
8	Clearing		1960
9	Preliminary Master Plan	04 Sep 1956	10 Dec 1956
9B	Original Master Plan	22 Sep 1961	26 Mar 1962
9B 1	Supplement No 1 – Recreational Dev.	14 Jan 1963	16 Apr 1963
9B 2	Supplement No 2 – Policy for Permits	08 Nov 1963	02 Apr 1964

Design Memo	Title	Date Submitted	Date Approved
9B 3	Supplement No 3 – Design Criteria and Cost	26 Feb 1964	17 Aug 1964
9C	Updated Master Plan	22 Sep 1961	Dec 1970
12 Rev	Hydrology		
13	Conservation Storage Contract		Aug 1959

Source: USACE

1.9 PERTINENT PROJECT INFORMATION

The following table provides pertinent information regarding existing reservoir storage capacity at Canyon Lake. Additional information concerning project specifics can be found in the 1970 Design Memorandum 9C.

Table 1.2 Water Storage Capacity

Feature	Elevation (feet NGVD)	Area (acres)	Capacity (acre-feet)
Top of Dam	974.0	18,000	1,215,400
Maximum Design Water Surface	969.1	17,120	1,129,300
Top of Flood Control Storage ⁽²⁾	943.0	12,890	740,900
Spillway Crest	943.0	12,890	740,900
Top of Conservation Pool ⁽²⁾	909.0	8,240	386,200
Streambed	750		

Shoreline at Conservation Pool – approximately 80 miles

(1) Upper guide contour for easement acquisition applies to the flat pool area of the main part of the reservoir

(2) Sediment reserve distributed as follows: 19,800 acre-feet below elevation 909.0; 8,300 acre-feet between elevations 909.0 and 943.0

Source: 1970 Design Memorandum 9C and Pertinent Data Sheet

A more recent study of water storage capacity was completed in November of 2000. In cooperation with the USACE, the Texas Water Development Board (TWDB) did a volumetric survey of Canyon Lake for the Guadalupe-Blanco River Authority. Table 1.3 below shows the area and volume comparisons at conservation pool elevation 909.0 ft. NGVD comparing the years 1952, 1972, and 2000. As can be seen, Canyon Lake has experienced a net increase of 69 acres in area and a decrease of 7,348 ac-ft. in volume, bringing the annual deposition rate of sediment in the lake since 1972 to an estimated at 0.1 acre-feet/square mile of drainage area.

Table 1.3 Area and Volume Comparisons at Conservation Pool (909.0 NGVD.)

Year	1952	1972	2000
Area (acres)	8,240	8,231	8,309
Volume (acre-feet)	386,200	382,000	378,852
Shoreline at Conservation Pool Elevation 95 miles.			

Source: TWDB Nov 2000 Volumetric Survey

CHAPTER 2 - PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

2.1 PHYSIOGRAPHIC SETTING

2.1.1 Ecoregion Overview

Canyon Lake is in the Edwards Plateau ecoregion. It is a land of mainly springs, stony hills, and steep canyons. The region is home to a host of rare plants and animals found nowhere else on earth. Soils are usually shallow with a variety of surface texture underlain by limestone. Elevations range from approximately 100 NGVD to over 3,000 NGVD. Though open grasslands and savannahs were more common in pre-settlement times than they are today, the Edward Plateau is characterized by grasslands, juniper/oak woodlands, and plateau live oak and mesquite savannah.

2.1.2 Climate

The climate of Comal County is warm temperate, subtropical, and humid with hot summers and mild winters. Occasional extreme cold temperatures occur in winter months but are of short duration. The average low and high temperatures range from 39 degrees (°) Fahrenheit (F) in January to 94°F in July. The lowest minimum-recorded temperature is 2°F and the highest maximum 109°F. The average frost-free period is 287 days but this can vary significantly from year to year. The average first freeze occurs in mid-November and the average last freeze occurs in early March.

Table 2.1 Temperature and Precipitation at Canyon Lake

Temperature Period of Record (1962 – 2016)	
Average Low January Temperature	39°F
Average High August Temperature	94°F
Record Temperatures	
Record Low Temperature (24 Dec 1989)	2°F
Record High Temperature (29 Aug 2011 and 06 Sep 2000)	109°F
Precipitation	
Mean Annual (Period of record 1962-2016)	36.78 inches
Maximum annual (2007)	64.07 inches
Minimum annual (1999)	18.08 inches

(Source: US Climate Data; NOAA National Centers for Environmental Information)

Annual precipitation for Canyon Lake averages 36.78 inches per year and is fairly evenly distributed throughout the year with the highest rainfall typically occurring in May and June then again in September and October. This area

experiences extremes in drought and inundation, as witnessed in disaster declarations for wildfires in June of 2011, followed by a disaster declaration for flooding in October of 2015. Snow rarely falls and is an insignificant source of moisture. Relative humidity ranges from 38 percent (%) to 94% with the driest period around late July and the most humid period in early May. The prevailing surface winds are southerly with strong winds from the north occurring frequently in winter months. In a typical year, wind speeds vary from 0 to 17 miles per hour (mph) and rarely exceed 25 mph. Table 2.2 shows data for rainfall at Canyon Lake including the record rainfall amounts. As can be seen, the area has experienced up to 16.49 inches of rain in a single month.

Table 2.2 Average Monthly and Annual Rainfall 1962-2016

Month	Average Rainfall (inches)	Percent of Average Annual Rainfall	Record Rainfall Events by Month
Jan	2.28	6.2%	10.85 (1968)
Feb	2.01	5.5%	6.95 (1965)
Mar	2.43	6.6%	7.18 (2007)
Apr	2.86	7.8%	9.46 (1976)
May	4.58	12.4%	11.89 (1972)
Jun	4.05	11.0%	12.09 (1997)
Jul	2.62	7.1%	16.49 (2002)
Aug	2.51	6.8%	9.31 (1974)
Sep	3.95	10.7%	10.53 (2010)
Oct	4.25	11.5%	24.29 (1998)
Nov	3.03	8.2%	13.62 (2004)
Dec	2.21	6.0%	13.86 (1991)
Total	36.78		
Maximum Annual Rainfall			64.07 (2007)
Minimum Annual Rainfall			18.08 (1999)

Source: USACE May 2017



Photo 2-1 Potters Creek Park at Canyon Lake (USACE Photo)

Evaporation data was collected at Canyon Lake from an evaporation pan on site. The empirical formula is based on meteorology data collected on site. The formula incorporates electronically collected data for solar radiation, wind speed air temperature and relative humidity. Average monthly pan evaporation figures for 1961 to 2014 are shown in Table 2.3.

Table 2.3 Estimated Monthly Evaporation

Month	Evaporation (inches)	
	Average (1961-2014)	Drought Periods ⁽¹⁾
Jan	3.14	3.13
Feb	3.87	3.61
Mar	5.57	5.35
Apr	6.68	6.96
May	7.79	8.06
Jun	9.48	10.49
Jul	10.51	10.31
Aug	10.27	11.38
Sep	7.48	7.80
Oct	5.94	5.29
Nov	4.01	3.47
Dec	3.05	2.41
Annual Total	77.77	78.25

(1) Using 2011 through 2014 as an example drought period

The USACE lake missions of flood risk management, water supply, and hydropower generation all serve to protect the built and natural resources of a region from the climate extremes of drought and floods. This creates a more resilient and sustainable region for the health, welfare, and energy security of its citizens. Maintaining a healthy vegetative cover and tree canopy on Federal lands within the constraints imposed by primary project purposes helps reduce stormwater runoff and soil erosion; mitigates air pollution; and moderates temperatures. The USACE Strategic Sustainability Performance Plan implements Executive Order (EO) 13693, stating:

“As a prominent Federal entity, a key participant in the use and management of many of the Nation’s water resources, a critical team member in the design, construction, and management of military and civil infrastructure, and responsible members of the Nation’s citizenry, the USACE strives to protect, sustain, and improve the natural and manmade environment of our Nation and is committed to sustainability and compliance with applicable environmental and energy statutes, regulations and Executive Orders.

Sustainability is ... a natural part of the USACE decision processes, [and is a] part of our organizational culture. USACE is a steward for some of the Nation’s most important natural resources and we must ensure our stakeholders and partners

receive products and services that provide for sustainable solutions that address short and long-term environmental, social, and economic considerations.”

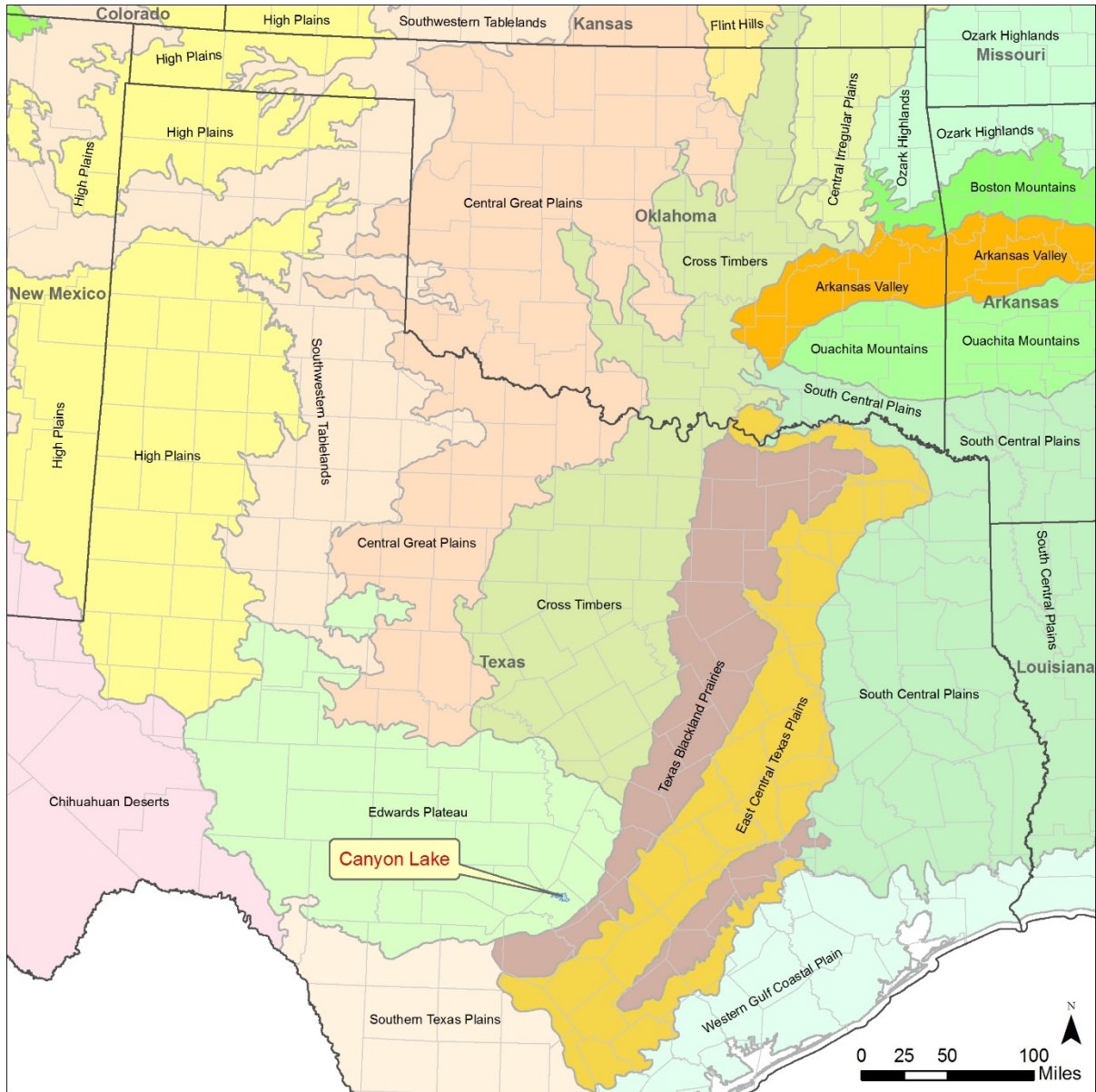


Figure 2.1 Ecoregions of Texas (Source: Environmental Protection Agency)

2.1.3 Geology

The limestone that underlies the Canyon Lake area was laid down during the Cretaceous Era over millions of years. The Glen Rose formation underlies the entire dam and lake, save for a small area in the upper reaches of the lake where the Hensell sand member of the Travis Peak formation is exposed. The Hensell sand member is the youngest of the Travis Peak formation. It is about 40 feet thick and is composed of light tan to grey sandy glauconitic dolomite, shaly dolomite, and shale.

The Glen Rose formation is divided into an upper member and lower member. The upper member is about 400 feet thick and consists of alternating thin beds of limestone, marl, and shale with some dolomite. The lower member consists of about 200 feet of alternating limestones, marls, and shales overlying about 100 feet of massive, fossiliferous limestone and underlies the major portion of the reservoir.

The Guadalupe Valley contains up to 55 feet of alluvial overburden; however, uplands are usually thinly mantled with soil or have rocky outcroppings devoid of soil. Operation of the Canyon Dam and Lake has confirmed a study in 1955 by the San Antonio City Water Board and original foundation studies that leakage from the lake would be minor.

2.1.4 Topography

Canyon Lake lies within the Edwards Plateau province of Texas. The region, locally known as the "Hill Country," is a geographically young plateau with a mature margin of moderate to strong relief. The watershed falls to the east-southeast with elevations of 1,350 NGVD in the headwaters near Kerrville to 750.0 NGVD at the dam site. The stream gradient within the project area is six feet per mile. The main divide of the watershed is 200 to 350 feet higher than the banks of the river, characterized by steep-walled canyons and generally rugged topography.

2.1.5 Hydrology and Groundwater

Canyon Lake is a major large reservoir impoundment on the Guadalupe River. The Guadalupe River and Canyon Lake drain the central hills and valleys of Comal County. Cibolo Creek forms the southwestern boundary of the county and is the primary drainage channel for that area. Numerous streams north and east of Canyon Lake flow north into the Blanco River in Hays County. The Balcones Fault zone of the Edwards Aquifer is the primary source of groundwater in Comal County, but the Guadalupe streambed has been cut down below the level of the Edwards Aquifer limestone and thus does not contribute to the aquifers recharge.

The Edwards Aquifer is an important consideration in the region. Its recharge zone is protected from a number of activities, as the aquifer provides water to most of the region to the south and west of the dam (see Figure 2.2). While the waters of the Guadalupe, which feeds Canyon Lake, provide no significant recharge to the Edwards Aquifer, a short stretch exists where the Edwards outcrop underlies the Guadalupe. It is believed that during very dry times the Guadalupe may contribute recharge that emerges as spring-flow at San Marcos Springs, one of the greatest outflows from the Edwards Aquifer. A portion of Canyon Lake is located within a zone regulated by the Edwards Aquifer Authority for certain activities. A brief description of the watershed is given in section 1.5 above.

An important consideration for flood risk management in this area is rainfall. This area has experienced intense rainfall, notably the 2002 rains that caused Canyon Lake to flow over the spillway for six weeks and carved out the Canyon Lake Gorge within the confines of the spillway channel. As one of the most flash-flood prone river basins in the world, the heavy rains of 2015 served as a reminder of the importance of Canyon Lake’s primary function for flood risk management. Water level management at Canyon Lake is a shared responsibility between USACE and Guadalupe-Blanco River Authority (GBRA). USACE determines the timing and amount of water releases made when the lake level rises above the conservation pool elevation of 909.0 NGVD. When the lake level is at or below 909.0 NGVD, GBRA controls water releases for water supply purposes and hydroelectric power generation. The management of Federal lands and outdoor recreation programs at Canyon Lake must be implemented within the constraints imposed by the primary missions of flood risk management and water conservation. Notable flood events since the construction of the dam are as follows:

Table 2.4 Notable Flood Events for Canyon Lake

Notable Flood Elevations	Date
930.60 NGVD	August 1978
942.67 NGVD	July 1987
937.77 NGVD	1991 - 1992
937.6 NGVD	August 1997
950.32 NGVD	July 2002 – Record High
927.68 NGVD	June 2015

Source: USACE

NOTE: The record low pool was in September 2009 at 892.7 NGVD.

For many years, the GBRA has annually requested, and been granted, a variance in Operation of Canyon Lake such that the storage between elevation 909 and 910 be utilized to augment downstream flows for purposes of summer recreational activities. In 2016, USACE has determined that they would no longer continue to grant this annual variance. Further discussion on the subject of pool rise can be found in chapter 6 of this Master Plan.

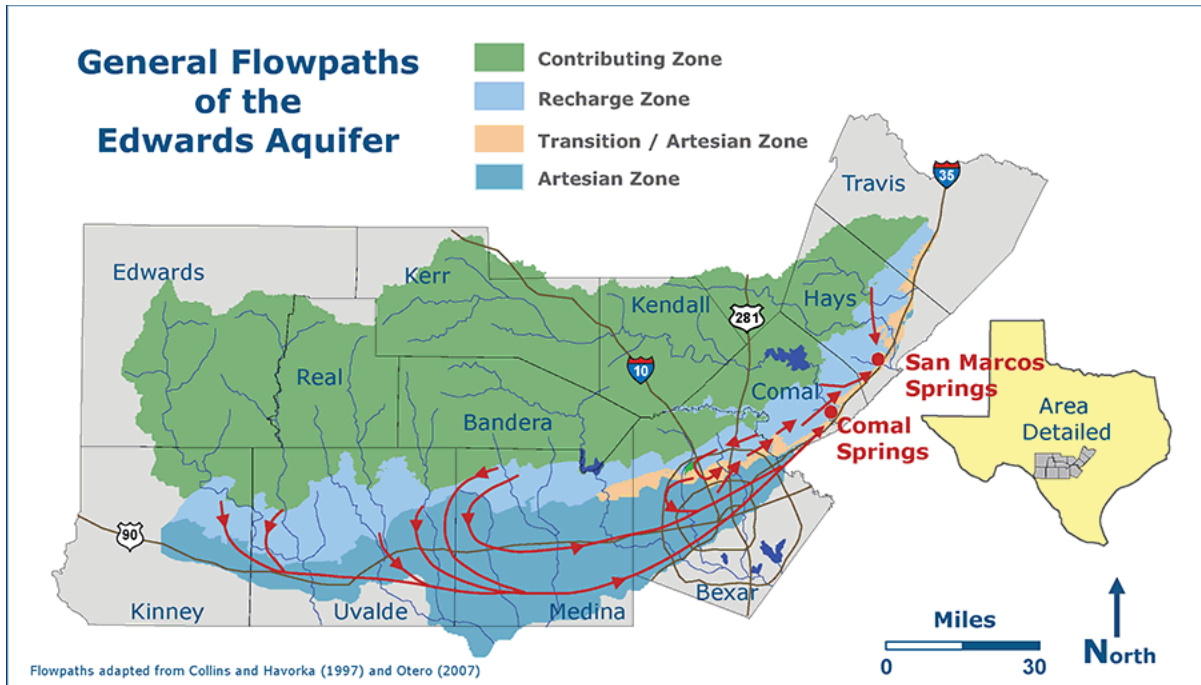


Figure 2.2 Edwards Aquifer Flowpaths (Source: Edwards Aquifer Authority Jun 2017)

2.1.6 Soils

There are two major soil associations found within the Canyon Lake area; Brackett-Tarrant-Denton Association in the upland area and the Eddy-Houston Black Stephen Association in the upland areas in and near the Guadalupe River Valley. The Brackett-Tarrant-Denton Association consist of very shallow and moderately deep, well-drained, sloping and hilly, clay and clay loam soils. Primarily used for rangeland, they are either moderately or severely limited for other use by shallow depth, rocks, slow permeability, high shrink-swell potential, and slope.

The Eddy-Houston Black Stephen Association which consists of deep, shallow and very shallow, moderately drained and well-drained, gently sloping, clayey soils. These soils were used mainly for cropland and pasture. Limitations for other use are low permeability, very high shrink-swell potential, and shallow soil depth in some areas.

A soil survey by the Natural Resource Conservation Service (NRCS) shows there are six out of the eight possible general classifications (Classes I through Class VIII) occurring in the reservoir area. The erosion hazards and limitations for use increase as the class number increases. Class I has few limitations, whereas Class VIII has many. The soil class data for project lands is provided in Table 2.5 This data is compiled by the NRCS and is a standard component of natural resources inventories on USACE lands. This, and other inventory data, is recorded in the USACE Operations and Maintenance Business Information Link (OMBIL).

Table 2.5 Soil Classes

Soil Class	Acreage
Class I	0.0%
Class II	10.6%
Class III	3.9%
Class IV	3.1%
Class V	0.0%
Class VI	31.3%
Class VII	46.9%
Class VIII	4.3%

A general description of the soils at Canyon Lake and the land capability classes are described below.

- *Class II* soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
- *Class III* soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- *Class IV* soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
- *Class VI* soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- *Class VII* soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.
- *Class VIII* soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for aesthetic purposes.

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

As noted in Section 1.9 above and illustrated in Table 1.3, the annual deposition rate of sediment in the lake since 1972 is estimated at 0.1 acre-feet/square mile of drainage area. As development of the lands adjacent to and upriver from Canyon Lake continues to grow and expand, and with the expected increase in intense weather events, it is predicted that this rate of sedimentation will increase over time.

2.2 ECOREGION AND NATURAL RESOURCE ANALYSIS

2.2.1 Vegetative Resources

The Guadalupe River Valley bottomlands supports a restricted hardwood forest of various species including pecan, hackberry, live oak, Texas oak, elm, bald cypress, and Texas black walnut. Slopes and uplands support live oak, some post

oak and blackjack oak, Texas ash, Texas persimmon, Texas sophora, and ashe juniper. Climax grasses consist of switchgrass, several species of bluestem, gramas, and lovegrass, curly mesquite, buffalograss, and Indiangrass. Common upland and hillside vegetation include yucca and prickly pear. On disturbed uplands sites, numerous specials of forbs, vines, and shrubs are intermixed with noxious and/or invasive species such as ragweed, cocklebur, broomweed, bloodweed, and Johnsongrass. Table 2.6 gives the 2015 vegetation classification and condition inventory information.

Table 2.6 Vegetation Classification and Condition 2015 Inventory

Division	Order	Class	Sub-Class	Total Sub-Class Acreage	Sustainable Areas	Transitioning Acres	Degraded Acres	Total Conditioned Acres
Non-Vegetated	Non-Vegetated	Non-Vegetated	Non-Vegetated	130	130	0	0	130
Non-Vegetated	Non-Vegetated	Non-Vegetated	Non-Vegetated	8,240	8,240	0	0	8,240
Vegetated	Herb Dominated	Herbaceous Vegetation	Perennial gramimoid vegetation (grasslands)	710	450	150	110	710
Vegetated	Scrub Dominated	Shrubland (Scrub)	Mixed evergreen-deciduous shrubland (scrub)	400	200	150	50	400
Vegetated	Tree Dominated	Closed Tree Canopy	Mixed evergreen-deciduous closed tree canopy	855	855	0	0	855
Vegetated	Tree Dominated	Open Tree Canopy	Mixed evergreen-deciduous open tree canopy	655	655	0	0	655
CANYON LAKE TOTALS				10,990	10,530	300	160	10,990

Note: Classification information is derived from the National Vegetation Classification System

An important vegetation type at Canyon Lake is the oak-juniper woodlands. Mature stages of this habitat provides important nesting areas for the Golden-cheeked Warbler (GCWA) (*Dendrioca chryoparia*), a federally-listed endangered neotropical bird. The bird requires older growth oak-juniper forest with a dense tree canopy for its nesting habitat. Several areas around Canyon Lake have been identified as having such habitat, and a portion of this habitat is on Federal property managed by USACE. Two reports of GCWA song were reported in April of 2013, but no songs or siting's have been recorded before or since that time. A present/absent study was completed at Canyon Park on 09 May 2017, which did not find any GCWA present. Before future development of additional high-density recreation can occur, a full bird survey will need to be completed to ensure the absence of GCWA.



Photo 2-2 Oak-Juniper Vegetation at Canyon Lake

2.2.2 Wetlands

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods during the year during the growing season. Water saturation (hydrology) largely determines soil development and the types of plant and animal communities living in and on the soil.

The National Wetland Inventory (NWI) maps prepared by the US Fish and Wildlife Service (USFWS) and available in the Wetland Mapper tool on the USFWS website show both freshwater emergent wetlands and freshwater forested/shrub wetlands occurring primarily in the far west reaches of the lake and to the north where Potter Creek and Sorral Creek enter the lake. However, as explained by the USFWS regarding use of the NWI map data, the data represents reconnaissance level mapping using high altitude imagery. The actual presence and boundaries of wetlands shown on NWI maps requires verification through detailed, on-the-ground inspection.

In accordance with national USACE policy, wetlands at operational projects are inventoried using the protocol established by USFWS in their *Classification of Wetlands and Deepwater Habitats of the United States*. The current USACE inventory for Canyon Lake indicates there are no wetlands located on USACE owned property.



Photo 2-3 Bald Cypress below Canyon Lake on the Guadalupe River

2.2.3 Fish and Wildlife Resources

Canyon Lake provides habitat for an abundance of fish and wildlife species with fishing opportunities for both boaters and bank fishermen alike. Predominant fish species present in Canyon Lake are largemouth bass (*Micropterus salmoides*), Guadalupe bass (*Micropterus treculii*), white bass (*Morone chrysops*), and striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus furcatus*), and flathead catfish (*Pylodictis olivaris*). There are a small number of crappie (*pomoxis*), but fishing opportunities for this species is generally poor. Smallmouth bass (*Micropterus dolomieu*) was stocked in the 1970's and 1980s and a relatively small population exists in the lake and persists through natural reproduction. Fishing for smallmouth bass is better in the lower third of the reservoir. Florida largemouth bass and striped bass, on the other hand, are stocked regularly by Texas Parks and Wildlife Department (TPWD) due to the inability of these species to reproduce effectively in Canyon Lake. Both species have been stocked in 2010, 2014, and 2015. Additionally, for the first time 200 adult rainbow trout were stocked in 2016.

There is a wide variety of wildlife at Canyon Lake, including game and non-game species, migratory waterfowl, indigenous and migratory song birds, wading birds, reptiles, amphibians, and insects. Some of the species are particularly popular for wildlife viewing, such as the osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), and brown booby (*Sula leucogaster*). Local birders participate in an annual Christmas bird count at Canyon Lake. Other wildlife include the grey fox

(*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), armadillos (*Dasypodidae*), squirrels (*Sciuridae*), raccoons (*Procyon lotor*), and bobcats (*Lynx rufus*).

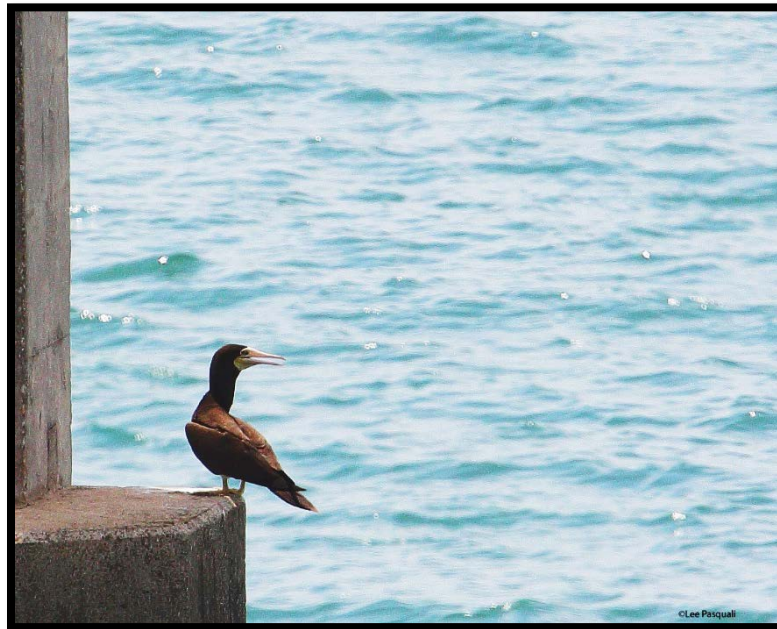


Photo 2-4 Brown Booby at Canyon Lake

Though Canyon Lake does not have permanent designated hunting areas, USACE provides unique deer hunting opportunities. White-tailed deer are in abundance, and hunting is limited to archery only and requires a proficiency test and hunter safety certification. Additionally, Canyon Lake staff hosts an annual white-tailed deer hunt specifically organized for the Wounded Warriors and the physically challenged.

2.2.4 Threatened and Endangered Species

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

According to the Trust Resources Report (Consultation Code: 02ETAU00-2016-SLI-0405) generated by the USFWS web-based Information for Planning and Conservation (IPaC) tool, there are a total of 17 federally-listed threatened, endangered, or candidate species that potentially occur on federal property at Canyon Lake. These species are listed in Table 2.7. Additionally, no designated critical habitat was identified for any of the federally-listed threatened or endangered species within the project area.

Table 2.7 Federally-Listed Threatened and Endangered Species

Common Name	Scientific Name	Federal Status	Occurrence
Amphibians			
San Marcos Salamander	<i>Eurycea nana</i>	T	No Habitat
Texas Blind Salamander	<i>Typhlomolge rathbuni</i>	E	No Habitat
Birds			
Black-Capped Vireo	<i>Vireo atricapilla</i>	E	Occasional
Golden-Cheeked Warbler	<i>Dendroica chrysoparia</i>	E	Occasional
Interior Least Tern*	<i>Sterna antillarum athalassos</i>	E	Occasional
Piping Plover*	<i>Charadrius melodus</i>	T	Rare
Red Knot*	<i>Calidris canutus rufa</i>	T	Rare
Whooping Crane	<i>Grus americana</i>	E	Rare
Clams			
Golden Orb	<i>Quadrula aurea</i>	C	No Habitat
Texas Fatmucket	<i>Lampsilis bracteata</i>	C	No Habitat
Texas Pimpleback	<i>Quadrula petrina</i>	C	No Habitat
Crustaceans			
Peck's Cave Amphipod	<i>Stygobromus pecki</i>	E	No Habitat
Fishes			
Fountain Darter	<i>Etheostoma fonticola</i>	E	No Habitat
Flowering Plants			
Bracted Twistflower	<i>Streptanthus bracteatus</i>	C	No Habitat
Texas Wild-Rice	<i>Zizania texana</i>	E	No Habitat
Insects			
Comal Springs Dryopid Beetle	<i>Stypoparnus comalensis</i>	E	No Habitat
Comal Springs Riffle Beetle	<i>Heterelmis comalensis</i>	E	No Habitat

Federal Listings: *E* - Listed Endangered, *T* - Threatened, *C* – Candidate

*Only requires consideration at this location if the project involves wind energy development

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.

Source: May 2017 IPaC Report, US Fish and Wildlife Service

The most recent Trust Resources Report is attached in Appendix C. The Bald Eagle has the potential to occur at Canyon Lake and was formerly listed by the United States Fish and Wildlife Service (USFWS) as an endangered or threatened species. Although recently delisted, the Bald Eagle is provided specific protections under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c).

Comal County is home to several federally-listed endangered species. While some of them have the potential to occur within federal property, very few are encountered at Canyon Lake. The whooping crane and Interior least tern may migrate through the region, but do not nest at Canyon Lake. Only the GCWA is known to be occasionally encountered on USACE operated lands. GCWA nest exclusively in the old growth oak-juniper forests of Central Texas. Outside of the existing designated parks, USACE manages relatively very little land around Canyon Lake. Most of which does not contain high quality GCWA nesting habitat.

In addition to the federally-listed species for Canyon Lake, TPWD maintains lists by Ecoregion for Species of Greatest Conservation Need and associated general habitat requirements for each species. The list for the Edwards Plateau Ecoregion is available in Appendix D. Many of the species on the list, particularly migratory songbirds, are known to utilize habitat at Canyon Lake on a regular basis and are considered in management plans.

2.2.5 Invasive Species

Invasive species are any kind of living organism, which, if uncontrolled, causes harm to the environment, economy, or human health. Invasive species generally grow and reproduce quickly, and spread aggressively. Non-native, or exotic, species have been introduced, either intentionally or unintentionally, and can out-compete native species for resources or otherwise alter the ecosystem. Native invasive species are those species that spread aggressively due to an alteration in the ecosystem, such as lack of fire or the removal of a predator from the food chain.

For Canyon Lake, the major invasive species are the Chinaberry tree and fire ants through 2015. On 08 June 2017, Texas Parks and Wildlife biologist confirmed zebra mussels at three sites in Canyon Lake including both Cranes Mill Marina and Canyon Lake Marina, indicating lake-wide infestation. This is the first positive documentation of zebra mussels in Canyon Lake and in the Guadalupe River Basin. Table 2.8 lists invasive species that occur on the Canyon Lake Project. More detailed information about invasive species can be found in Section 6.5 of the Plan, as well as in the attached EA (Appendix B).

Table 2.8 Invasive Species at Canyon Lake - 2015

Habitat	Common Names	Scientific Name	Prevalence
Plant			
Terrestrial	Tree of heaven	<i>Ailanthus altissima</i>	Minor
Terrestrial	Yellow star thistle	<i>Centaurea solstitialis</i>	Moderate
Terrestrial	Chinaberry tree	<i>Melia azedarach</i>	Major
Terrestrial	Chinese tallow tree	<i>Triadica sebifera</i>	Moderate
Terrestrial	Castor beans	<i>Ricinus communis</i>	Moderate
Terrestrial	King Range bluestem	<i>Bothriochloa ischaemum</i>	Major
Terrestrial	Ashe juniper	<i>Juniperus ashei</i>	Major
Terrestrial	Willow baccharis	<i>Baccharis salicina</i>	Major
Animal			
Terrestrial	Feral hog	<i>Sus scrofa</i>	Minor
Terrestrial	Feral cats	<i>Felis catus</i>	Moderate
Aquatic	Zebra mussel	<i>Dreissena polymorpha</i>	Minor
Aquatic	Armored catfish	<i>Hypotomus plecostomus</i>	Minor
Birds			
Terrestrial	Eurasian sparrow	<i>Passer montanus</i>	Minor
Terrestrial	European starling	<i>Stumus vulgaris</i>	Minor
Insect			
Terrestrial	Fire ants	<i>Solenopsis invicta</i>	Major

Source: OMBIL

According to the Natural Resource Management objectives in Chapter 3 of the Master Plan, USACE will monitor lands and waters for invasive, non-native and aggressively spreading native species. USACE will take action to (1) prevent and/or reduce the spread of those species along with implementing prescribed fire as a management tool to control the spread of Ashe Juniper and other noxious plants and (2) to promote the vigor of native prairie grasses and forbs.



Photo 2-5 Invasive Chinese Tallow at Canyon Lake Gorge (USACE Photo)

2.2.6 Interpretation and Visual Qualities

With its hilly terrain and interesting vegetation, Canyon Lake has a number of high quality vistas. Many of these are accessed along the trails and from the parks that exist on Federal lands. Protecting these views for future generations is an important aspect of land planning for Canyon Lake and included in the environmental mandate. One of the places with high visual quality include vistas from the top of the Madrone Trail.

The gorge provides an excellent interpretive and visual resource for Canyon Lake. Managed by GBRA, the deep gorge provides multiple opportunities to experience high quality natural areas. More detail on the gorge is provided in Chapter 6 of this Master Plan. Preserving, protecting, and building on these natural visual resources will need to be a priority in future land use planning for Canyon Lake and its neighbors.

2.2.7 Mineral and Timber

In general terms, during the land acquisition process for the Canyon Lake project, the mineral estate underlying the dam was purchased by the Federal government as a precautionary measure to protect the integrity of the dam structure.

The majority of the mineral estate underlying the remainder of Federal lands at Canyon Lake was not purchased by the Federal government and remains in private ownership. Should oil and gas exploration ever occur within the 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 Federal lands at Canyon Lake in so far as 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. There is currently no oil and gas exploration or production activity on USACE lands at Canyon Lake and virtually no such activity throughout Comal County. A check of the Texas Railroad Commission public GIS viewer tool indicates virtually no oil and gas activity near Canyon Lake. The very active oil and gas exploration in the Eagle Ford Shale Formation approximately 40 miles east of Canyon Lake Dam is the nearest oil and gas activity to Canyon Lake.

In Comal County, limestone is abundant and utilized in the manufacture of lime, which is used in a large number of products and processes. However, federal lands at the Canyon Lake project are not used for mineral or timber extraction. The primary tree species on USACE lands include Ashe juniper and live oak. These species have very limited commercial value as posts or firewood but have much greater value as wildlife habitat, shade and landscape aesthetics. Management plans do not call for the sale or disposal of any timber resources.

2.2.8 Water Quality

Canyon Lake is one of the clearest and deepest lakes in Texas, making it ideal for a number of recreational water activities, water supply and hydroelectric power generation. Keeping the waters clean and clear is an essential part of water management at Canyon Lake. The USACE, U.S. Geological Survey (USGS), Texas Water Development Board (TWDB), GBRA, and the TWCA conduct water quality testing at Canyon Lake. In a 1982 report by the USGS, it was found that stratification of the lake usually begins in March and persists until mid-to-late fall.

Factors that affect the water quality at Canyon Lake are the quality of inflow, the circulation pattern of the lake, the chemical reactions of the water with the bed material, the annual rainfall, and the evaporation rate. The chemical constituents in Canyon Lake vary seasonally as a result of thermal stratification. Thermal stratification results in significant seasonal and areal variations in dissolved oxygen, which in turn results in higher concentrations of dissolved iron, dissolved manganese, and total ammonia during the summer. Oxygen used in the stabilization of unoxidized material in the lake is not replaced during summer stagnation.

The impoundment of the Guadalupe River to create Canyon Lake resulted in decreased monthly water temperatures downstream and shifting times for temperature extremes. Prior to the impoundment, water temperatures in the river downstream from the site of Canyon Lake Dam ranged from 52.7°F to 84.2 °F, with the lowest temperatures in December and January and highest from June to August. Since the impoundment, the temperature range has been 52.7°F to 66.2°F, with the lowest temperatures occurring in February and highest temperatures from September to November.

During the winter, the lake is well mixed with respect to dissolved solids, dissolved oxygen, and water temperature. During the spring, the thermally-induced stratification pattern develops and continues through summer. By late summer, three distinct layers occur in the deep areas of the lake. The hypolimnion is a cold, anaerobic, stagnant lower stratum; the metalimnion is the middle stratum characterized by a rapid decrease in temperature with increases in depth; and the epilimnion, which is the warm, freely circulating surface stratum. The depth-integrated concentration of dissolved oxygen averaged less than 4.0 milligrams per liter except in the hypolimnion (bottom stratum) during summer stagnation when nitrate and nitrite are reduced to ammonia.

In 2006, the Texas Department of State Health Services published a Fish and Shellfish Consumption Advisory for mercury at Canyon Lake. Samples from longnose gar and striped bass indicated levels of the heavy metal that pose a threat to human health. The agency advises limiting consumption of Canyon Lake longnose gar and striped bass to no more than two eight-ounce meals per month for adults, no more than two four ounce meals per month for children under the age of twelve, and no consumption for woman in childbearing years or who are nursing.

2.2.9 Sedimentation and Shoreline Erosion

Sedimentation and shoreline erosion have not been a problem at Canyon Lake. This does not include the creation of the gorge in 2002, which was carved out of the bedrock in three days due to a single flood event.

2.2.10 Air Quality

Air quality in Comal County is typically good, based on ozone alert days and number of pollutants in the air as reported by the EPA. There are two ozone monitoring stations in Comal County near the southern boundary of the lake. The sites are operated by Alamo Area Council of Governments and are included in Texas Commission on Environmental Quality's (TCEQ's) network monitoring stations. Currently in attainment of National Ambient Air Quality Standards (NAAQS), air quality could be negatively impacted as more development encroaches on the area and road networks increase. Canyon Lake's vegetation and tree canopy helps mitigate pollution, absorbing carbon dioxide (CO₂), filtering other air pollutants, and modulating air temperatures.

2.3 CULTURAL RESOURCE AND ANALYSIS

2.3.1 Prehistoric

The 1949 archeological survey under the direction of the National Park Service examined features that would be adversely affect by the construction and development of the dam. The survey recommended that eight of the twenty sites located be salvaged. Three multi-component Indian campsites in the Canyon Reservoir area were excavated in 1959 and 1960 by the Texas Archeological Salvage Project.

Intermittent occupations at the sites are attributed principally to the Archaic Edwards Plateau Aspect (around 5,000 B.C.) and, to a lesser extent, the Central Texas Aspect (Neo-American approximately A.D 600). A summary of the findings and conclusions of the three sites that were excavated are below, as well as the details published in a report entitled, "Salvage Archeology of Canyon Reservoir: The Wunderlich, Footbridge and Oblate Sites." Copies can be found at the district office.

Wunderlich, A Burned-Rock Midden Site: 355 artifacts were recovered along with a relatively large number of snail and mussel shells and a few animal bone fragments. This site is an open occupation site consisting of two burned-rock middens (refuge heap) located on a low bench or terrace of alluvium on the northern side of Rebecca Creek.

Footbridge, A Terrace Site: 396 artifacts were recovered. Small animal bones, snail and mussel shells were found in abundance. Animal bones were few and not well preserved, and consisted of deer, bison, and turtle, in that order of frequency. This site is at the confluence of the Guadalupe River and Sorrell Creek, buried in thick alluvial deposits.

Oblate, A Rockshelter Site: 1,609 artifacts were recovered. This site is situated on a small tributary south of the Guadalupe River. A study of the provenience of the artifacts from this site has produced important data concerning the relative chronology of certain artifact types.

Two of the sites, Wunderlich and Oblate, yielded data which permits a tentative sequential ordering of certain Edwards Plateau Aspect dart point types. These data, especially when compared with those from related Central Texas sites, suggest that the Edwards Plateau Aspect can be tentatively divided into four time periods: Early, Middle, Late, and Transitional Archaic. Brief comparison with other dart point sequences in Texas and northern Mexico indicates that Edwards Plateau dart points have close stylistic ties to the west.

The excavation of Pleistocene faunal assemblage from Freizehnen Cave in Bexar County, approximately 20 miles to the southwest of the Canyon Lake, as well as the abundance of solution cavities in the reservoir area, prompted the stationing of a paleontologist in the Canyon project area in 1961. No rocks older than those of

the Cretaceous age crop out in Comal County. After the long and complex history of the Paleozoic era the sea retreated from central Texas and a large part of Texas remained above sea level during the Triassic and Jurassic periods which followed. It is believed that Paleozoic rocks underlie Comal County at considerable depth but Triassic and Jurassic formations are probably absent. Dinosaur tracks exposed by the 2002 flood were formed during the Cretaceous period.

The 1970 Master Plan calls for the development of historical resources by coordinating with state universities and historical commissions and societies. Coordination and interest in the area and its cultural resources have occurred since the creation of the gorge by the 2002 flood which exposed dinosaur tracks and layers of geological time. Further discussion of the Canyon Lake Gorge is provided in Section 6.1 of this Plan.

2.3.2 Historic

In 1691 French and Spanish expeditions commonly passed through what later became southeastern Comal County near the future site of New Braunfels. From 1756 to 1758 Comal Springs became the site of the short-lived Nuestra Senora de Guadalupe Mission. During the eighteenth century the springs and river (which had been called Las Fontanas and the Little Guadalupe respectively) took the name Comal, Spanish for "flat dish." It is thought that the name was suggested to the Spanish by the numerous small islands in the river or by the shallow basin through which the river runs.

The inhabitants of the region on the eve of settlement were primarily Tonkawa and Waco Indians. Early settlers' contacts with these peoples were generally uneventful. Nomadic Wacos who were camped at springs north of New Braunfels moved their camp west within a year of the founding of the settlement, and a village of some 500 Tonkawas on the Guadalupe River above New Braunfels initially welcomed German visitors. Notwithstanding the rapid influx of settlers in the 1840s and 1850s and isolated incidents of violence, county fathers and Indian leaders generally maintained peaceful relations.

Permanent settlement of the county began in 1845. Settlement progressed rapidly; in March 1846 the Texas legislature formed Comal County from the Eighth Precinct of Bexar County and made New Braunfels the county seat. The final boundary determination was made in 1858 with the separation of part of western Comal County to Blanco and Kendall counties. The population of the county grew 133 percent between 1850 and 1860, and numbered more than 4,000 on the eve of the Civil War.

Comal County was founded and initially populated under the sponsorship of the Association for the Protection of German Immigrants in Texas. The county was perhaps one-half German-born in the 1850s. The influx of Americans from the old South and border states in subsequent years diluted the Germans' early predominance, and by 1890 only about one in five county residents was a native German. The flow of German immigrants dwindled after the Civil War, and by 1940

only 1.6 percent of county residents were native Germans; but their influence on the social and cultural life of the area endured.

Mexican immigration in this area peaked during the period of the Mexican Revolution. The 1930 census recorded 3,662 ethnic Mexicans in the county, or 30.5 percent of the total population. Though there were nearly twice as many Hispanic-surnamed residents when they were next recorded in 1970, their number did not grow as quickly as the population of the county as a whole. By 1980, when 8,728 Mexican Americans were counted, they made up 24 percent of the county population. The 1860 census recorded only 193 African Americans in Comal County, and in 1870, when blacks constituted 31 percent of the state population, they made up just 7.1 percent of the county total. By 1980 blacks constituted barely one percent of the area population.

The influx of new residents as well as the expansion and transformation of the job market after 1970 dramatically improved the average educational level of citizens. In 1950 just 20 percent of the population over the age of twenty-five had completed high school. Steady improvement before 1970 raised that figure to 35 percent. In 1980, 60 percent of residents over twenty-five were high school graduates. The shift from an agricultural economy to one based on industry and tourism is reflected in the proportional growth of New Braunfels. In 1900 the city's 2,097 people made up less than 30 percent of the county's residents. In 1990 the 27,334 inhabitants were more than half the county population of 51,832.

Since its impoundment in 1964, Canyon Lake has transformed a rural stretch of the Guadalupe River valley in northern Comal County into one of the largest rural population centers in Central Texas. By 1984 more than eighty subdivisions had been built on the shores of the lake and in the hills surrounding it; the number of permanent residents is estimated at 12,000 to 15,000. The area is especially popular with retired people. Canyon Lake and the scenic river valley below the dam have also served as the focal point for revitalization of a tourist industry in the county that dates to the early years of the century, when the International-Great Northern Railroad promoted New Braunfels as a tourist destination for San Antonians. Capitalizing on the natural and historic attractions offered by the Guadalupe River, by Natural Bridge Caverns, and by the county's German heritage, tourism in the mid-1980s supported some thirty hotels and motels, as well as resort condominiums, around New Braunfels and Canyon Lake.

The emergence of tourism as a primary industry, as well as attendant increases in retail and service employment, explains much of the population growth. The county is located in the "corridor" along Interstate Highway 35 between San Antonio and Austin and in 1973 was included in the San Antonio Metropolitan Statistical Area. Between 1970 and 1984 the number of residents employed in trade nearly doubled, to 2,287; the number of jobs in service industries increased more than 600 percent, to 1,977; and employment in financial, insurance, and real estate businesses rose 400 percent.

The U.S. Census counted 123,694 people living in Comal County in 2014. About 69.5 percent were Anglo, 26.2 percent were Hispanic, and 2.1 percent African-American. Of residents age twenty-five and older, 84 percent had completed high school, and 26 percent had college degrees. In the early twenty-first century various manufacturing concerns, tourism, and agriculture were important elements of the local economy. In 2002 the county had 852 farms and ranches covering 203,291 acres, 62 percent of which were devoted to pasture, 18 percent to crops, and 18 percent to woodlands. Cattle, goats, sheep, hogs, horses, nursery plants, hay, corn, sorghum, and wheat were the chief agricultural products. Besides Canyon Lake, tourist attractions in the county include the Gruene historic area, tubing on the Guadalupe River, and the Schlitterbahn water park.

2.3.3 Long-term Cultural Resources Objectives

As funding allows, a Cultural Resources Management Plan (CRMP) shall be developed and incorporated into the OMP in accordance with EP 1130-2-540. The purpose of the CRMP is to provide a comprehensive program to direct the historic preservation activities and objectives at Canyon Lake. Completion of a full inventory of cultural resources at Canyon Lake is a long-term objective that is needed for compliance with Section 110 of the National Historic Preservation Act (NHPA). All currently known and newly recorded sites must be evaluated to determine their eligibility for the National Register of Historic Places (NRHP). In accordance with Section 106 of the NHPA, any proposed ground-disturbing activities or projects, such as those described in this master plan or as may be proposed in the future by others for right-of-way easements, will require cultural resource surveys to locate and evaluate historic and prehistoric resources. Resources determined eligible for the NRHP must be protected from proposed project impacts, or the impacts must be mitigated. All future cultural resource investigations at Canyon Lake must be coordinated with the State Historic Preservation Officer and federally-recognized Tribes to insure compliance with the NHPA, the Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act.

2.4 DEMOGRAPHIC AND ECONOMIC ANALYSIS

2.4.1 Current Demographics and Economics Trends and Analysis

Canyon Lake is a regional resource, with a large portion of its lake, parks and trails visitors coming from the Austin and San Antonio areas. The zone of influence for the socio-economic analysis of Canyon Lake is comprised of nine Texas counties. These counties include Comal County, where the lake lies and those directly adjacent; Bexar, Blanco, Guadalupe, Hays, and Kendall Counties. Also included in the zone of influence are the nearby counties of Bandera, Caldwell, and Travis, whose population regularly contributes to the lake's visitation.

It is notable that large portions of property owners near the lake are residents of the Houston, Texas area in Harris County. Based on information from the Comal County Appraisal District, it is estimated that approximately 12.6 percent (%) of the parcels adjacent to the lake are owned by residents of the Houston area, and 17.1%

of parcels within a half mile of the lake are owned by Houston area residents. Harris County is not included in the zone of influence for the purposes of this analysis.

2.4.2 Population

The population in the zone of interest makes up approximately 13% of the total population of Texas. From 2014 to 2040, the population in the zone of interest is expected to increase to approximately 4.8 million from 3.6 million, an annual growth rate of 1.1% per year. By comparison, the population of Texas is projected to increase at an annual rate of 1.2% per year, and the national growth rate is expected to be 0.7% per year between 2014 and 2040. During this timeframe, Hays and Caldwell Counties are the only two in the zone of interest with a projected annual growth rate higher than the state of Texas, at 2.4% and 1.4% respectively.

The total population for the zone of interest in 2014 was 3.6 million, as shown in Table 2.9. Over half of this population (approximately 52%) resides in Bexar County, with another 32% residing in Travis County. Hays County makes up 5% of the population, and Guadalupe and Comal counties each make up 4%. The four remaining counties account for less than 2% each of the zone of interest's population.

Table 2.9 2000 and 2014 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
Bandera County	17,645	20,892	24,143
Bexar County	1,392,931	1,855,866	2,442,098
Blanco County	8,418	10,812	12,778
Caldwell County	32,194	39,810	57,444
Comal County	78,021	123,694	169,835
Guadalupe County	89,023	147,250	220,138
Hays County	97,589	185,025	346,625
Kendall County	23,743	38,880	50,357
Travis County	812,280	1,151,145	1,474,822
Zone of Interest Total	2,551,844	3,573,374	4,798,240

Source: U.S. Bureau of the Census, American Fact Finder (2000, 2014 Estimate); Texas State Data Center, The University of Texas at San Antonio (2040 Projections)

The distribution of the population among gender, as shown in Table 2.10 is approximately 49.6% male and 50.4% female in the zone of interest, which is the same as the overall gender distribution in Texas.

Table 2.10 2014 Percent of Population Estimate by Gender

Geographical Area	Male	Female
Texas	13,382,386	13,574,572
Bandera County	0.3%	0.3%
Bexar County	25.7%	26.5%
Blanco County	0.2%	0.2%
Caldwell County	0.6%	0.6%
Comal County	1.7%	1.8%
Guadalupe County	2.0%	2.1%
Hays County	2.6%	2.6%
Kendall County	0.5%	0.6%
Travis County	16.3%	16.1%
Zone of Interest Total	49.6%	50.4%

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

Illustrated in Figures 2.3 and 2.4 and displayed in Table 2.11 is the population by age group associated with the zone of interest. As displayed in Figure 2.3, the distribution of age groups is similar between the zone of interest and the state of Texas. In the zone of interest, the largest age group is the 25 to 34 group, which makes up approximately 15% of the population followed by the 35 to 44 and the 45 to 54 age groups with 13% of the population each. Figure 2.3 also illustrates that the population of Comal County has an older population than the zone of interest and the state of Texas with more residents ages 45 and over and less residents ages 44 and younger. Wide variations between the median ages exists across counties, such that the median age in Comal County is 42.5 while the Median age of Bexar County of 33.1 and Bandera County's at 50.1. Figure 2.4 illustrates the zone of interest population estimate in 2014 compared to the projection of the population by age group in 2040. The forecast shows that the population ages 54 and below will decrease while ages 55 and above will increase between 2014 and 2040.

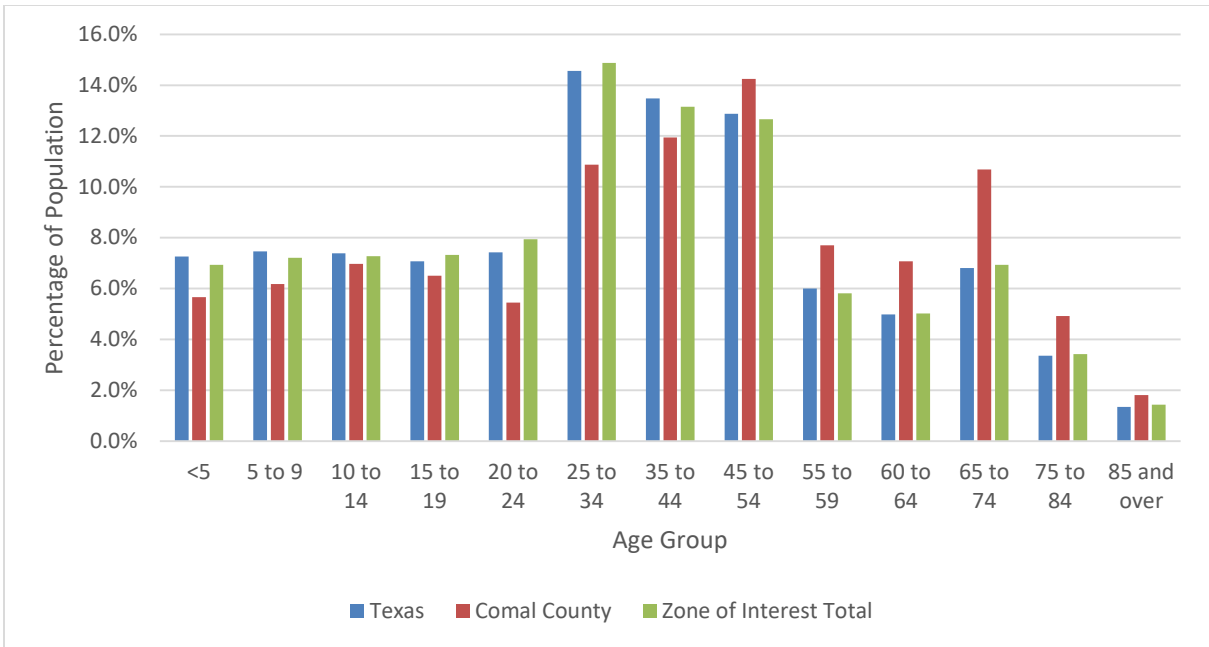


Figure 2.3 2014 Percent of Population by Age Group
 Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

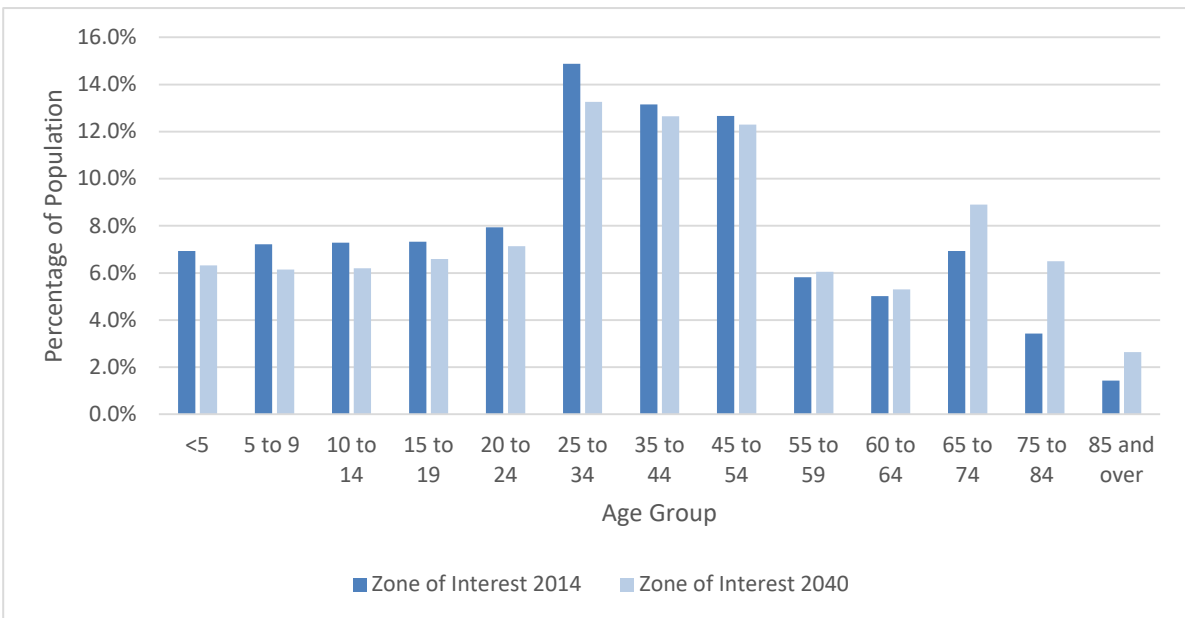


Figure 2.4 2014 Population Estimate and 2040 Projection by Age Group
 Source: U.S. Bureau of the Census, American Fact Finder (2000, 2014 Estimate); Texas State Data Center, The University of Texas at San Antonio (2040 Projections)

A compared of age groups across the counties in the zone of interest as illustrated in Table 2.11 shows that the majority of people in Bexar County, where a large percent of Canyon Lake visitors originate (see section 2.5.2), are between the ages of 25 and 54. This is the same as for the zone of Interest. Another 28.7% of the population in the Zone of Interest are children between the ages of 0-19. As illustrated in Figure 2.4, the current population trends are expected to continue throughout the life of this Plan.

Table 2.11. 2014 Population Estimate Percent by County by Age Group

Age Group	Geographic Area										
	Texas	Bandera County	Bexar County	Blanco County	Caldwell County	Comal County	Guadalupe County	Hays County	Kendall County	Travis County	Zone of Interest Total
<5	7.3%	4.1%	7.2%	4.0%	5.7%	5.7%	6.3%	6.0%	4.9%	6.9%	6.9%
5 to 9	7.5%	4.7%	7.4%	5.1%	6.8%	6.2%	7.3%	6.7%	6.2%	6.6%	7.2%
10 to 14	7.4%	5.0%	7.3%	6.1%	6.9%	7.0%	7.7%	6.8%	7.5%	6.2%	7.3%
15 to 19	7.1%	5.6%	7.2%	5.9%	8.3%	6.5%	7.6%	8.6%	7.3%	6.1%	7.3%
20 to 24	7.4%	4.4%	7.8%	4.5%	8.3%	5.4%	6.3%	13.0%	5.3%	7.3%	7.9%
25 to 34	14.6%	8.2%	15.6%	8.9%	13.0%	10.9%	12.5%	14.0%	9.3%	19.9%	14.8%
35 to 44	13.5%	9.3%	13.3%	10.6%	12.5%	11.9%	13.9%	12.8%	11.6%	15.8%	13.1%
45 to 54	12.9%	15.3%	12.5%	14.3%	12.9%	14.2%	14.2%	11.6%	14.4%	12.7%	12.7%
55 to 59	6.0%	9.6%	5.6%	8.9%	6.4%	7.7%	6.1%	5.5%	7.4%	5.6%	5.8%
60 to 64	5.0%	9.3%	4.8%	9.2%	5.7%	7.1%	5.1%	4.9%	6.9%	4.6%	5.0%
65 to 74	6.8%	15.7%	6.5%	14.1%	7.7%	10.7%	7.8%	6.4%	11.3%	5.2%	6.9%
75 to 84	3.4%	6.5%	3.3%	5.9%	3.9%	4.9%	3.8%	2.6%	5.4%	2.2%	3.4%
85 +	1.3%	2.4%	1.4%	2.4%	1.6%	1.8%	1.4%	1.0%	2.5%	1.0%	1.4%

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

Canyon Lake’s zone of interest holds a diverse population in terms of race and ethnicity. The zone of interest population is approximately 41% White, 7% Black, 47% Hispanic or Latino, and 4% Asian. The other race categories account for less than 2% each of the population. By comparison, the state’s population is approximately 44% White, 12% Black, 39% Hispanic or Latino, and 4% Asian. Based on those estimates, the Hispanic or Latino population in the zone of interest is approximately 8% higher than that of the state, with the highest Hispanic or Latino populations in Bexar County (59%) and Caldwell County (50%). Figure 2.5 shows the 2014 estimate of race/Hispanic origin in the zone of interest distributed between four categories, White, Black, Hispanic and Other, as well as the projected distribution in 2040. It can be seen from the two graphs in the figure that the Hispanic and Other categories are expected to increase by 8% and 3% respectively while the White category decreases by 10% and the Black category decreases slightly (1%).

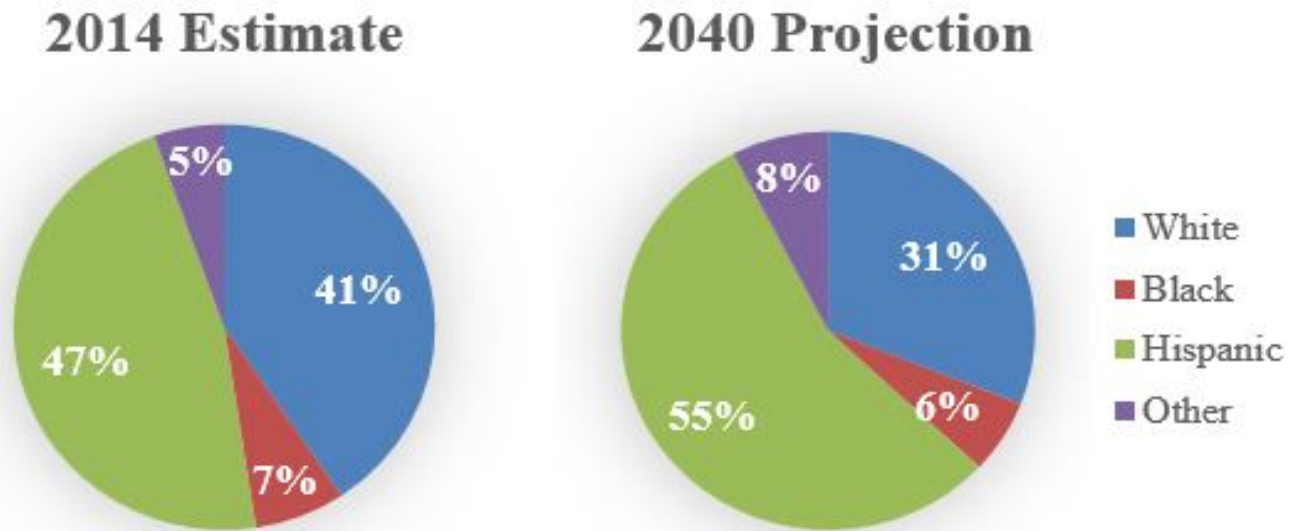


Figure 2.5 Zone of Interest Population Estimate and Projection by Race/Ethnicity

2.4.3 Education

Table 2.12 displays the highest level of education attained by the population ages 25 and over. In the zone of interest, 7% of the population has less than a 9th grade education, and another 7% has between a 9th and 12th grade education; 23% has a high school diploma or equivalent and another 23% has some college and no degree; 7% has an Associate’s degree; 21% has a Bachelor’s degree; and 12% has a graduate or professional degree. The zone of interest has a slightly larger population that has received a higher-level diploma (i.e., Bachelor’s, graduate, or professional degree) when compared to the state of Texas. In Texas, 9% of the population has less than a 9th grade education; another 9% has between a 9th and 12th grade education; 25% has at least a high school diploma or equivalent; 23% has some college; 6% has an Associate’s degree; 18% has a Bachelor’s degree; and 9%

has a graduate or professional degree. Comal County has a similar distribution of educational attainment to the zone of interest.

Table 2.12 2014 Population Estimate by Highest Level of Educational Attainment, Population 25 Years of Age and Older by County

Area	Highest Level of Educational Attainment							
	Population 25 years and over	Less than 9th grade	9th to 12th grade, no diploma	High school graduate (includes equivalency)	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree
Texas	16,426,730	9.3%	9.2%	25.2%	22.7%	6.6%	17.9%	9.1%
Bandera County	15,774	4.3%	9.4%	28.7%	28.5%	7.7%	14.6%	6.9%
Bexar County	1,117,679	8.3%	8.7%	25.0%	24.0%	7.5%	17.0%	9.5%
Blanco County	7,862	6.6%	5.3%	29.5%	25.3%	5.4%	19.9%	8.0%
Caldwell County	24,532	10.5%	11.3%	35.1%	21.6%	5.9%	11.3%	4.3%
Comal County	80,267	5.4%	5.1%	24.3%	24.2%	7.9%	22.5%	10.8%
Guadalupe County	89,753	5.6%	7.7%	29.5%	23.5%	8.6%	16.7%	8.6%
Hays County	98,870	5.1%	5.9%	21.3%	24.1%	6.9%	25.7%	11.1%
Kendall County	24,823	5.0%	5.1%	20.8%	20.5%	7.9%	25.2%	15.5%
Travis County	714,301	6.7%	5.9%	17.1%	19.7%	5.5%	28.6%	16.5%
Zone of Interest Total	2,173,861	7.4%	7.4%	22.5%	22.5%	6.9%	21.4%	11.9%

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

2.4.4 Households, Income, Employment, Poverty

Table 2.13 displays the number of households and average household sizes as of the 2010 census. There were approximately 8.9 million households in the state of Texas with an average household size of 2.75. The zone of interest contained approximately 1.2 million of those homes with an average household size of 2.71.

Table 2.13 2010 Households and Household Size

Geographic Area	Total Households	Average Household Size
Texas	8,922,933	2.75
Bandera County	8,564	2.35
Bexar County	608,931	2.75
Blanco County	4,309	2.41
Caldwell County	12,301	2.82
Comal County	41,363	2.60
Guadalupe County	45,762	2.83
Hays County	55,245	2.72
Kendall County	12,617	2.61
Travis County	404,467	2.48
Zone of Interest Total	1,193,559	2.71

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

As shown in Table 2.14, median household income in the zone of interest ranges from \$47,435 in Caldwell County to \$74,320 in Kendall County in 2014. Per capita income in the zone of interest is \$28,023, which is slightly greater than that of Texas at \$26,513.

Table 2.14 2014 Median and Per Capita Income

Geographic Area	Median Household Income	Per Capita Income
Texas	\$52,576	\$26,513
Bandera County	\$48,587	\$26,900
Bexar County	\$50,867	\$24,525
Blanco County	\$51,740	\$28,113
Caldwell County	\$47,435	\$20,368
Comal County	\$64,987	\$33,020
Guadalupe County	\$62,412	\$26,696
Hays County	\$58,878	\$27,080
Kendall County	\$74,320	\$36,169
Travis County	\$59,620	\$33,943
Zone of Interest Total	N/A	\$28,023

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

The civilian labor force in the zone of interest accounts for approximately 8.8% of the civilian labor force of the state of Texas. As shown in Table 2.15, the zone of interest had the same unemployment rate as the state of Texas in 2014 at 7.7%. Bexar and Blanco counties are the only two counties in the zone of interest with unemployment rates higher than the state of Texas at 8.0% and 8.2% respectively. Of the counties in the zone of interest, Kendall County had the lowest employment rate (4.2%) followed by Bandera County (5.9%).

Table 2.15 Labor Force, Employment and Unemployment Rates, 2014 Annual Averages

Geographic Area	Civilian Labor Force	Number Employed	Number Unemployed	Unemployment Rate
Texas	12,791,590	11,809,010	982,580	7.7%
Bandera County	9,418	8,867	551	5.9%
Bexar County	872,933	803,439	69,494	8.0%
Blanco County	5,180	4,753	427	8.2%
Caldwell County	17,198	15,958	1,240	7.2%
Comal County	55,931	52,534	3,397	6.1%
Guadalupe County	70,110	65,304	4,806	6.9%
Hays County	88,336	82,122	6,214	7.0%
Kendall County	17,129	16,405	724	4.2%
Travis County	619,810	577,855	41,955	6.8%
Zone of Interest Total	1,126,817	1,040,515	86,302	7.7%

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

Employment by sector is presented in Figure 2.6. The largest percentage of the zone of interest is employed in the Educational services, and health care and social assistance sector at 23%, followed by 12% in Retail Trade, 11% each in the Professional, scientific, and management, and administrative and waste management services and the Arts, entertainment, and recreation, and accommodation and food services sectors, 8% each in the Finance and insurance, and real estate and rental leasing, and the Construction sectors, 6% each in the Manufacturing and the Public Administration sectors. The remainder of the employment sectors each comprise 5% or less of the zone of interest’s labor force.

The Alamo Workforce Development Area (WDA) encompasses Comal County, where Canyon Lake lies. Also encompassed in this WDA are Atascosa, Bandera, Bexar, Frio, Gillespie, Guadalupe, Karnes, Kendall, Medina, and Wilson Counties. It is anticipated that the most growth within the WDA is anticipated to be seen in the *Agriculture, forestry, fishing and hunting, and mining* industry (32.8%). The *Professional, scientific, and management, and administrative and waste*

management services industry and the Construction industry will also see significant growth rates, at 26.2% and 22.5% respectively. The least amount of growth in the WDA will be in the Manufacturing industry (11.3%).

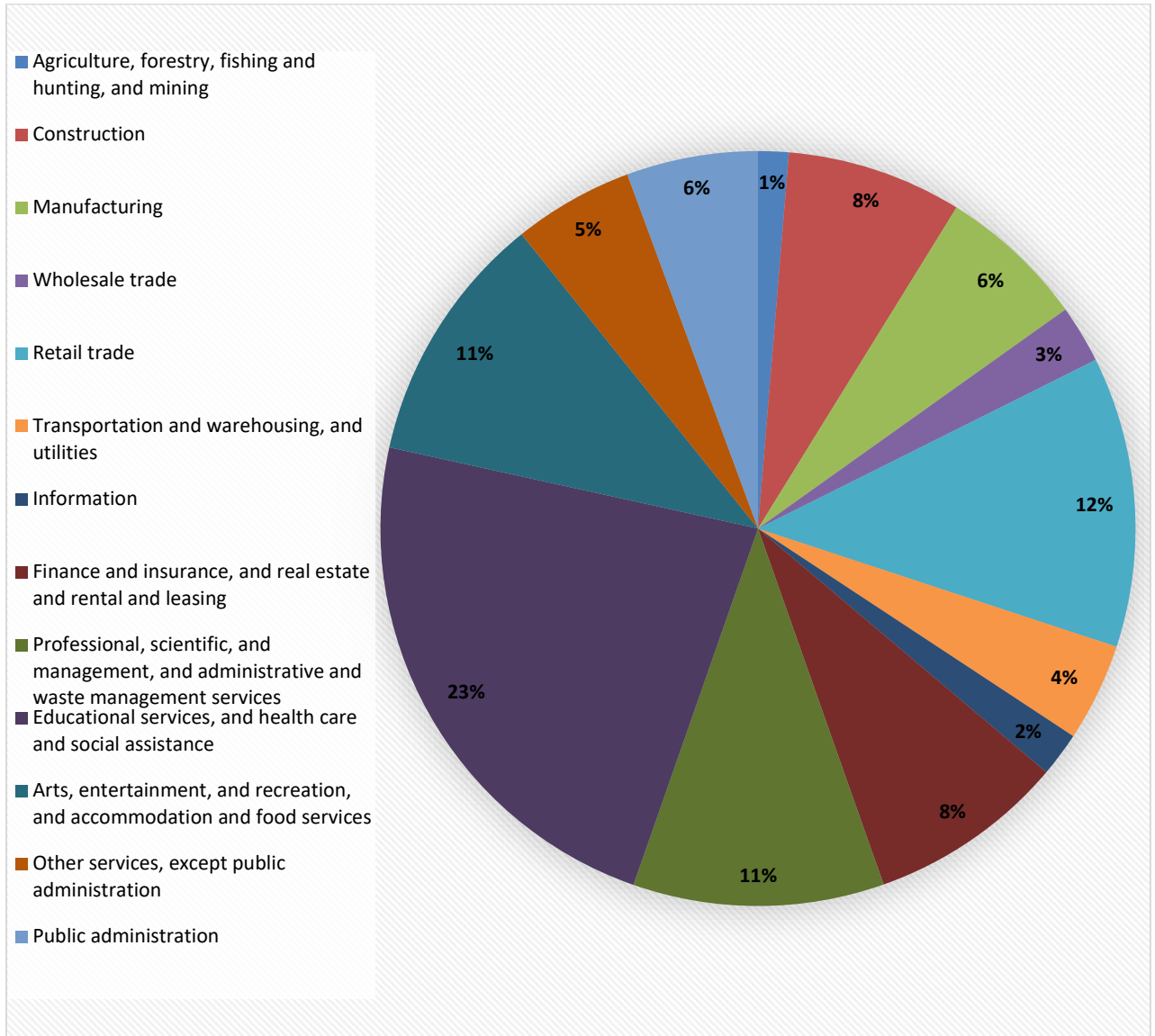


Figure 2.6 Zone of Interest Employment by Sector

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

As shown in Table 2.16, there were fewer persons in the zone of interest with incomes below the poverty level in 2014 (16.9%) as compared to the state of Texas (17.7%). Caldwell County has the most persons with incomes below the poverty level at 18.1% in 2014, followed by Bexar County at 17.8%, Travis County at 17.5%, and Hays County at 17.3%. Kendall and Guadalupe Counties have the least percentage of individuals with incomes below the poverty level at 9.3% and 9.7%

respectively. In terms of families below the poverty level in 2014, Bexar County was the only county in the zone of interest with a greater percentage of families below the poverty level (14.0%) than the state of Texas (13.7%).

Table 2.16 Percent of Families and People Whose Income in the Past 12 Months is Below the Poverty Level (2014)

Geographic Area	All Persons	All Families
Texas	17.7%	13.7%
Bandera County	15.1%	8.8%
Bexar County	17.8%	14.0%
Blanco County	10.1%	6.1%
Caldwell County	18.1%	11.5%
Comal County	10.6%	7.8%
Guadalupe County	9.7%	7.5%
Hays County	17.3%	9.6%
Kendall County	9.3%	4.6%
Travis County	17.5%	12.2%
Zone of Interest Total	16.9%	N/A

Source: U.S. Bureau of the Census, American Fact Finder (2014 Estimate)

2.4.5 Economic Impact

Visitors to Canyon Lake have a strong, positive impact on the local economy by supporting jobs and generating income. Data gathered by the USACE Recreation Economic Assessment System (REAS), which calculates the economic effects of the visits within 30 miles of the lake, estimates that the 806,777 visits to Canyon Lake in 2012 resulted in \$29.1 million in visitor spending and an additional \$15.2 million in sales. In terms of the labor market, the money spent by lake visitors added 217 jobs and resulted in the addition of \$6.2 million in labor income and \$9.6 million in a combination of wages & salaries, payroll benefits, profits, rents, and indirect business taxes. Future predicted population growth in the surrounding counties would indicate that these benefits will continue to increase in future years.

In addition to the impacts above, Canyon Lake has also had a positive effect on land values adjacent to the lake. As indicated in Table 2.17 below, 55% of properties adjacent to the Lake are valued at \$100,000 or more. It is predicted that as demand for these properties increase, the values will continue to rise.

Table 2.17 Canyon Lake Adjacent Property Values 2016 (353 Parcels)

Property Value	Number of Parcels	Percent of Total Properties
Less than \$50,000	62	17.6%
\$50,000 - \$99,999	95	26.9%
\$100,000 - \$199,999	89	25.2%
\$200,000 - \$249,999	31	8.8%
\$300,000 - \$399,999	18	5.1%
\$400,000 - \$499,999	15	4.2%
\$500,000 - \$599,999	18	5.1%
\$600,000 - \$699,999	9	2.5%
\$700,000 - \$799,999	5	1.4%
\$800,000 - \$899,999	2	0.6%
\$900,000 - \$999,999	3	0.8%
\$1,000,000+	6	1.7%

Note: Excludes properties with appraisal of zero.

2.5 RECREATION FACILITIES, ACTIVITIES, AND NEEDS

Canyon Lake is arguably a regionally important outdoor recreation resource. The following factors have given Canyon Lake prominence as a place relied upon by many citizens for their outdoor recreation needs:

- Location within one hour of the urban centers of both Austin and San Antonio
- A growing population within the counties adjoining the lake
- Desirable shorelines that provide scenic, natural shorelines featuring steep bluffs and land dominated by Ashe juniper, oaks and honey mesquite as well as Texas madrone, Texas smoke tree, witch hazel and big tooth maples
- Exceptional water quality in the lake
- Colder than average water temperatures and active regional water recreation in the lake and Guadalupe River
- Popular boating and fishing area. Trout stocking by TPWD in the cold downstream waters of the Guadalupe River supports a very popular trout fishery

2.5.1 Zone of Influence and Visitation Statistics

The primary zone of visitation and significant influence on the public use and management of Canyon Lake are the surrounding counties of Bandera, Bexar, Blanco, Caldwell, Comal, Guadalupe, Hays, Kendall, and Travis. Because of the

growing populations in San Antonio and Houston (Bexar and Harris Counties, respectively) a large portion of visitors come from these two counties. Recreational demand is expected to grow in relation to growth in these counties.

2.5.2 Visitation Profile

Visitors to Canyon Lake come from many areas beyond the limits of Comal County. For example, the campsite reservation records for Potters Creek Park show that more than 6,000 reservation transactions were made in 2014 with more than 27,000 visitors associated with those reservations. Using zip codes from these campsite reservations, it was determined that the top five counties where camping visitors are coming from includes:

- Bexar County 22.6%
- Harris County 15.7%
- Comal County 9.4%
- Hays County 6.1%
- Travis County 4.3%

As seen above, the majority of visitors to Canyon Lake come from within a 100-mile radius of the lake, with a large portion coming from the San Antonio and Houston areas. Table 2.18 summarizes the number of visitors for each park for the period between 2002 and 2012.

Table 2.18 Canyon Lake Visitation 2002 – 2012

Year	North Park	Jacob's Creek Park	Little Jacobs	JBSA - Ft. Sam Rec Area	JBSA - Randolph AFB Rec	Canyon	Guadalupe	Potters Creek	Cranes Mill	Comal	Overlook	Dispersed	All Canyon Lake
2002	65,736	36,990	0	5,480	1,563	92,673	39,739	74,131	51,663	17,894	13,317	107,012	506,198
2003	26,876	9,855	0	10,842	2,186	82,136	31,616	63,600	13,862	39,265	63,626	92,786	436,650
2004	26,896	9,855	0	10,842	2,186	82,136	31,915	63,600	16,290	39,229	63,777	92,786	439,512
2005	30,163	10,569	0	13,995	5,339	72,099	33,835	78,544	12,904	39,468	65,629	140,211	502,756
2006	33,619	35,678	23,563	22,856	29,440	53,277	12,285	97,278	45,279	59,021	68,347	128,840	609,483
2007	22,800	22,426	17,372	28,616	37,654	21,406	18,045	122,551	34,030	6,884	33,005	193,192	557,981
2008	21,124	33,734	28,586	30,326	33,145	108,275	28,331	145,238	54,434	24,657	80,317	37,947	626,114
2009	40,272	34,088	17,309	25,605	9,705	96,163	14,119	86,261	44,331	37,192	115,399	31,520	551,964
2010	46,336	25,122	38,263	25,206	12,325	153,638	39,210	163,114	43,187	41,929	106,441	72,720	767,491
2011	28,276	22,518	30,356	16,118	12,175	147,615	47,451	90,345	50,069	40,595	105,159	104,232	694,909
2012	30,707	26,459	32,165	13,655	10,592	149,408	71,840	92,083	58,210	43,386	99,705	107,921	736,131
Average	33,891	24,299	26,802	18,504	14,210	96,257	33,490	97,886	38,569	35,411	74,066	100,833	584,472

Note: Data are generated by the Visitation Estimation & Reporting System (VERS) and do not reflect the actual recording of the traffic counter. Floods and cleanup greatly affected visitation numbers in 2002 and 2003. Visitation numbers beyond 2012 are not available as the VERS system is being updated.

2.5.3 Recreation Areas and Facilities

Table 2.19 lists the USACE-operated developed camping parks and day use parks on Canyon Lake where user fees are charged. Developed camping parks are Potters Creek Park, Canyon Park, Cranes Mill Park, and North Park. Day use parks are Canyon Park Beach at Canyon Park, Comal Park, Guadalupe Park, and Overlook Park. The USACE also operates North Ramp (ramp 17) at Little Jacobs Creek Park. In accordance with the Land and Water Conservation Fund Act, Public Law 85-578, as amended, fees collected at USACE operated parks are turned over to the U.S. Treasury where it is deposited into special accounts for each agency before being appropriated by Congress through the Federal budget process.

Table 2.19 USACE Managed Public Parks at Canyon Lake

Public Use Areas (Parks)	ACRES	Type of Use
Potters Creek Park	302	Camping
Canyon Park (Includes a day use area)	407	Camping
Cranes Mill Park	150	Camping
Comal Park	116	Day Use
Guadalupe Park	13	Day Use
Overlook Park	23	Day Use
Little Jacobs Creek (Ramp 17 only)	15	Day Use
North Park	51	Camping

There are eight recreation areas that are managed by others through leases or permit agreements with USACE as shown in Table 2-20. More detailed information on parks, commercial concessions, and leases can be found in Chapter 4 of the Master Plan. A map showing the location of these marinas is included in Appendix A.

Table 2.20 Park & Recreation and Commercial Concession Leases

Park and Recreation Leases	ACRES
Joint Base San Antonio @ Jacobs Creek Park	30.6
Joint Base San Antonio @ Hancock Cove	110
Joint Base San Antonio @ Sunny Side Area	110.1
Comal County Hidden Valley Sports Complex @ Guadalupe Park	68.43
Guadalupe Blanco River Authority – Canyon Gorge Park	61.46
Commercial Concessions/Private Yacht Club Leases	ACRES
Suntex Marina @ Canyon Park	18
Suntex Marina @ Cranes Mill Park	9
Canyon Lake Yacht Club – Boat Ramp Number 12	3.9

In addition to the outgranted facilities, there are twenty-three public boat ramps at Canyon Lake. Many visitors to Canyon Lake use these public boat ramps, especially on holiday weekends. Past observations have illustrated the abundance of visitors and reflected the challenges of launching watercraft, parking, and driving along roads when these ramps are at or over capacity. Table 2.21 lists the current boat ramps at Canyon Lake by the managing entity, the ramp's location, parking spaces, fees and hours as of June 2017.

Table 2.21 Boat Ramps by Managing Organization at Canyon Lake

	DESCRIPTION	LOCATION	HOURS	Fee	Parking Spaces
USACE					
	Comal Park 2	Comal Park East	8 am - Sunset	Day Use Fee	16
	Comal Park 1	Comal Park West	8 am - Sunset	Day Use Fee	54
	Crane's Mill	Crane's Mill Park	8 am - 10 pm	Boat Launch Fee	45
	Little Jacob's Creek/ Jacob's Creek North	Little Jacob's Creek	24 Hours	Free	55
	Canyon Park	Canyon Park	Registered Campers Only	Camping Fee	40
	Potter's Creek Park	Potter's Creek East (Inside)	Registered Campers Only	Camping Fee	30
	Potter's Creek West	Potter's Creek East (Outside)	24 Hours	Free	36
COMAL COUNTY					
	Lake Village East Ramp	Skyline/Canyon Dam	24 Hours	Free	12
	Lake Village West Ramp	Turkey Cove/Colleen Drive	24 Hours	Free	24
	Lake Forest Ramp	Tom Creek 1/ Canyon Lake Forest Drive	24 Hours	Free	15
	Lake Hills East Ramp	Tom Creek 2/ Canyon Lake Drive	24 Hours	Free	43
	Lake Hills West Ramp	Lakeview Drive/ Ledge Rock Drive	24 Hours	Free	15

	DESCRIPTION	LOCATION	HOURS	Fee	Parking Spaces
	Canyon Springs Ramp	Lighthouse Road/ Canyon Springs Drive	24 Hours	Free	15
	Cypress Cove Ramp	Rebecca Creek/ Tanglewood Trail	24 Hours	Free	8
	Lake Shores Ramp	Park Shore Drive	24 Hours	Free	15
	North Crane's Mill Ramp	Mystic Shores/ N. Cranes Mill Road	24 Hours	Free	30
JBSA					
	Sunny Side (old Randolph MWR)	Sunny Side - JBSA (East)	Call JBSA	Call	68
	Jacob's Creek 1	Jacob's Creek Park	Call JBSA	Call	45
	Jacob's Creek 2	Jacob's Creek Park	Call JBSA	Call	0
	Hancock Cove (old Ft Sam MWR)	Hancock Cove - JBSA (West)	Call JBSA	Call	81
OTHER					
	Crane's Mill Marina	Crane's Mill Marina	Call Marina	Call	15
	Canyon Lake Marina	Canyon Marina	Call Marina	Call	25
	Lake Canyon Yacht Club	Lake Canyon Yacht Club	Members Only	Members only	Call

Source: USACE

Finally, Canyon Lake has three hiking and biking trails. These trails can be found throughout the lake and offer a variety of terrain for different skill and ability levels. Section 5.3.4 of the Master Plan details these trails.

2.5.4 Recreational Analysis - Trends

Recreational use at Canyon Lake continues to evolve. While visitation in USACE managed recreational areas remains strong, there is demand for recreational opportunities not offered in these parks. The 2012 Texas Outdoor Recreation Plan (TORP) published by TPWD is a comprehensive recreational demand study completed by Texas Parks and Wildlife. The TORP pointed out the top five needs within all park systems in the state as identified by professional recreation providers and by Texas citizens. Tables 2.22 through 2.25 and Figure 2.7 are a summary from the TORP and are provided to illustrate general trends in outdoor recreation. Some of the information in the TORP was extracted directly from

the National Survey on Recreation and the Environment (NSRE) and reports generated by the USFWS.

As seen in Table 2.22, the top five recreational facilities needs in Texas focus on walking, hiking, biking, and wildlife observations. As population grow and urban environments expand, this trend is expected to continue. Having a regional resource like Canyon Lake can provide these amenities to the rapidly expanding populations of San Antonio, Houston, and Austin

Table 2.22 Top Five Recreation Facilities Needed by Texas Citizens – TORP 2012

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%

Source: NSRE; TORP 2012

Interest in watercraft sports such as boating, canoeing and kayaking continue to hold strong interest in recreation. Table 2.23 illustrates that over 35% of the population surveyed participate in boating activities. Canoeing and Kayaking are seeing an increase in participation amongst those surveyed.

Table 2.23 Percent of Population Participating in Recreational Boating in the U.S.

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)

While participation in hunting and fishing show stable growth across those surveyed, there is a large jump in the population of people who are participating in the more passive activity of wildlife watching. As seen in Table 2.24, from 2001 to 2006 almost a million more people reported participating in this activity.

Table 2.24 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

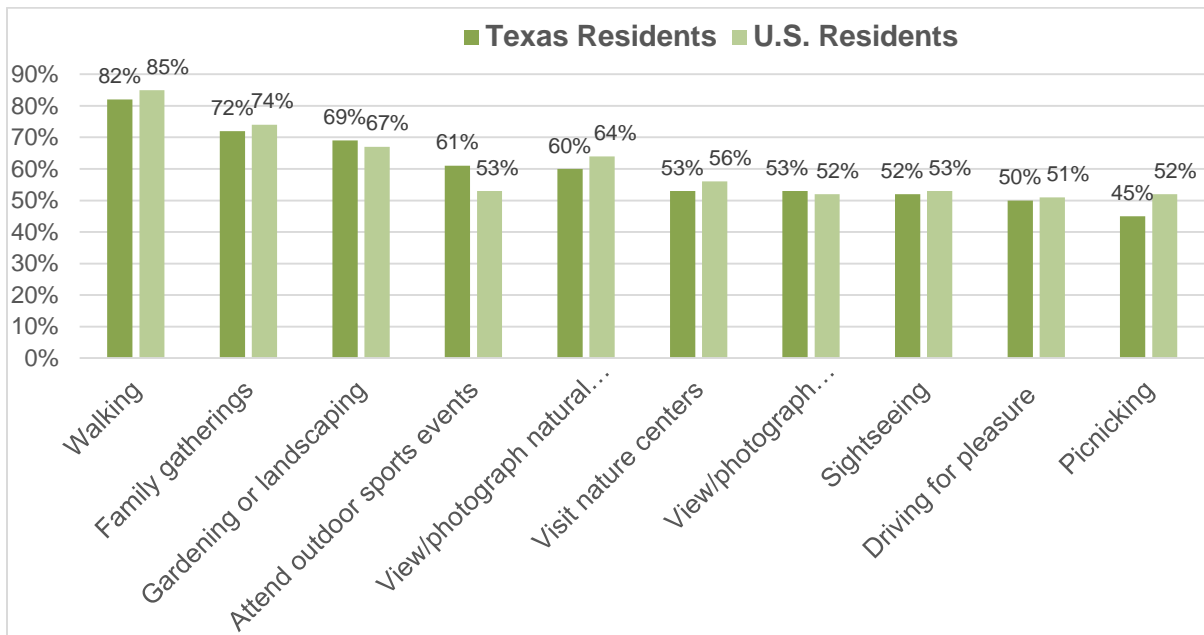


Figure 2.7 Participation Rates of Texas Residents (2006-2009) versus U.S. Residents (2005-2009) in the Top 10 Outdoor Recreation Activities (Source: NSRE; TORP 2012)

As illustrated in Figure 2.7, Texas and the US are very similar, with more participation in walking and family gatherings, for which the facilities at Canyon Lake can and do accommodate. Canyon Lake has a diverse culture of visitors, including a large number of Hispanic visitors from the area of influence. Table 2.25 illustrates a slightly larger population of Hispanic respondents participate in many outdoor

recreation activities available at Canyon Lake, including walking for pleasure and family gatherings.

Table 2.25 Comparison of Participation Rates of White/Non Hispanics Versus Hispanics in the Top 10 Outdoor Recreation Activities in Texas 2006-2009

ACTIVITY	% 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%
Attend Outdoor Sports Events Outdoors	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: NSRE; TORP 2012

2.5.5 Recreation Analysis – Needs

Canyon Lake receives approximately 750,000 visits each year. Tables 2.26 and 2.27 summarizes results from comment cards provided for both camping and day use by visitors in 2013-2014. The lowest mark for any item was 3.7 from the day use survey concerning restroom cleanliness and availability of conveniences. The overall ratings are very good (4.5) for both camping and day use visitors.

Table 2.26 Camping Visitor Survey 2013-2014

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
152 total submitted comment cards								
Facilities:								
Suitability of park facilities for my recreational equipment and activities	149	51%	41%	8%	0%	0%	100%	4.4

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
152 total submitted comment cards								
Restroom cleanliness and availability of conveniences	144	43%	33%	15%	4%	5%	100%	4.0
Appearance of park grounds	151	52%	36%	12%	0%	0%	100%	4.4
Adequacy of signs providing directions and information	146	53%	33%	14%	1%	0%	100%	4.4
Parking space availability during my visit	148	56%	37%	5%	1%	1%	100%	4.5
Condition of roads and parking areas in the park	151	61%	31%	7%	0%	1%	100%	4.5
Employees:								
Availability of park rangers and staff	148	56%	38%	6%	0%	0%	100%	4.5
Helpfulness of park rangers and staff	148	56%	34%	7%	1%	1%	100%	4.4
Environmental Setting:								
Attractiveness of surrounding scenery and landscape	148	52%	43%	4%	1%	0%	100%	4.5
Quality of land and water	150	55%	35%	9%	1%	0%	100%	4.4

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
152 total submitted comment cards								
resources for my activities								
Overall:								
Waiting times needed to access park facilities and services	148	54%	39%	6%	1%	1%	100%	4.4
Feeling of safety and security in the park	151	59%	34%	5%	1%	1%	100%	4.5
Value received for any visitor fees paid	147	52%	39%	7%	0%	1%	100%	4.4
Overall satisfaction with my visit to this area	149	57%	37%	6%	0%	0%	100%	4.5

Table 2.27 Day Use Visitor Survey 2013-2014

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
140 total submitted comment cards								
Facilities:								
Suitability of park facilities for my recreational	134	43%	43%	13%	1%	1%	100%	4.3

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
equipment and activities								
Restroom cleanliness and availability of conveniences	135	29%	41%	13%	6%	11%	100%	3.7
Appearance of park grounds	139	40%	40%	16%	5%	0%	100%	4.1
Adequacy of signs providing directions and information	136	43%	45%	10%	1%	1%	100%	4.3
Parking space availability during my visit	137	47%	36%	12%	4%	1%	100%	4.2
Condition of roads and parking areas in the park	138	47%	42%	9%	1%	0%	100%	4.3
Employees:								
Availability of park rangers and staff	137	42%	46%	11%	1%	0%	100%	4.3
Helpfulness of park rangers and staff	134	45%	46%	8%	1%	0%	100%	4.4
Environmental Setting:								
Attractiveness of surrounding scenery and landscape	139	56%	37%	6%	1%	0%	100%	4.5

Customer Satisfaction Item	No. of Visitor Response	Response Distribution (Percent)					Total	Mean Response (1-5 Scale)
		Very Good (5)	Good (4)	Neither Good Nor Poor (3)	Poor (2)	Very Poor (1)		
Quality of land and water resources for my activities	138	49%	40%	9%	2%	0%	100%	4.4
Overall:								
Waiting times needed to access park facilities and services	135	54%	40%	5%	0%	1%	100%	4.5
Feeling of safety and security in the park	139	48%	45%	6%	1%	0%	100%	4.4
Value received for any visitor fees paid	129	52%	43%	5%	0%	0%	100%	4.5
Overall satisfaction with my visit to this area	138	53%	41%	6%	1%	0%	100%	4.5

While the comment cards provide some indication of the current recreational needs at Canyon Lake, the trends identified in the TORP indicate new and emerging needs and direction for future management. Although the TORP is not specific to Canyon Lake recreation areas, the facilities and opportunities offered by USACE and other providers at Canyon Lake fall short in some of the recreation categories where need is indicated or participation rates are high. The campsite utilization rate at Canyon Lake is very healthy, at about 48 percent. Campgrounds are booked to capacity on peak use days.

Public comments concerning future uses at Canyon Lake include increasing facilities for fishing, seating, trails, and natural areas for wildlife viewing, which are all reflected as increasing participation in the TORP. Barrier free facilities are in demand, as it allowance for more non-motorized watercraft facilities, more parking, and expanded swim beaches. Obviously, these recreational needs will need to be

tempered in response to the limited space, funds, and personnel available at Canyon Lake. More importantly, all these demands must be subjugated to the primary missions of flood mitigation, water supply, and hydroelectric power generation.

2.5.6 Recreational Carrying Capacity

The recreation carrying capacity of a lake is the amount of development, use, and activity any lake and associated recreational lands can sustain without being permanently adversely impacted. The 1970 Master Plan analyzed the design load for recreational use based on a predicted build-out for 3 million visitors annually. The design day load was calculated as 28,000 visitors. The picnicking design day load was estimated at 320 required picnic areas, and the camping design day load estimated was 800 camping units. It was also determined that the number of boat launching ramps needed was 25, and that a total of 2.37 acres of water surface was needed to accommodate swimming beaches. Canyon Lake experiences less than a third of its overall projected visitation based on predicted visitation from the 1970's MP. However, this number was based on a constant rate of visitation throughout the year. Visitation records over the years clearly shows that the majority of visits to Canyon Lake occur from April to September. Campsites and day use areas can experience capacity and over-capacity crowds on weekends and holidays but park areas during the week may be used at far less than capacity. Using 2014 data from the National Recreation Reservation System (NRRS), the campsite utilization rate at Canyon Lake is approximately 47% which, compared to other USACE lakes nationally, is a relatively high rate of utilization.

Use of the water surface by recreational boaters is another important aspect of recreation carrying capacity. Based on a vessel count conducted over the Memorial Day Weekend in 2004, and institutional knowledge of water surface utilization, Canyon Lake is known to have a high level of boating traffic. The topic of a Recreational Boating Study is addressed in more detail in Chapter 6.

Presently, USACE manages recreation areas at Canyon Lake 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 and site management using NRRS utilization data.



Photo 2-6 Potters Creek

2.5.7 Recreational Fee Analysis

Table 2.28 details use and service fees collected at Canyon Lake parks for the period of 2008 to 2015. As previously stated, these fees are turned over to the U.S. Treasury and then distributed as Congressional appropriations through the federal budget process. As illustrated, Potter's Creek Park generates the most revenue and visitation of all USACE managed facilities at Canyon Lake. The 2015 floods had significant adverse impact on revenue generation in 2015, as many of the parks were closed.

Table 2.28 Canyon Lake Visitation Versus Fees for Canyon Lake

YEAR	Potters - Field	Potters - Non-Field	Canyon Beach	Canyon Campground	North Park	Comal Park	Cranes Mill - Field	Cranes Mill - Non-Field	Fee Area Totals	Notes:
FY08										
Fees	\$96,070	\$197,872	\$23,197	\$57,576	\$19,692	\$49,756	\$22,420	\$0	\$394,407	Total Lake Revenue (NRRS call center+park):
Visitation	145,238		46,394	61,881	21,124	24,657	54,434		353,728	Total Lake Visitation: 657,287
										From May-Aug lake was below normal by 8 feet
FY09										
Fees	\$182,398	\$172,093	\$12,588	\$54,940	\$18,148	\$31,752	\$22,402	\$0	\$494,321	Total Lake Revenue (NRRS call center+park):
Visitation	86,261		25,176	70,987	40,272	37,192	44,331		222,696	Total Lake Visitation: 589,814
										From May-Aug lake was below normal 12 to 16 feet
FY10										
Fees	\$231,193	\$203,615	\$24,736	\$73,535	\$16,684	\$68,216	\$1,584	\$0	\$619,563	Total Lake Revenue (NRRS call center+park):
Visitation	137,882		49,472	104,166	46,336	41,929	3,000		337,856	Total Lake Visitation: 772,527
										From May-Aug lake was only below normal by 1 foot
										Cranes Mill closed from November 2009 through September 2010
FY11										
Fees	\$260,578	\$222,194	\$38,383	\$81,038	\$14,744	\$99,246	\$0	\$0	\$716,183	Total Lake Revenue (NRRS call center+park):
Visitation	100,678		70,766	76,849	27,309	35,131	0		275,602	Total Lake Visitation: 699,631
										From May-Aug lake was below normal 3 to 8 feet
										Cranes Mill closed all FY for Modernization
FY12										
Fees	\$231,193	\$222,500	\$40,750	\$69,215	\$18,864	\$96,810	\$63,288	\$0	\$742,620	Total Lake Revenue (NRRS call center+park):
Visitation	95,431		72,200	77,208	30,239	36,312	53,827		275,078	Total Lake Visitation: 739,985
										From May-Aug lake was below normal by 7 feet
FY13										
Fees	\$227,969	\$193,237	\$30,682	\$80,117	\$8,851	\$81,859	\$55,886	\$56,259	\$734,860	Total Lake Revenue (NRRS call center+park):
Visitation	95,431		72,200	77,208	30,239	36,312	53,827		275,078	Total Lake Visitation: 739,985 (used FY 12 visitation while VERS Modernization going)
										From May-Aug lake was below normal 10 to 11 feet
FY14										
Fees	\$203,703	\$223,316	\$34,311	\$73,761	\$9,306	\$83,146	\$49,476	\$74,111	\$751,130	Total Lake Revenue (NRRS call center+park) thru Sept 30, 2014:
Visitation										Total Lake visitation thru June 30 2014:
										From May-June lake was below normal 8 to 9 feet
FY15										
Fees	\$131,567	\$76,289	\$21,097	\$56,985	\$9,330	\$69,040	\$56,830	\$45,414	\$466,552	Total Lake Revenue (NRRS call center+park) thru Sept 30, 2015:
Visitation										Total Lake Visitation :
										Lake Closed May 24 due to flood. Slowly reopened parks except for tent section of CM. Loop 1 in PC opened Sept 1
Updated 16 Nov 2015										

2.6 REAL ESTATE

2.6.1 Project Land Acquisition

Canyon Lake has interest in two different types of real estate: "Fee Lands", which is real property that the USACE has all right, title, and interest in the property, and "Flowage Easement", which is privately owned real property on which the Government purchased the perpetual right to flood. Although flowage easement lands are privately owned, there are restrictions on their use. Land acquisition for Canyon Lake took place under a 1953 joint policy between the Department of the Army and Department of the Interior. The 1953- 1962 acquisition policy, known as the Eisenhower Policy, was very conservative. From 1953 to 1962, the Corps acquired fee title to lands only to the five-year flood frequency level. Flowage easements were obtained from this level to the full pool level. Minimum additional lands were acquired in fee where needed for operations or for public access. At Canyon Lake, fee title was acquired up to 918.0 feet NGVD contour line (the five-year pool) plus some high ground for park areas. Flowage easements were acquired on all other lands up to approximately the 948.0 feet NGVD contour line.

The basis for establishing the five-year flood frequency, the fee acquisition line, the upper guide contour, and the easement acquisition line is discussed in Design Memorandum No 12, Hydrology (Revised).

Prospective buyers of property adjacent to Canyon Lake are strongly encouraged to determine the location of the flowage easement line on any property they are considering purchasing. Flowage easements may or may not be located on deeds or plats provided by seller(s).

The 948.0 feet NGVD contour line applies to the majority of flowage easement lands surrounding Canyon Lake. However, in a few areas in the upstream portions of the lake, a flowage easement was acquired to a slightly higher elevation to allow for induced backwater flooding. The total area on which flowage easements were acquired is 3,620 acres.

2.6.2 Outgrants

Significant development near Canyon Lake has resulted in the following 311 active real estate outgrants at Canyon Lake: 5 leases, 23 easements for roads and utilities, 11 licenses (such as waterlines for private use), 1 permits (leases to other government agencies), and 271 consents to easement structures within flowage easement areas. A small number of utility lines within the fee boundary at Canyon Lake existed prior to Federal land acquisition. In those cases, the acquired lands were subject to existing easements that are not reflected in the in the totals given above. All outgrants are subject to periodic compliance inspections by USACE personnel.

Individuals and companies interested in lease acquisition to provide services to the public on USACE fee lands should be aware that specific restrictions and procedures apply to such leases. In many cases, individuals or companies will be encouraged to pursue a sublease with an existing lessee, such as with a marina. Any leases for new services are subject to a competitive bidding process following market studies and a determination by USACE that the prospective service or product would be beneficial to users at Canyon Lake. Questions regarding this topic can be directed to the lake office in Overlook Park near the southern end of the Canyon Lake dam.

2.6.3 Trespass and Encroachment

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

The term “encroachment” pertains to an unauthorized structure or improvement on Government property. When encroachments are discovered, lake personnel will attempt to resolve the issue at the project level. Where no resolution is reached, or where the encroachment is a permanent structure, the method of resolution will be determined by Real Estate Division, with recommendations from Operations Division and Office of Counsel. 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.

2.7 PERTINENT PUBLIC LAWS

Numerous public laws apply directly or indirectly to the management of Federal land at Canyon Lake. Listed below are several key public laws that are most frequently referenced in planning and operational documents. Refer to Appendix F for a more comprehensive listing.

- 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 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 86-717, Forest Conservation. - This act provides for the protection of forest and other vegetative cover for reservoir areas under this jurisdiction of the Secretary of the Army and the Chief of Engineers.
- 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. A HQUSACE/OMB implementation policy made these provisions applicable to projects completed prior to 1965.
- 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. It is Section 102 that requires consideration of environmental impacts associated with Federal actions. Section 101 of NEPA requires the federal government to use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony.

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

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

- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.
- PL 89-665, Historic Preservation Act of 1966. - This act provides for: (1) an expanded National Register of significant sites and objects; (2) matching grants to states undertaking historic and archeological resource inventories; and (3) a program of grants-in aid to the National Trust for Historic Preservation; and (4) the establishment of an Advisory Council on Historic Preservation. Section 106 requires that the President's Advisory Council on Historic Preservation have an opportunity to comment on any undertaking which adversely affects properties listed, nominated, or considered important enough to be included on the National Register of Historic Places.
- PL 101-601, Native American Graves Protection and Repatriation Act (16 November 1990), requires Federal agencies to return Native American human remains and cultural items, including funerary objects and sacred objects, to their respective peoples.

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CHAPTER 3 - RESOURCE GOALS AND OBJECTIVES

3.1 INTRODUCTION

This chapter sets forth goals and objectives necessary to achieve the USACE vision for the future of Canyon Lake. The terms “goal” and “objective” are often defined as synonymous, but in the context of this Master Plan goals express the overall desired end state of the Master Plan whereas resource objectives are specific task-oriented actions necessary to achieve the overall Master Plan goals.

3.2 RESOURCE GOALS

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

- GOAL A.** Provide the best management practices to respond to regional needs, resource capabilities and capacities, and expressed public interests consistent with authorized project purposes.
- GOAL B.** Protect and manage project natural and cultural resources through sustainable environmental stewardship programs.
- GOAL C.** Provide public outdoor recreation opportunities that support project purposes and public interests while sustaining project natural resources.
- GOAL D.** Recognize the unique qualities, characteristics, and potentials of the project.
- GOAL E.** Provide consistency and compatibility with national objectives and other State and regional goals and programs.

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

- Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse and sustainable condition is necessary to support life.
- Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances.
- Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.

- Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
- Seek ways and means to assess and mitigate cumulative impacts to the environment; 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 clearly written statements that respond to identified issues and that specify measurable and attainable activities for resource development and/or management of the lands and waters under the jurisdiction of the Fort Worth District, Canyon Lake Project Office. The objectives stated in this Master Plan support the goals of the Master Plan, USACE Environmental Operating Principles (EOPs), and applicable national performance measures. They are consistent with authorized project purposes, Federal laws and directives, regional needs, resource capabilities, and they consider public input. Recreational and natural resources carrying capacities are also accounted for during development of the objectives found in this Master Plan. Regional and State planning documents including TPWD’s Texas Conservation Action Plan (TCAP) and TORP.

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

Table 3.1 Recreational Objectives

Recreational Objectives	Goals				
	A	B	C	D	E
Evaluate the demand for improved recreation facilities and increased public access on USACE-managed public lands and water for recreational activities (i.e. camping, walking, hiking, biking, boating, fishing, wildlife viewing, etc.) and facilities (i.e. campsites, picnic facilities, overlooks, all types of trails, boat ramps, courtesy docks, interpretive signs/exhibits, and parking lots).	*		*		

Recreational Objectives	Goals				
	A	B	C	D	E
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, tent pads, restrooms, trails, pavilions, and improved park entrances.	*		*		
Monitor public use levels (with a special focus on boating congestion and marina capacity) and evaluate potential impacts from overuse and crowding. Take action to prevent/remediate overuse, conflict, and public safety concerns.	*		*		
Evaluate recreational use zoning and regulations for designated quiet water or no-wake areas with emphasis on natural resource protection, quality recreational opportunities, and public safety concerns.	*				
Follow the Environmental Operating Principles associated with recreational use of waterways for all water-based management activities and plans.		*	*		*
Increase universally accessible facilities on Canyon Lake.	*		*		*
Evaluate established permits/outgrants to determine impacts on public lands and waters. Sustain the Shoreline Management Program in order 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.	*		*		
Consider flood/conservation pool to address potential impact to recreational facilities (i.e. campsites, boat ramps, courtesy docks, etc.).	*	*	*	*	
Consider long-term sustainable operational and maintenance costs when planning future new recreational facilities or upgrading and expanding existing facilities.					
Ensure consistency with USACE Recreation Strategic Plan.					*
Monitor the TCAP, the TORP, and adjacent 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 Canyon Lake.					*

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

Table 3.2 Natural Resource Management Objectives

Natural Resource Management Objectives	GOALS:				
	A	B	C	D	E
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 and water supply.	*	*		*	
Ensure project lands are managed with preservation and conservation of natural habitat and open space as a primary objective in order to maintain the public open space.	*			*	
Actively manage and conserve fish and wildlife resources, especially habitat for the golden-cheeked warbler and other special status species, by implementing ecosystem management principles. Key among these principles is the use of native species adapted to the ecological region in restoration and mitigation plans.	*	*		*	*
Consider watershed approach during decision-making process.					*
Optimize resources, labor, funds, and partnerships for protection and restoration of fish and wildlife habitats.		*			*
Minimize activities that disturb the scenic beauty and aesthetics of the lake.	*	*	*	*	
Continually evaluate erosion control and sedimentation issues at Canyon Lake and develop alternatives to resolve the issues.	*	*			*
Address unauthorized uses of public lands such as off-road vehicle use, trash dumping, unauthorized fires, fireworks, poaching, clearing of vegetation, 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 the zebra mussel and Emerald Ash borer. Implement prescribed fire as a management tool to control the spread of noxious plants including Johnsongrass, King Ranch bluestem, and Ashe juniper, and to promote the vigor of native prairie grasses and forbs.	*	*		*	*

Natural Resource Management Objectives	GOALS:				
	A	B	C	D	E
Protect and/or restore important native habitats such as Texas Edwards Plateau, 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.	*	*	*	*	*

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

Table 3.3 Visitor Information, Education, and Outreach Objectives

Visitor Information, Education and Outreach Objectives	Goal				
	A	B	C	D	E
Provide more opportunities for communication with agencies, special interest groups, and the general public (i.e. comment cards, updates to City Managers, 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 and water supply), water safety, recreation, nature, cultural resources, ecology, and USACE missions.	*	*	*	*	*
Enhance network among local, state, and federal agencies 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.	*	*	*	*	*

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

Table 3.4 General Management Objectives

General Management Objectives	Goal				
	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.	*	*		*	
Secure sustainable funding for the shoreline management program.	*	*	*	*	*
Ensure consistency with USACE Campaign Plan (national level), IPlan (regional level), and 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 405-1-12.	*	*			*
Manage project lands and recreational programs to advance broad national climate change mitigation goals, including but not limited to climate change resilience and carbon sequestration, as set forth in Executive Order 13693 and related USACE policy.					*

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

Table 3.5 Cultural Resources Management Objectives

Cultural Resources Management Objectives	Goal				
	A	B	C	D	E
Monitor and coordinate lake development and the protection of cultural with appropriate entities.	*	*		*	*
Complete an inventory of cultural resources.	*	*		*	*
Increase public awareness and education of regional history.		*		*	*
While currently no listed sites exists at Canyon Lake, the project office will ensure any future historical preservation is fully integrated into the Canyon Lake Master Plan and planning decision making process (Section 106 and 110 of the National Historic Preservation Act; the Archeological Resources Protection Act; and the Native American Graves		*		*	*

Cultural Resources Management Objectives	Goal				
	A	B	C	D	E
Protection and Repatriation Act on public lands surrounding the lake.					
Develop partnerships that promote and protect cultural resources at Canyon Lake, including the Gorge.		*	*	*	*
Stop unauthorized use of public lands as it pertains to the illegal excavation and removal of cultural resources.		*		*	*

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

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

4.1 LAND ALLOCATION

All lands at USACE water resource development projects are allocated by USACE into one of four categories in accordance with the congressionally authorized purpose for which the project lands were acquired. There are four possible categories of allocation identified in USACE regulations including Operations, Recreation, Fish and Wildlife, and Mitigation. At Canyon Lake, the only land allocation category that applies is Operations, which is defined as those lands that are required to operate the project for the primary authorized purposes of flood risk management, hydroelectric power, and water conservation. The remaining allocations of Recreation, Fish and Wildlife, and Mitigation would apply only if lands had been acquired specifically for these purposes. The entire fee simple federal estate at Canyon Lake is 11,571 acres of land at conservation pool, all of which is allocated to Operations.

4.2 LAND CLASSIFICATION

Previous versions of the Canyon Lake Master Plan included land classification criteria that were similar to the current criteria. These prior land classifications were based more on projected need than on actual experience, which resulted in some areas being classified for a type of use that has not, or is not likely to occur. Additionally, in the 40 plus years since the previous Master Plan was published, wildlife habitat values, surrounding land use, and regional recreation trends have changed giving rise to the need for revised classifications. Refer to Table 8.1 in Chapter 8 for a summary of land classification changes from the prior classifications to the current classifications.

4.2.1 Current Land and Water Surface Classifications

USACE regulations require project lands and waters to be classified in accordance with the primary use for which project lands are managed. There are six categories of classification identified in USACE regulations including:

- Project Operations
- High Density Recreation
- Mitigation
- Environmentally Sensitive Areas
- Multiple Resource Management Lands
- Water Surface

The land and water surface classifications for Canyon Lake were established after taking into account public comments, input from key

stakeholders including elected officials, city and county governments, and lessees operating on USACE land. Additionally, public comment, wildlife habitat values, and the trends analysis provided in TPWD's TORP and TCAP were also used in decision making. Maps showing the various land classifications can be found in Appendix A. Each of the land classifications, including the acreage and description of allowable uses is described in the following paragraphs.

4.2.2 Project Operations

This classification includes the lands managed for operation of the dam, project office, and maintenance yards, all of which must be maintained to carry out the authorized purpose of flood risk management. In addition to the operational activities taking place on these lands, limited recreational use may be allowed for activities such as public access to the fishing pier in the tailrace area of the hydroelectric plant. Regardless of any limited recreation use allowed on these lands, the primary classification of Project Operations will take precedent over other uses. There are 333 acres of Project Operations land specifically managed for this purpose.

4.2.3 High Density Recreation (HDR)

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. That policy includes the following statement:

“The primary rationale for any future recreation development must be dependent on the project’s natural or other resources. This dependency is typically reflected in facilities that accommodate or support water-based activities, overnight use, and day use such as marinas, campgrounds, picnic areas, trails, swimming beaches, boat launching ramps, and comprehensive resort facilities. Examples that do not rely on the project’s natural or other resources include theme parks or ride-type attractions, sports or concert stadiums, and standalone facilities such as restaurants, bars, motels, hotels, non-transient trailers, and golf courses. Normally, the recreation facilities that are dependent on the project’s natural or other resources, and accommodate or support water-based activities, overnight use, and day use, are approved first as primary facilities followed by those facilities that support them. Any support facilities (e.g., playgrounds, multipurpose sports fields, overnight facilities, restaurants, camp stores, bait shops, comfort stations, and boat repair facilities) must also enhance the recreation experience, be dependent on the resource-based facilities, and 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 Canyon Lake, prior land classifications included a 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. At Canyon Lake there are 1,405 acres classified as High Density Recreation land. Refer to Table 2.18 for a listing of the current High Density Recreation Areas at Canyon Lake. Each of the High Density Recreation areas is described briefly in Chapter 5 of this Plan.

4.2.4 Mitigation

This classification is used only for lands allocated for mitigation for the purpose of offsetting losses associated with the development of the project. There are no lands at Canyon Lake with this classification.

4.2.5 Environmentally Sensitive Areas (ESA)

These are areas where scientific, ecological, cultural, and aesthetic features have been identified. At Canyon Lake several distinct areas have been classified as Environmentally Sensitive Areas (ESA), primarily for the protection of sensitive habitats or cultural resources. Each of these areas is discussed in Chapter 5 of this Plan and illustrated on the maps in Appendix A. There are 430 acres classified as ESA at Canyon Lake.

4.2.6 Multiple Resource Management Lands (MRML)

This classification is divided into four sub-classifications identified as: Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. A given tract of land may be classified using one or more of these sub-classifications but the primary sub classification should reflect the dominant use of the land. Typically, Multiple Resource Management Lands support only passive, non-intrusive uses with very limited facilities or infrastructure. Where needed, some areas may require basic facilities that include, but are not limited to minimal parking space, a small boat ramp, and/or primitive sanitary facilities. There are 1,097 acres of land under this classification at Canyon Lake. The following paragraphs list each of the sub-classifications, and the number of acres and primary uses of each.

- Low Density Recreation (LDR) These are lands that may support passive public recreational use (e.g., fishing, hunting, wildlife viewing, natural surface trails, hiking, etc.). Under prior land classifications, several relatively large tracts were classified for low-density recreation, but during

the study process to develop this Plan, these larger tracts were reclassified under the sub-classification of Wildlife Management. Low Density Recreation lands are typically narrow strips of land lying between the shoreline at the conservation pool elevation and the USACE property boundary line, and are often located adjacent to private residential areas. The narrow configuration and location next to residential areas make these areas unsuitable for other uses such as High Density Recreation, Vegetation or Wildlife Management. There are 1,097 acres under this classification at Canyon Lake.

- Wildlife Management (WM) 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 no acres of land included in this classification at Canyon Lake.



Photo 4-1 Whitetail Deer at Canyon Lake (USACE)

- Vegetative Management (VM) These are lands designated for stewardship of forest, prairie, and other native vegetative cover. Passive

recreation activities previously described may be allowed in these areas. There are no acres of land included in this classification at Canyon Lake.

- Future or Inactive Recreation. These are lands with site characteristics compatible with High Density Recreation development. These are areas where High Density Recreation development was anticipated in prior land classifications, but the development either never took place or was minimal. These areas are typically closed to vehicular traffic and will be managed as multiple resource management lands until development takes place. There no acres of land included in this classification at Canyon Lake.

4.2.7 Water Surface

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

- Restricted. Restricted water surface includes those areas where recreational boating is prohibited or restricted for project operations, safety and security purposes. The areas include the water surface upstream and downstream of the Canyon Lake Dam as well as around the six swim beaches at Canyon Lake parks. There are 31 acres of restricted water surface at Canyon Lake.
- Designated No-Wake. Designated No-Wake areas are intended to protect environmentally sensitive shorelines and improve boating safety near key recreational water access areas such as boat ramps. There are 23 boat ramps and two marina areas at Canyon Lake where no-wake restrictions are in place for reasons of public safety and protection of property. There are 178 acres of designated no-wake water surface at Canyon Lake.
- 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. Canyon Lake has no water surface areas designated as a Fish and Wildlife Sanctuary.
- Open Recreation. Open Recreation includes all water surface areas available for year round or seasonal water-based recreational use. This classification encompasses the majority of the lake water surface and is open to general recreational boating. Boaters are advised

through maps and brochures, or signs at boat ramps and marinas, that navigational hazards may be present at any time and at any location in these areas. Operation of a boat in these areas is at the owner’s risk. Specific navigational hazards may or may not be marked with a buoy. There are 8,097 acres of open recreation water surface at Canyon Lake.

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

4.2.8 Recreational Seaplane Operations

Seaplane restrictions are part of Title 36 Code of Federal Regulations. At Canyon Lake and other USACE lakes across the nation, areas where recreational seaplane operations are prohibited were established through public meetings and environmental assessments circa 1980. The seaplane policy for USACE Fort Worth District is found in the Notice to Seaplane Pilots (see Appendix E), which lays out the general restrictions as well as lake-specific restrictions for seaplane operation. Seaplane operations at Canyon Lake are generally prohibited in several major coves and bays off the main body of the lake and within 500 feet of structures such as bridges and the dam. Once on the water, seaplanes are considered to be water vessels and fall under guidelines for watercraft.

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

Table 4.1 Land Classification Acres at Canyon Lake

CLASSIFICATION	ACRES
Project Operations	333
High Density Recreation	1,405
Environmental Sensitive Areas	430
Multiple Resource Managed Lands - Low Density Recreation	1,097
Multiple Resource Managed Lands - Wildlife Management	-
Multiple Resource Managed Lands - Vegetative Management	-
Multiple Resource Managed Lands - Future/Inactive Recreation Areas	-
Water Surface: Restricted	31
Water Surface: Designated No-Wake	178
Water Surface: Fish and Wildlife Sanctuary	-
Water Surface: Open Recreation	8,097

Note: Acreages were measured using GIS technology and may vary from the official land acquisition records. Acreage varies depending on changes in lake levels, sedimentation and shoreline erosion. Total Water Surface: 8,307 acres - Miles of Shoreline: 95 miles

4.3 PROJECT EASEMENT LANDS

Project Easement Lands are primarily lands on which easement interests were acquired. Fee title was not acquired on these lands, but the easement interests convey to the Federal government certain rights to use and/or restrict the use of the land for specific purposes. Easement lands are typically classified as Operations Easement, Flowage Easement, and/or Conservation Easement. At Canyon Lake, flowage easement lands exist for one primary purpose. A flowage easement, in general, grants to the government the perpetual right to temporarily flood/inundate private land during flood risk management operations and to prohibit activities on the flowage easement that would interfere with flood risk management operations such as placement of fill material or construction of habitable structures. There are 3,620 acres of flowage easements lands at Canyon Lake.

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CHAPTER 5 - RESOURCE PLAN

5.1 MANAGEMENT BY CLASSIFICATION

This chapter describes the management plans for each land use classification within the Master Plan. The classifications that exist at Canyon Lake are Project Operations, High Density Recreation, Environmentally Sensitive Areas, and Multiple Resource Management Lands, which consist of Low Density Recreation and Wildlife Management, and Water Surface. The management plans describe how these project lands will be managed in broad terms. A more descriptive plan for managing these lands can be found in the Canyon Lake OMP.

5.2 PROJECT OPERATIONS

Project Operations is land associated with the dam, spillway, levees, lake office, maintenance facilities, and other areas solely for the operation of the project. There are 333 acres of lands under this classification, all of which are managed by the USACE. These acres include to Canyon Lake Gorge, which are managed in cooperation with GBRA. Section 6.1 gives a description and more detail concerning the Gorge. The management plan for the Project Operations area is to continue providing physical security necessary to ensure sustained operations of the dam and related facilities including restricting public access in hazardous locations near the dam and spillway.

5.3 HIGH DENSITY RECREATION

Canyon Lake has 1,405 acres classified as High Density Recreation. These lands are developed for intensive recreational activities for the visiting public including day use and campgrounds. National USACE policy set forth in ER and EP 1130-2-550, Chapter 16, limits recreation development on USACE lands to those activities that are dependent on a project's natural resources and typically include water-based activities, overnight use, and day use such as marinas, campgrounds, picnic areas, trails, swimming beaches, boat launching ramps and comprehensive resorts. Examples of activities that are not dependent on a project's natural resources include, theme parks or ride-type attractions, sports or concert stadiums, and stand-alone facilities such as restaurants, bars, motels, hotels, and golf courses.

USACE operates and manages numerous areas designated as high density recreation. The following is a description of each park operated by USACE along with a conceptual management plan for parks by classification groups. Groups include Class A (highly developed listed in section 5.3.1) and Class C (basic facilities listed in section 5.3.2). Maps showing existing parks and facilities managed by USACE can be found in Appendix A. In addition to the USACE managed and

operated high density recreation areas, USACE leases seven high density recreation areas that are managed as parks by recreation partners. Section 5.3.3 includes a brief description of these parks and notes the recreational partners who manage them. Table 5.1 summarizes each park and associated amenities.

5.3.1 Class A Parks

In accordance with historical visitation rates and recent outdoor recreation trends documented in the 2012 TORP, camping in both highly developed and primitive settings has declined significantly in Texas since 2000. NSRE surveys documented that in the period 2006-2009 only 21.9% of Texans participated in developed camping and only 9.7% participated in primitive camping. These percentages are down significantly from surveys conducted in 2000-2001. As noted in Chapter 2, visitation rates for some of the Class A parks at Canyon Lake is growing, while at others it is steady or decreasing. Facilities provided are sufficient in some parks, while at others demand exceeds available resources during peak use periods. USACE intends to continue to operate the Class A campgrounds and day use areas by maintaining and improving existing facilities, but has no long range plans to add additional campsites. In response to trends documented in the TORP, USACE will endeavor to improve access to some swim beaches and to develop hiking and biking trails in or adjacent to some park areas as funding permits. USACE encourages partnerships with agencies who lease and manage parks to respond to increasing demands and build on the current quality of USACE parks for present and future visitors.

Potter's Creek Park: Located on the northwest side of Canyon Lake, this 303 acre fee-based camping park includes 132 modern RV sites, seven screened shelters, ten designated tent camping sites and five family sites. Park amenities include one large pavilion, five shower houses with restrooms, a large beach, and boat ramps. A fishing dock is located at the outside boat ramp, but has been damaged by flooding in 2015 and 2016. Repairs are pending as of 2017. Parts of the park are open all year, with closures based on utilization. Some sections are closed in the fall and winter in response to decreased use and to better manage wildlife. According to 2014 data from the National Recreation Reservation System, the campsites in Potters Creek Park have a utilization rate of approximately 50 percent, which is considered moderately high compared to the national USACE average of approximately 29 percent. The utilization rate indicates the percent of days a campsite is occupied compared to the total number of days the site is available for use in any given year. At Potters Creek Park, as at most USACE parks, most of this use occurs on weekends and holidays during the peak recreation season of April thru September.

Canyon Park: Open from 8 a.m. to 10 p.m. daily April - September, this 485-acre fee-based park offers tent camping opportunities as well as a beach where day use is allowed. The park offers a primitive campground with 155 campsites, two overnight shelters, one day use shelter, a boat ramp and courtesy dock, vault toilets, water fountains and over 8 miles of hiking and biking trails. The park does not

include shower facilities, and a number of additional campsites have been abandoned and closed. The swim beach, locally known as Canyon Beach Park, is located on the east side of Canyon Park near the park entrance. This day use only area is open from April through September. Within this area are picnic tables, closable grills, vault toilets, and a water fountain. A fee is assessed for use of this facility.



Photo 5-1 Canyon Park

Cranes Mill Park Located on the southwest shore of Canyon Lake at the end of FM 2673 this 234-acre park is open year round. Facilities include 59 modern RV sites, 5 tent sites, three restrooms, a boat ramp, a boat dock, two fishing piers, a dump station, and water and electricity at most sites. The tent section is closed from October – April due to decreased utilization. Campsite amenities include a covered picnic table, fire ring, closable standing grill, 40-60 foot parking pads, 20, 30, and 50 amp electrical, and water hook-ups. A fee is assessed for use of this facility.

5.3.2 Day Use Parks

The management plan for all the parks listed below is to continue to operate them as day use areas and access points by maintaining and improving existing facilities. Similar to Class A parks, emphasis will be placed on improvements such as upgrading aging water and electrical infrastructure, repairing or replacing outdated restrooms, paving gravel roads in some parks and installing site amenities such as fire rings, lantern posts and cookers. Trails within parks will be considered.

Comal Park: Located on the south shore near Startzville, this 116-acre park is open from 8 a.m. to sunset from April through September. The park features 2 boat ramps, 55 picnic sites, a large swim beach, children's playground, and a restroom at the beach. A fee is assessed for use of this facility.

Guadalupe Park: This 18-acre day use area within the boundaries of Guadalupe Park is free of charge and open daily from sunrise to sunset year round. Located below Canyon Dam along the first mile of the Guadalupe River, the park features an ADA-accessible parking lot and trailway with a fishing pier near the dam and adjacent to the GBRA hydroelectric plan tailrace. A foot trail is available along the right bank of the river, and the river can be accessed from the trails for fishing. The Guadalupe River below Canyon Dam is the southern-most sustainable trout fishery in the nation and is a popular place for trout fishing. TPWD monitors the trout population and releases rainbow trout in the river annually. The park does not have camping, or picnic facilities, and portable restrooms are only available occasionally. The nearest restroom facility is located at the nearby Overlook Park. Comal County has leased a 68-acre portion of Guadalupe Park from USACE for operation of their Comal County Hidden Valley Sports Complex.

North Park: This 51-acre tent camping only facility is open Friday, Saturday and Sunday from April to September and is a popular scuba diving area. Located on the north side of the Canyon Lake Dam on North Park Road, it includes 19 campsites and vault toilets. Each campsite includes a picnic table and a fire ring. Potable water is available but there are no RV hookups, showers or boat ramps at this park. A fee is assessed for use of this facility.

Overlook Park: This free 23-acre day use only park is located at the south end of Canyon Dam near the USACE lake office. The park offers a scenic view of Canyon Lake and Dam. Visitor parking and a restroom are available at the top of the hill. While no camping or picnic facilities are available, visitors are welcome to hike and picnic. The park is open daily all year from 7 a.m. to sunset.

Table 5.1 Canyon Lake Parks and Amenities

	Day Use Area	Camping-Primitive	Camping-Water and Electricity	Group Pavilion(s)	Picnic Facilities	Playground	Swim Beach	Trail(s)	Fishing Dock/Pier	Drinking Fountain	Restrooms-Vault	Restrooms-Flushing	Restrooms w/Showers	RV Dump Station	Boat Ramp	Boat Rental(s)	Marina	Restaurant
Canyon Park	■	■		■				■		■	■				■	■	■	■
Comal Park	■				■	■	■			■		■			■			
Cranes Mill Park			■						■			■	■	■	■	■	■	
Guadalupe Park	■							■										
North Park		■								■	■							
Overlook Park								■				■						
Potters Creek Park			■	■			■		■				■	■	■			
Jacobs Park	Joint Base San Antonio (JBSA) managed facilities																	
Sunny Side Area																		
Hancock Cove Area																		

Managed By: USACE Concessionaire
 Source: OMBIL Visitor Map, 2016

5.3.3 Leased Parks

USACE has eight outgrants issued in the form of permits or leases to recreational partners, referred to as grantees. Each grantee is responsible for the operation and maintenance of their leased area, and although USACE does not provide direct maintenance within any of the leased locations, it may occasionally lend support where appropriate. The USACE reviews requests and ensures compliance with applicable laws and regulations for proposed activities in all leased and USACE-operated HDR areas. USACE works with partners to ensure that recreation areas are managed and operated in accordance with the objectives prescribed in Chapter 3. The following are areas leased to grantees at Canyon Lake:

Joint Base San Antonio Recreation Area: This area, located entirely with Jacobs Creek Park originally included a USACE-operated park and two areas permitted separately to the U.S. Army and U.S Air Force. The area is now three separately permitted areas, all operated by JBSA. Two areas are for military and Department of Defense (DoD) employees only, and a third area is a day use park open for general public use. JBSA operates the public day use area and charges a fee for use. The two areas managed for military members and DoD employees are

open year round and feature 216 total campsites, 41 sites with electrical and water hookups and 175 without electricity and water, 30 group campsites, and 2 group picnic shelters and several cabins. Two marinas offer 130 dry storage slips, 123 wet slips, fishing piers, and boat rentals. It also features four boat ramps, a nature trail, and swim beaches. Table 5.2 summarizes these areas and locations.

Table 5.2 Permitted Parks

Parks	Manager	Access
Jacob's Creek	Joint Base San Antonio	Public
Hancock Cove (Formally: Ft Sam Houston MWR)		Military / DOD
Sunny Side (Formally: Randolph AFB MWR)		Military / DOD

Due to the merger of base operations, Randolph and Ft Sam Houston MWRs are now jointly managed. The parks are for Active Duty, Retired Military and current DOD employees.

Lake Canyon Yacht Club: This 4-acre lease of water surface area is adjacent to JBSA Sunny Side. Originally leased in 1968, it currently occupies 18 acres of land on a bluff overlooking the lake. This is a private recreation lease open to members only.

Canyon Lake Marina: Leased to and operated by Suntex Marina, the Canyon Lake Marina is located on the west side of Canyon Park and provides 450 wet slips, 53 dry storage units, ship stores, fuel docks, a comprehensive service center, boat rentals, and a restaurant. This lease consists of 18 acres of land and 13 acres of water.

Cranes Mill Marina: Also leased and operated by Suntex Marina, the Cranes Mill Marina is located near Cranes Mill Park and features 250 wet slips, dry storage units, ship stores, fuel docks, a comprehensive service center, and boat rentals. This lease consists of 9 acres of land and 5 acres of water.

Comal County Hidden Valley Sports Complex CRRC : Comal County has lease for 68 acres within Guadalupe Park and is referred to as the CRRC. This sports complex has approximately 75 acres that includes a recreation center, nine soccer fields, six baseball fields, two football fields, an outdoor basketball court and softball complex, and a community pavilion.

5.3.4 Comal County Boat Ramps

There are nine boat ramps operated by Comal County and serviced by the Water Oriented Recreational District (WORD). The ramps, listed in Table 2.21, are open 24 hours a day year-round, and are free to the public.

5.3.5 Trails

As stated in the TORP, there is a growing demand for trails of all kinds. Canyon Lake feature three different trails for hiking, biking and equestrian use operated by USACE. Table 5.3 below gives details about these trails.

Hancock Horse Trail:

This multi-purpose trail operated by USACE is 3.5 miles long one way and runs along the north shoreline of Canyon Lake. It is intended for equestrian riding, hiking, and cycling. The trailhead is located at the end of Old Hancock Road just off FM 306 and terminates near a group pavilion at Canyon Park. The trail runs from open plains near the shore to wooded coves along the north shore. Several park style benches are placed near the water's edge. Proof of a "Negative Coggins Test" is required for equestrian use of this trail.

Madrone Trail:

This hiking and cycling trail, operated by USACE, has connecting loops and is over eight miles long round trip. The trailhead parking is located on Canyon Park Road approximately one mile off FM 306. The first two miles of the trail feature the madrone trees, for which the trail is named. With breathtaking vistas, the trail is great for all levels of hiking. The majority of the trail's rocky terrain runs beneath a tree canopy and varies from flat to steep on a few climbs. During the spring wildflowers bloom profusely, and wildlife are abundant according to the season. For mountain bikes, the trail is rated as intermediate to advanced level. Drops, ledges, tight turns, narrow paths, and other natural obstacles make the trail technically challenging to most riders.

Guadalupe River Trail: This trail is a 0.9 mile long trail. The trailhead is located at the base of Canyon Dam at the far end of the southern-most parking area. The trailhead is located at the base of Canyon Dam at the far end of the southernmost parking area. The trail features a scenic walk along the bald cypress-lined banks of the Guadalupe River. Many of the trees along this trail are thought to be over 100 years old.

Table 5.3 USACE Trails at Canyon Lake

Trail Name	Handicap Accessible	Trail Type			Location	Trail Length (miles)	
		Hike	Bike	Horse		One Way	Round Trip
Madrone Trail	NO	YES	YES	NO	Canyon Park	N/A	8+
Hancock Trail	NO	YES	YES	YES	Old Hancock Road	3.5	7
Guadalupe Trail	NO	YES	NO	NO	Guadalupe Park at Base of Dam	0.9	1.8

*Distance of each trail is approximate.

*Madrone Trail distance is the full length of the trail since you start and finish at the trail head. All other trails have separate start and end locations unless you do a round trip.

5.4 MITIGATION

This classification is used for lands that were acquired specifically for the purpose of offsetting losses associated with development of the project. There are no acres at Canyon Lake under this classification.

5.5 ENVIRONMENTALLY SENSITIVE AREAS

ESA's are areas where scientific, ecological, cultural or aesthetic features have been identified. Designation of these lands is not limited to just lands that are otherwise protected by laws such as the Endangered Species Act, the National Historic Preservation Act or applicable state statues. These areas must be managed 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 and management. These areas are typically distinct parcels located within another, and perhaps larger, land classification, area. There are 430 acres at Canyon Lake under this classification. The acreages in these areas are designated as critical habitat for the endangered GCWA, unique view-sheds and scenic qualities of the area, such as the scenic cliffs.

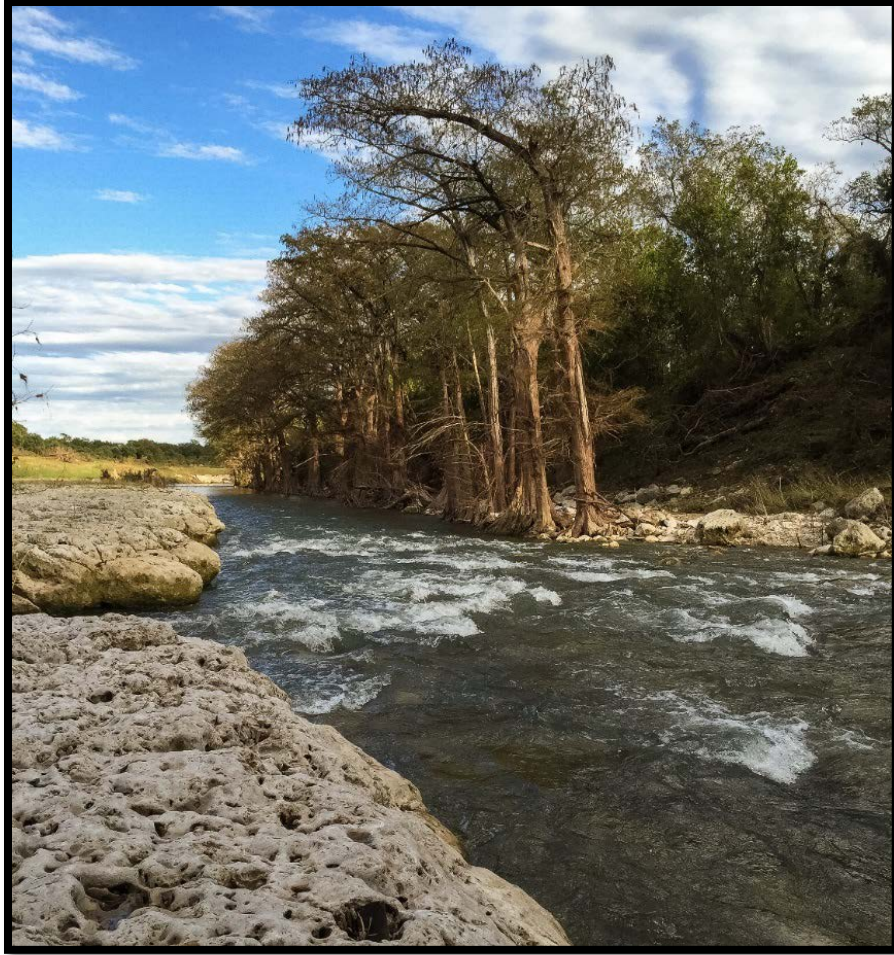


Photo 5-2 Upstream Cypress

5.6 MULTIPLE RESOURCE MANAGEMENT LANDS

Multiple Resource Management Lands are organized into four sub-classifications. These sub-classifications are Low Density Recreation, Wildlife Management, Vegetative Management, and Future/Inactive Recreation Areas. The following is a description of each sub-classification's resource objectives, acreages, and description of use.

- 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. The general public may use these lands for bank fishing, hiking, and for access to the shoreline. Hunting is strictly limited to controlled hunts in park areas. Future uses may include additional designated natural surface hike/bike/equestrian trails. There are 1,097 acres zoned Low Density Recreation under this classification.

- Wildlife Management. These are lands designated for the stewardship of fish and wildlife resources and are managed by USACE. There are currently no acres of land under this classification at Canyon Lake, however, areas of low density recreation, ESA's and vegetative management all support wildlife. Management efforts focus on producing native wildlife food and habitat.

There is at least one federally-listed endangered species that could utilize habitat within the Canyon Lake area. Therefore, any work conducted on this project will be in accordance to the Endangered Species Act and will be appropriately coordinated with the USFWS. The species of focus within this area of consideration are animals listed as a threatened or endangered species under the Endangered Species Act. These species (Table 2.6) will continue to receive attention to ensure they are managed in accordance to their habitat needs.

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

- Vegetative Management. These are lands that have vegetative types considered to be sensitive and needing special classification to ensure success. A good example of these types of vegetation would be forested wetlands and Cross Timber forests. There are no acres currently identified at Canyon Lake for vegetative management purposes.
- Future/Inactive Recreation Areas. These are areas with site characteristics compatible with potential future recreational development or recreation are that are closed. Until there is an opportunity to develop or reopen these areas, they will be managed for multiple resources. There are no acres classified under this sub-classification at Canyon Lake.

5.7 WATER SURFACE

At conservation pool level of 909.0 NGVD there are 8,306 acres of surface water. Buoys are managed by USACE with close coordination with the TPWD. These buoys help mark hazards, swim beaches, boats keep-out and no-wake areas.

- Restricted. Restricted areas are around swim beaches as well as the dam for project operations, safety, and security purposes. Water surface zoned as restricted total approximately 31 acres.
- Designated No-wake. No-wake areas are located near boat launch areas for the safety of launching and loading boat or personal watercraft. During formulation of this Plan, public comment indicated a desire for establishment of passive use boating areas in the form of paddle trails or no-wake areas where paddle boats would not have to compete with motorized watercraft. USACE is open to this concept and will work with interested parties to fulfill this need. Currently, approximately 178 total acres of Canyon Lake is designated for no-wake.
- Fish and Wildlife Sanctuary. These areas are managed with annual or seasonal restrictions to protect fish and wildlife species during periods of migration, resting, feeding, nesting, and/or spawning. There are no water surface acres under this classification at Canyon Lake.
- Open Recreation. The remaining lake area not in the above classifications is open to recreational use. No specific zoning exists for these areas, but there is a buoy system in place to help aid in public safety. 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. Approximately 8,097 total acres of Canyon Lake is zoned for open recreation.

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CHAPTER 6 - SPECIAL TOPICS/ISSUES/CONSIDERATIONS

6.1 CANYON LAKE GORGE

The Canyon Lake Gorge was created in July of 2002 when for the first time in the history of the reservoir, floodwaters flowed through the emergency spillway. The upper part of the Guadalupe River Watershed officially received 34 inches of rain in approximately one week. At the peak flow the water was moving at about 67,000 cfs and was approximately seven feet above the Spillway. Normal flow from the reservoir is 350 cfs with a maximum release of 5000 cfs. For six weeks, the water flowed over the spillway carving out a gorge that is one mile long, 130 to 200 feet wide, and up to 50 feet deep out of the 100 million year limestone. Material carved out of the gorge included rocks, trees, logs, soil and other flood debris that piled up in the Guadalupe River and created a huge blockage that took considerable time and expense to remove. While the dam performed its primary function and prevented an estimated \$38.6 million in damages downstream during the event, flooding continued from the dam to the Gulf Coast and the floodwaters were still responsible for significant damage.

The Canyon Lake Gorge formation has provided a unique opportunity for education and research. Dramatic vistas were created, dinosaur tracks were exposed, seeps, springs and waterfalls were created, layers of geologic time can be seen, and scientist are able to learn more about water and geological formations. Tours of the gorge are available through the Gorge Preservation Society for a fee, and scientific research continues to evolve at the site. Currently, GBRA has a lease from USACE to manage the 64-acre Canyon Lake Gorge site and partners with the local private citizen to promote and conserve the gorge. GBRA and partners have plans to construct a rim trail to overlook the gorge.



Photo 6-1 Canyon Lake Gorge (USACE Photo)

6.2 SHORELINE MANAGEMENT POLICY

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 Canyon Lake, 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 Canyon Lake.

In FY 2012, an administrative update to the Canyon Lake Shoreline Management Policy was prepared to incorporate current terminology and to ensure compliance and compatibility with the most current versions of ER 1130-2-406 and ER 1130-2-540, as well as Fort Worth District policy decisions related to shoreline management. One of the primary reasons for the administrative update was to incorporate language that supports the USACE natural resources mission statement to “manage and conserve natural resources consistent with ecosystem management principles” as set forth in ER 1130-2-540.

The purpose of the SMPS is to set forth the policy and procedures by which USACE manages certain private uses of public lands at Canyon Lake. Private uses that accrue exclusive benefits to an individual are not allowed at Canyon Lake. 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 Canyon Lake, please contact the lake office.

6.3 RECREATIONAL BOATING STUDY

In 2002, the Fort Worth District adopted a policy governing water-related recreation development that has the potential to affect the degree of boating traffic on the water surface of all Fort Worth District lakes. In brief terms, the policy established a target capacity of 22 surface acres of boatable water surface for each vessel on the water during peak use periods. Using the number of boat ramp parking spaces, wet storage slips and dry stacked storage slips as a basis for calculating potential boating activity, USACE can determine whether any proposed additions of parking spaces or storage slips has the potential to exceed the target capacity. USACE has determined that the number of existing parking spaces and slips at Canyon Lake as of the date of this Plan has the potential to exceed the target capacity and may have already exceeded the target. In view of this potential, USACE would require a comprehensive water-related recreation use study prior to making a decision to approve or deny a proposal for additional slips or boat ramp parking spaces at Canyon Lake. The policy allows limited flexibility in decision-making. Adequate funding to conduct a Recreational Boating Study at the same time as the Master Plan revision was not available.

6.4 ENDANGERED SPECIES

Amateur birders have reported seeing GCWA's in Overlook Park and North Park. Habitat suitable for GCWA is prevalent in the region. Canyon Park also has suitable habitat, but a presence/absence study completed in May 2017 found no evidence of the GCWA. However, any future development of high-density recreation will need to include a full GCWA study to ensure that no GCWA's are present and/or using the area for nesting. Until that time, the lake staff will continue to monitor for the GCWA and take necessary actions to protect the birds when found.



Photo 6-2 Golden-cheeked Warbler. Courtesy, USFWS

While GCWA have not been found at Canyon Park, they have been sighted higher up along the cliffs adjacent to the gorge. This area, which is managed by GBRA, is under the land classification of Project Operations. Figure 6.1 shows the location of the sightings from spring 2014.



Figure 6.1 GCWA Sightings at Canyon Lake Gorge, spring 2014

6.5 INVASIVE SPECIES

The extent of invasive species currently documented as present at Canyon Lake lands and waters is presented in Table 2.8. While efforts are made to prevent and eradicate invasive species from the lands and waters at Canyon Lake, special attention is given to particularly destructive species, including the zebra mussel (*Dreissena Polymorpha*). Population levels of zebra mussels at several Texas lakes have quickly risen to levels that are impacting raw water intakes for water supply and internal piping. At present these impacts are mainly in the form of increased maintenance costs due to having to remove the mussels. The Zebra mussel is roughly 1.5 inches long and is characterized by an alternating light and dark striped pattern resembling zebra stripes on two connected hard shells. As of June 2017, zebra mussels were positively documented in Canyon Lake. Precautions are being taken and educational and warning signs are posted at the lake and affiliated websites. Currently, USACE is working with TPWD to help educate the public at Canyon Lake, including creating a series of informational YouTube videos for

boaters, hunters, and anglers. Management plans will be formulated in the coming months to address zebra mussels at Canyon Lake.

Terrestrial invasive species at Canyon Lake include the Chinese tallow tree (*Triadica sebifera*), Chinaberry tree (*Melia azedarach*), willow baccharis (*Baccharis salicina*) and castor beans (*Ricinus communis*). The Chinese tallow tree is a deciduous species with a 12" to 18" crooked trunk and a height of 50 feet at maturity. The USDA first introduced it to the Gulf coast in the 1900's to develop a soap-making industry from the seeds. Eradication of the tree is difficult due to its fast growth and ability to adapt to all soils. The species causes large-scale ecosystem modification by replacing native vegetation thereby reducing native species diversity that, in turn, has a negative effect on wildlife. Additionally, the plant is toxic to humans and cattle and can cause dermatitis on contact.

The Chinaberry tree is a very drought tolerant tree native to Asia that grows extremely fast (5-10 feet each year) and has very few diseases allowing it to out-compete native species. While it has brilliant yellow fall foliage and lavender spring flowers, the berries, bark, leaves and flowers produced by the tree are all toxic to livestock, humans and pets. The plant was originally introduced for its ability to thrive in poor conditions, and its berries were used to make soap, and extracts from the tree have been used as natural pesticides. Seeds are spread by birds, and the plant spreads by root sprouts, thus forming a dense thicket.

Willow baccharis is a weedy, noxious, perennial shrub that grows between three to nine feet. The plant prefers wet sites along rivers, streams and lakes but has begun spreading into the upland sites, tolerating saline soils. Originally used to control erosion, it is a prolific seed producer, reproducing by seed and rhizomes, rapidly spreading and invading mesic sites. While native, it is toxic and aggressively invades in disturbed areas. It can be controlled with some herbicides.

Castor beans is an invasive plant at Canyon Lake. The plant can reach up to nine feet tall and has stems that are purplish and highly branched, with large palmate leaves. Castor beans are evergreen in frost-free areas and are very fast growing. Stands of castor beans displace native vegetation, exhausts the soil of nutrients, and the seeds produce the toxic substance ricin. Additionally, it has been found to cause allergic asthma. Control of this plant is via herbicides and pulling of seedlings. Fire is discouraged, as it most likely causes further invasion.

Canyon Lake also is invaded by the armored catfish (*Hypotomus plecostomus*), an algivorous, mostly nocturnal fish that ranges from 3 inches to over three feet in length. Originally introduced to control algae, it is unclear how effective they actually are for this intended purpose. The fish is resilient due to a combination of successful breeding strategies, the ability to adapt to a wide range of ecological conditions, and the fact that it can gulp air and survive out of water for more than 30 hours. With overabundance of these fish in freshwater ecosystems, local indigenous

species can be out-competed and reduced. This could lead to a collapse of freshwater fisheries.

6.6 GBRA HYDROPOWER AND WATER RIGHTS

The GBRA is the local agency with rights to the water in the conservation pool of the lake. The GBRA entered into a Conservation Storage Agreement with the United States of America on 20 September 1957, to utilize all storage between elevation 800.0 NGVD and elevation 909.0 NGVD, based on the vertical datum of 1929. For this right, GBRA paid 42.9% of the Total Project Investment Cost, and also agreed to pay 34.8% of all annual Joint Use Operation and Maintenance Costs. Under its permit with TCEQ, GBRA has the right to store water in the conservation pool portion of the reservoir for water supply purposes and to deliver that water to customers.

Hydroelectric Power. GBRA operates several small hydroelectric plants downstream from New Braunfels in addition to the hydropower plant near the downstream toe of the dam at Canyon Lake. The plant, located along the north side of the Guadalupe River near the fishing pier at Guadalupe Park, is equipped with two 3-megawatt generators, each capable of using available river flows between 90 and 300 cubic feet per second (cfs) and operates through a license from the Federal Energy Regulatory Commission, with permits from TCEQ and the USACE. The plant can be remotely operated from Seguin with microwave communication equipment, and generates 25 million kilowatt hours (KWh) of electricity annually.

Water and Wastewater Treatment. GBRA manages water rights and operates water and wastewater treatment plants as well as a regional laboratory. It was originally established to develop, conserve, and protect the water resources of the Guadalupe River basin and make them available for beneficial use.

6.7 PERMANENT CONSERVATION POOL RISE

Over the past 15 years, the GBRA has annually requested and been granted a variance in Operation of Canyon Reservoir to allow water stored between elevation 909.0 and 910.0 NGVD be utilized to augment downstream flows for purposes of summer recreational activities from May and October. Depending on the availability of water stored between 909.0 and 910.0 NGVD, this water could be used to support summer river flows during times of drought. As mentioned previously, in 2016, USACE determined that they would no longer continue to grant this annual variance.

Recent public comment has focused on a permanent pool rise of two feet at Canyon Lake to augment downstream flows for purposes of summer recreational activities. Information in a USACE 2016 White Paper provides an overview of the processes, procedures, timeline, and cost associated with the potential creation of a permanent storage pool for Canyon Lake, for all storage located between elevation

909 and 911 NGVD. This equates to approximately 16,800 ac-ft. of storage. Any permanent pool rise would require a multi-stepped process that would include local sponsorship, congressional authorization, approximately ten or more years for processing and a reallocation study, and multi-million dollar budgeting. Currently, a permanent pool rise is not being considered at Canyon Lake.

6.8 RECREATION DOWNSTREAM OF CANYON DAM

The Guadalupe River downstream of Canyon Dam to New Braunfels is a popular recreation area, which is affected by releases from Canyon Lake. During the summer months, tubing on the Guadalupe River is a very important recreational activity and economic driver for the area. Tubing and other forms of water recreation have an estimated impact of approximately \$450 million per year for the City of New Braunfels. During the winter, trout fishing alone has an approximate \$1.9 million economic impact. The Guadalupe River Chapter of Trout Unlimited is the largest chapter in the nation with over 5,000 members. Releases from the lake sustain the trout fishery. While the primary mission of the Canyon Lake project is flood risk management, recreation considerations are important.

CHAPTER 7 - PUBLIC AND AGENCY COORDINATION

7.1 PUBLIC AND AGENCY COORDINATION OVERVIEW

The USACE is dedicated to serving the public interests in support of the overall development of land uses related to land management for cultural, natural, and recreational resources of Canyon Lake. An integral part of this effort is gathering public comment and engaging stakeholders in the process of planning. USACE policy guidance in ER and EP 1130-2-550 requires thorough public involvement and agency coordination throughout the master plan revision process including any associated NEPA process. Public involvement is especially important at Canyon Lake to ensure that future management actions are both environmentally sustainable and responsive to public outdoor recreation needs in a region, which is experiencing rapid population growth. The following milestones provide a brief look at the overall process of revising the Canyon Lake Master Plan.

The USACE began planning to revise the Canyon Lake Master Plan in September 2015. The objectives for the master plan revision were to (1) update land classifications to reflect changes in USACE land management policies since 1970 and (2) update the Master Plan to reflect new agency requirements for master plan documents in accordance with ER 1130-2-550, Change 7, January 30, 2013 and EP 1130-2-550, Change 5, January 30, 2013.

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. The public scoping meeting was held on 18 March 2016 at the CRRC, 125 Mabel Jones Dr., Canyon Lake, TX 78133. The Fort Worth District placed advertisements on the USACE webpage, social media and print publications two weeks prior to the public scoping meeting.

USACE employees hosted the workshop, which was conducted in an open format. Participants were asked to sign in at a table where staff provided the participants with information regarding the structure of the scoping meeting and comment forms. After signing in, participants were directed to be seated in the auditorium and a PowerPoint presentation was presented by the Project Manager for the Master Plan Revision Project Delivery Team (PDT) to convey information about the following topics:

- Public Involvement Process
- Project Overview
- Overview of the NEPA process
- Master Plan and current land classifications

- How to Submit Comments

At the conclusion of the presentation USACE representatives were available to answer questions and receive written comments at information tables. 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 at a later date
- Submitting a comment using electronic mail
- Submitting a comment and mailing it in on letterhead or choice of paper

In total, approximately 36 individuals, not including USACE personnel, attended the March 18 public scoping meeting for interest groups, partner agencies, other government agencies, and businesses. Among the attendees were representatives from the TPWD, GBRA, Water Oriented Recreational District of Comal County (WORD), and Comal County. A total of 346 comments were received following this public scoping meeting. Many of the comments received did not relate to the master plan, such as issues of shoreline management (i.e. water access and pollution) or water control and water quality (i.e. water levels and water quality monitoring). While these comments and concerns are very important, they are not within the purview of a master plan. Additionally, many of the comments focused on issues of private exclusive use, special consideration of local residents, and concerns outside the control of USACE, such as signage along roads. Much like national forests or parks, Canyon Lake is a Federally-owned and managed public property. It is USACE goal to be a good neighbor as well as steward of public interest as it concerns Canyon Lake. As such, USACE is bound to the equal enforcement of policies and fees for this publically held national assets. Table 7.1 below gives a summary list of the comments during the initial scoping comment period for the master plan, followed by the USACE response.

Table 7.1 Public Comments from March 18, 2016 Public Scoping Meeting

COMMENT	USACE RESPONSE
Accessibility: <i>10 comments</i> : more barrier-free amenities throughout the parks, fishing areas, seating areas, and trails at Canyon Lake	Future management of high density recreation areas includes upgrades of existing day use and camping facilities as well as new or expanded trails. As funds are available for these upgrades, universal access will be incorporated where needed.
Boat Ramps: <i>25 comments</i> : extend boat ramps for low water access, keep ramps open all the time, improved maintenance of boat ramps and access	USACE will endeavor to improve conditions at existing boat ramps operated by USACE and others, including making key ramps more

COMMENT	USACE RESPONSE
<p>roads, parking at ramps are too crowded and dangerous, increase number of boat ramps, prohibit overnight parking at boat ramps</p>	<p>useable during low lake levels but boat ramp access is linked to boating capacity. Funding from TPWD's Boating Access Grant Program may be available for this purpose. USACE will also endeavor to prevent unauthorized overnight parking at boat ramps. New or additional ramps will not be considered until a Recreation Boating Study is conducted to determine the boating capacity of the lake. Past vessel counts, and USACE knowledge of crowded conditions, indicates that boating use at Canyon Lake may have exceeded a reasonable level and has certainly exceeding the Fort Worth District target capacity of 22 surface acres of water per boat on peak use days.</p>
<p>Boating: <i>9 comments</i>: continue to support eco-friendly water sports like sailing, limit number of motorized watercraft, set limit of number of boats on the water, concern for summer congestion on the lake, concern for changes to boating capacity by the Yacht Club Regatta</p>	<p>The Fort Worth District target boating capacity for all district lakes is 22 surface acres per boat during peak use periods. The boating use at Canyon Lake almost certainly exceeds this target capacity, but at the time this Plan was written, no funding was available for a comprehensive boating capacity study. The topic is one of great importance that USACE will continue to pursue as a matter of public safety. Pending completion of a comprehensive study, no increase or decrease of existing slips or parking spaces is anticipated. USACE is aware of the recreational trend of increased passive use boating by canoe and kayak enthusiasts and is open to the establishment of paddle trails in appropriate areas.</p>
<p>Communication: <i>10 comments</i>: more communication with local residents, more local input into lake operations, better publications about public amenities, rules for trails, and wildlife that exist at lake</p>	<p>The Lake office attempts to communicate in a number of different ways with both residents and visitors alike. The USACE Canyon Lake website contains information, including maps, rules, history, and natural resources for the project. Kiosks exist</p>

COMMENT	USACE RESPONSE
	throughout the project with information concerning the area and safety. In spite of these efforts, communication could be better and USACE would like to work with area stakeholders including but not limited to WORD, Comal County and GBRA to set up regular information exchange meetings
Courtesy Docks: <i>7 comments</i> : likes lake to stay a “no free floating dock” lake, would like additional docking facilities at boat ramps, docks at boat ramps in need of maintenance and repair	National USACE policy prohibits private floating facilities at Canyon Lake. Courtesy docks at public boat ramps are extremely popular but are frequently damaged due to lake level fluctuation and cannot be placed in locations exposed to high wind and wave action. As funds are available, repairs of existing courtesy docks and ramps are made based on public need. .
Education: <i>4 comments</i> : would like to see educational opportunities around the hydroelectric plant, increase education on boating, invasive species, and preservation	USACE partner, GBRA, has plans to build an environmental learning center at Canyon Lake near the Gorge in the near future. This center will provide an excellent venue for the type of educational opportunities requested. Information about the center can be found on GBRA’s website. Chapter 6 of this plan gives more detail concerning the Gorge. USACE is active in providing education resources related to safe boating, invasive species management, and environmental stewardship.
Encroachment: <i>1 comment</i> : keep Hancock Trail clean and free of encroachers where the trail crosses onto Civic Club property.	USACE relies on volunteers and trail user groups to maintain the Hancock Trail and will endeavor to keep the trail clean. Current funding and personnel levels prohibit contractual cleaning and maintenance of this trail section. USACE will meet with the Civic Club to reevaluate the routing of Hancock Trail to remove it from private property.
Enforcement: <i>16 comments</i> : enforce speed limits and wake control and increase law enforcement on the water, enforce parking during community events held outside lake property,	On-the-water law enforcement is conducted primarily by Comal County Sheriff’s Office and TPWD game wardens. Water patrols and enforcement of Title 36 is also

COMMENT	USACE RESPONSE
prohibit the use of drones, create a watch group for crime and trash offenders	conducted by USACE park rangers. Parking along county roads and parking on private property is not regulated by USACE. Activities outside USACE properties cannot be regulated by USACE. Further, the Federal Aviation Administration (FAA) regulates drones, and USACE Headquarters (HQ) is currently drafting a drone policy for both public and USACE operation of drones.
Fishing: <i>11 comments</i> : construct shoreline piers for fishing and increase access for the general public, add more fish attractors, introduce native plantings to support fishery, stock more fish, maintain angling access, continue enhancing fish habitat, develop park at lower gorge for anglers	Fishing piers are very popular but require very specific locations taking into account lake fluctuation, water depth and exposure to wave action. USACE will examine the shoreline for suitable locations where such facilities can be maintained at minimal cost.
Funding: <i>3 comment</i> : are we paying enough taxes to support the infrastructure now and in the future, all government run projects are wasteful, can the USACE accept grant money to get the parks open more quickly	Operation and maintenance costs to repair facilities have increased while funding has been reduced. The opportunity exists for other government agencies or groups to lease and operate current parks on USACE projects. Volunteer assistance and contributions will be reviewed on an individual basis to determine if they meet USACE guidance. In general, the acceptance of any contribution must not materially increase annual operation and maintenance expenditures. Currently, volunteers assist with debris clean-up, however, due to liability issues, USACE ability to accept volunteer work is limited
Lake Level: <i>14 comments</i> : improve water release and water flows, limit downstream release rates, don't let GBRA sell all the water, stabilize lake level for boating, increase conservation pool, be proactive in preparing for drought	Release rates, lake levels and water allocation are not covered by the master plan update. Water management issues and concerns are covered in the Canyon Lake Water Management Plan. The topic of water management and water rights is addressed in the master plan, but only for informational purposes.

COMMENT	USACE RESPONSE
<p>Local Economy: <i>13 comments</i>: develop Canyon Lake as a destination, eliminate mobile homes, no large developments, build diversity and quality of businesses, improved business processes to work with local businesses, focus more on economic development and less on water supply and flood control at Canyon Lake</p>	<p>Canyon Lake is authorized primarily as a flood risk management and water conservation project as its primary missions. As a good neighbor USACE is concerned for the local economy, however it is not within the mission nor the control of USACE to regulate economic development. The presence of the lake has obviously been a major economic driver in terms of residential development around the lake and tourism.</p>
<p>Marinas: <i>4 comments</i>: stop commercial marina monopolization, allow expansion of commercial marinas to increase slip numbers, allow the Lake Canyon Yacht Club (LCYC) to increase wet slips, increase marina’s areas to accommodate more boat storage or add an additional marina</p>	<p>Pending completion of a comprehensive recreational boating study, no increase or decrease of existing slips or parking spaces at boat ramps is anticipated. As explained in the response to comments about needing more boat ramps, past vessel counts, and USACE knowledge of crowded conditions, indicates that boating use at Canyon Lake may have exceeded a reasonable level and has certainly exceeding the Fort Worth District target capacity of 22 surface acres of water per boat on peak use. Only through a comprehensive study can a reasonable boating capacity be determined for Canyon Lake. The need for the study is discussed in Chapter 6 of the Master Plan.</p>
<p>Natural Habitat: <i>6 comments</i>: keep the lake in its natural state, preserve sensitive areas, remove all juniper trees, keep “nature preserves” adjacent to USACE parks and not adjacent to private property</p>	<p>Stated objectives in Chapter 3 of the Master Plan call for managing project lands to ensure preservation and conservation of natural habitat and open space as a primary objective in order to maintain public open space. Ecosystem management principles call for the encouragement of native species and the control of exotic species and aggressive native species such as Ashe juniper. Limited vegetation modification by adjacent landowners may be allowed by written permit in accordance with the Canyon Lake Shoreline Management Policy Statement.</p>

COMMENT	USACE RESPONSE
<p>Parking: <i>7 comments</i>: increase parking areas around boat ramps and parks, make designated parking, increase parking for boating, pave all areas at ramps where cars are parking on grass and rocks, consider parking permits or collection of fees at public use areas</p>	<p>Parking areas are related to carrying capacity of developed recreational areas. See earlier responses about boat ramps and marina expansion. Parking on county right of ways is regulated and enforced by the county and not by USACE. USACE has authority to charge a nominal fee at boat ramps and will consider charging a fee where the cost of collection is economically justified.</p>
<p>Parks: <i>50 comments</i>: keep parks open year round, provide annual pass for all day use parks, increase maintenance of all parks, add more benches, give local residents free access to parks, increase trail systems, want pool and playground on the north east side, create a dog park, add play areas and free parks for kids, more recreational areas accessible to the public who don't boat, expand public space in parks and trails, increase use fees to improve facilities and services, create a skateboard area, open parks for residents to use for wading, biking, and swimming, open camping areas to day users, repair and upgrade RV parks, allow RV reservations; make North Park a place for SCUBA Diving</p>	<p>While it would be desirable to keep parks open year round, they are currently operated seasonally due to the limited usage from October to March compared to their operating expenses. Operation and maintenance costs to repair existing facilities have increased while funding has been reduced. The opportunity exists for other government agencies or groups to lease and operate current parks on USACE projects. The inclusion of playgrounds, dog parks and more trails might be feasible in the future based on funding and increased operations personnel. Amenities such as pools and skate parks would be feasible within a comprehensive resort. <i>America the Beautiful</i> passes and USACE annual day use passes are available for use in camping parks and day use areas. SCUBA divers frequently use North Park. USACE is committed to helping facilitate this user group activities in the future.</p>
<p>Partnerships: <i>6 comments</i>: allow other entity to operate parks/RV/Marinas, allow private businesses to operate on the water, partner with other agencies to do fund raisers, work with scouting etc. to promote outdoor activities and education opportunities.</p>	<p>The opportunity exists for other government agencies or entities to lease and operate current parks on USACE projects. It is also possible for commercial entities to lease and operate park areas within the USACE guidelines for such leases. USACE intends to continue the current robust volunteer program and cooperation with</p>

COMMENT	USACE RESPONSE
	scout troops and other entities on service projects.
Pollution: 24 comments: reduce and/or remove billboards, control light pollution, reduce noise from visitors and boats to Canyon Lake and from concerts held off site; reduce lake odor; enforce outdoor burn ban, concern for uncleaned discharge into waterways	USACE is sensitive to light and noise pollution and can take steps to correct these problems in USACE operated recreational areas and in areas where security is a priority. A proper and effective exhaust muffler is required on vehicles and vessels, and excessive noise is prohibited in campgrounds between the hours of 10:00 pm and 6:00 am. Additionally, TPWD can enforce noise from vessels exhaust systems. Other noise, such as loud music on the water, is an issue that is enforceable under county and state law with respect to disturbance of the peace. County burn bans are enforceable by USACE if posted appropriately on Federal lands and by Comal County in locations off of Federal lands. Problems associated with off-site concerts, and water pollution are enforceable by Comal County.
Private Exclusive Use: 18 comments: give free access to parks for resident of Comal County and Canyon Lake; ensure that adjacent landowners be allowed to access the lake via private docks and swimming and fishing areas, create parks for residents only, allow access to boat ramps near subdivision to residents only, restrict boat ramp traffic in neighborhood, boat traffic could be limited to area residents during peak times	As a federal property, USACE managed parks are operated for the public at large with no discrimination against any user group. USACE policy allows for leasing of existing parks. If leased by a government entity, differential fees may be charged for residents versus non-residents, but the leased area must remain open to the public at large. USACE does not allow leases for private exclusive use by any individual or group.
Real Estate: 5 comments: keep heavy equipment from clearing USACE land, manage thick vegetation along boundary line, turn ownership/operations over to the State of Texas, install a big fence along dam for protection and keep people off slope	Vegetation management along the boundary line by adjacent landowners is addressed in the Shoreline Management Policy and is not part of the master plan. If an adjacent landowner is granted a written vegetation modification permit, they are not allowed to use heavy equipment.

COMMENT	USACE RESPONSE
	Interested landowners should contact the USACE lake office for more information. Leasing land to the State of Texas is possible for park and recreation or wildlife management purposes. Dam safety and security issues are not addressed in the master plan, but are addressed in the Project Security Plan.
Shoreline Management: <i>10 comments</i> : allow private boat docks and the ability to launch small watercraft from lakes edge by adjacent owners, use drones to inspect USACE boundaries, keep shoreline pristine and no allow docks or lifts, increase access for bank fishing, swimming, wildlife viewing, etc	National USACE policy prohibits private floating facilities on Canyon Lake. Vegetation management and other shoreline issues are addressed in the Shoreline Management Policy Statement and are not part of the master plan. USACE is open to proposals to facilitate canoe and kayak launching in areas where the facility is open to the public at large. In accordance with earlier responses on boat ramps and boating, no additional boat ramps for motorized vessels will be considered pending a comprehensive Recreational Boating Study. Anyone can launch a kayak or canoe from the shoreline, as long as no motorized vehicle is used to transport it across USACE property. USACE HQ is currently drafting a policy for drones. Management objectives stated in Chapter 3 of the Master Plan call for managing project lands to ensure preservation and conservation of natural habitat and open space as a primary objective in order to maintain public open space. USACE is open to proposals that provide increased public access for wildlife viewing and bank fishing. Swimming as allowed on most shoreline areas, but designated swimming beaches must meet specific criteria.
Signage: <i>9 comments</i> : clearer signage warning swimmers at boat ramps, more signage for rules, regulations, and lake	Signage is addressed in the USACE Sign Program Manual and is not part of the Master Plan. However, USACE will

COMMENT	USACE RESPONSE
<p>information ramps; entrance sign with neat landscaping, signage for the dangers of impaired boating, better wayfinding signage, signs showing trees underwater</p>	<p>consider actions needed to improve the aesthetics of park entrance signs. USACE does work with volunteer groups to place “wayfinding” signage on large lakes with complex shorelines. Canyon Lake is comparatively small and USACE does not consider “wayfinding” signage to be needed. USACE does manage the navigation buoys on Canyon Lake but does not attempt to mark every possible hazard due to fluctuations in lake levels. However, USACE encourages anyone to report a known navigational hazard to determine if marking the hazard is feasible.</p>
<p>Swimming: <i>6 comments</i>: allow free access at swim beaches, more public swimming areas</p>	<p>USACE regulations require fees to be collected at developed, designated beaches. <i>America the Beautiful</i> passes and USACE annual day use passes are available for use in USACE-managed camping parks and day use areas. Public beaches are currently provided in Comal Park and Canyon Beach from April - September. Due to natural, steep topography and a relatively limited amount of Federal land, the planning team does not consider new or expanded beaches as being needed or possible at Canyon Lake. Swimming is allowed in all water surface areas classified for “Open Recreation”, but only designated swimming beaches are required to meet certain criteria.</p>
<p>Traffic: <i>15 comments</i>: area has too much traffic, make 360 a four-lane road, install lights at intersections and marina, better maintenance of roads, no heavy trucks on side roads</p>	<p>Comal County and TXDOT are responsible for the roads off USACE project property. These issues are not part of the master plan.</p>
<p>Trails: <i>16 comments</i>: facilitate bike lanes on roads, build hiking trails, construct multi-use trails around the lake, improve mountain bicycling opportunities, improve walking pathway from Overlook parking to the lake shore</p>	<p>USACE currently collaborates with scout groups and other entities on service projects to enhance existing trails. Chapters 3 and 5 of the Master Plan state that new trails and expansion of existing trails will be considered.</p>

COMMENT	USACE RESPONSE
<p>Trash: <i>22 comments</i>: increase number and quality of trash receptacles throughout property, especially at boat ramps and on trails, mow parks and remove trash, organize a community cleanup for trash, need more flexible volunteer system for cleanup</p>	<p>These issues are not part of the master plan. However, service levels are based on available funding and staff. Priority for trash removal and mowing is focused on developed parks. In non-park areas USACE collaborates with scout groups and other entities on service projects to address trash and litter. A lake-wide lakeshore cleanup is an excellent idea and USACE is open to proposals by volunteer organizations to implement a lakeshore cleanup.</p>
<p>Utilities: <i>6 comments</i>: add water fountains and electrical service at boat ramps and along trails, put utilities underground and add street lighting, end septic tanks and create a central treatment system</p>	<p>Potable water is typically provided only in high use campgrounds and day use areas, but not at boat ramps or on trails. Electrical service at boat ramps is typically limited to security lighting. Utilities in park areas are placed underground and security lighting is installed as needed. USACE works closely with Comal County to ensure that septic tank installations proposed for placement on flowage easement lands or within public use areas on USACE lands are safe and effective. A regional wastewater treatment system is beyond the scope of the Master Plan.</p>
<p>Water Quality: <i>3 comments</i>: need to monitor water quality in aquifer, need more information on water quality, maintain natural health of the water</p>	<p>Comal County, TCEQ and the Edwards Aquifer Authority are the regulating entities for these issues and not USACE.</p>
<p>Water Surface: <i>8 comments</i>: zone water surface to create safe zones for citizens; send dive teams out to remove hazards, better marking with buoys, control no-wake zones, establish fishing only areas, restrict some areas to “non-motorized” watercraft use</p>	<p>The master plan identifies no-wake and restricted areas on the water. Restricted areas are normally related to the operation of the dam, spillway and designated swimming beaches. Enforcement of no wake zones and restricted areas is conducted by Comal County Sheriff’s Office, USACE and TPWD game wardens. Marking navigation hazards is generally not feasible due to lake level fluctuations, but USACE encourages all boaters to report known navigation hazards. Designation of areas for “non-</p>

COMMENT	USACE RESPONSE
	<p>motorized” vessels is possible but USACE would like to know where such a designation is needed or desirable and would also need assurance that such designations are within the enforcement capabilities of TPWD and the Comal County Sheriff’s Department. Maintenance of buoy markers is expensive and USACE would almost certainly need volunteer assistance to maintain any additional buoys over those that are already being maintained.</p>
<p>Wildlife: <i>8 comments</i>: add wildlife view areas and add restrooms, continue to protect natural areas, encourage the protection of the wildlife, provide map of sensitive areas for habitats, protect and reserve wildlife and their habitat, believe Canyon Lake is a jewel worth protecting</p>	<p>The objectives in Chapter 3 are focused on protection and preservation of natural habitat and open space. Environmentally Sensitive Areas are designated and discussed in Chapter 5. The master plan identifies areas of preservation and guides natural area policy. The Canyon Lake’s website contains information, including maps, rules, history, and natural resources for the project. Kiosks exist throughout the project with information concerning the area and safety. The GBRA website provides significant information on natural resources associated with Canyon Lake. GBRA’s plans for an environmental center will also help meet the need to inform visitors of the significant natural resources at Canyon Lake.</p>

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

The final draft Master Plan and Environmental Assessment was made available for public and agency review online beginning 10 July 2017, then was presented at a public workshops held on 20 July 2017 at the Canyon Lake Resource and Recreation Center, Canyon Lake, Texas. The process of announcing the availability of the draft final master plan and the requirements for submitting comments was identical to the process described above for the initial public scoping workshops held in March 2016. Public and agency comments for the draft final master plan were accepted through 20 August 2017. A total of 51 individuals

attended the workshop. At the end of the comment period a total of 9 written public comments were received, whose contents fell into seven broad categories. Table 7.2 lists the comments as well as USACE responses.

Table 7.2 Public Comments from July 20, 2017 Public Scoping Meeting

COMMENT	USACE RESPONSE
<p>Recreational facilities expansion, operation and maintenance</p> <ul style="list-style-type: none"> • Additional public swim beaches • Addition of benches on dam service road • Expand roadways and public parking areas • Develop more bicycle trails • Expand number of RV Areas • Promote private partnerships over public partnerships 	<p>Operation and maintenance costs have increased while funding has been reduced. The opportunity exists for other government agencies or groups to lease and operate current parks on USACE projects.</p> <p>Public beaches are currently provided in Comal Park and Canyon Beach from April - September. Due to natural, steep topography and a relatively limited amount of Federal land, the planning team does not consider new or expanded beaches as being needed or possible at Canyon Lake. Swimming is allowed in all water surface areas classified for "Open Recreation", but only designated swimming beaches are required to meet certain criteria.</p> <p>The road across the dam is strictly for operational access and maintenance. Public pedestrian access is currently allowed on the road as an incidental recreation use as long as that use does not interfere with operational requirements or security. There are no plans to provide amenities such as benches.</p> <p>Future management of high density recreation areas includes upgrades of existing day use and camping facilities as well as new or expanded trails. Upgrades would be implemented based on available funding or through lease agreements with other entities.</p>

COMMENT	USACE RESPONSE
<p>Water Surface Issues</p> <ul style="list-style-type: none"> • Designated areas for non-motorized water recreation • Designated fishing docks • Removal of stumps well below water surface 	<p>Designation of areas for “non-motorized” vessels is possible but USACE would need assurance that such designations are within the enforcement capabilities of TPWD and the Comal County Sheriff’s Department. Such designations would also require an investment in buoys, which require routine maintenance. USACE remains open to the concept of designated areas for non-motorized vessels if the issues of law enforcement and maintenance funding can be resolved</p> <p>The master plan identifies no-wake and restricted areas on the water. Restricted areas are normally related to the operation of the dam, spillway and designated swimming beaches.</p> <p>It is not feasible to remove stumps from the lake. Marking navigation hazards is generally not feasible due to lake level fluctuations and changing nature and location of such hazards. However, USACE encourages all boaters to report known navigation hazards.</p>
<p>Boat Ramps</p> <ul style="list-style-type: none"> • Address damaged boat ramps • Manage times and types of uses at boat ramps 	<p>USACE will endeavor to improve conditions and user preferences at existing boat ramps operated by USACE and others, including making key ramps more useable during low lake levels. Funding from TPWD’s Boating Access Grant Program may be available for this purpose.</p>
<p>Invasive Species</p> <ul style="list-style-type: none"> • Control of zebra mussels • Address Invasive plant species 	<p>Invasive species is an ongoing concern throughout the US, including Canyon Lake. USACE will continue to pursue a number of programs and best management practices to help control the spread of these species, including collaborating with private and public</p>

COMMENT	USACE RESPONSE
	agencies for invasive species at Canyon Lake.
<p>Communication</p> <ul style="list-style-type: none"> • Signage for location of non-motorized areas • Better signage for no-fishing areas 	<p>The Lake office attempts to communicate in a number of different ways with both residents and visitors alike. The USACE Canyon Lake website contains information, including maps, rules, history, and natural resources for the project. Kiosks exist throughout the project with information concerning the area and safety. As time and funds permit, USACE personnel will work to improve signage throughout the project to enhance our service to the public.</p>
<p>Operations</p> <ul style="list-style-type: none"> • Reinstate conservation pool variance • Limit development around lake • Expand responsibilities of attendants to include monitoring of trash dumping, peace-keeping amongst boaters, and animal control 	<p>These issues are not part of the master plan.</p> <p>Release rates, lake levels and water allocation are not covered by the master plan revision. Water management issues and concerns are covered in the Canyon Lake Water Management Plan. The topic of water management and water rights is addressed in the master plan, but only for informational purposes.</p> <p>Development on USACE lands at Canyon Lake are limited to High Density Recreation Areas, and then only to the extent that it serves the public interest in recreation. Lands adjacent to Canyon Lake property are not part of USACE control.</p> <p>Contract and hire staff responsibilities are not part of the Master Plan at USACE projects and therefore these issues are not addressed here.</p>

COMMENT	USACE RESPONSE
Edit Master Plan climate section to reflect only time period since the completion of the dam.	Concur – data adjusted
EPA comment: recommends best management practices be implemented in order to reduce potential short-term air quality impacts associated with construction activities.	USACE appreciates the comment and concurs. Table 3.4 contains an objective to “Ensure green design, construction, and operation practices...are considered as well as applicable Executive Orders.”

Copies of letters received from governmental entities are included in the EA. Upon incorporation of public comment into the draft Master Plan, EA and FONSI, final versions were prepared and signed by the District Engineer for implementation. The final version is posted on the District website.

CHAPTER 8 - SUMMARY OF RECOMMENDATIONS

8.1 SUMMARY OVERVIEW

The preparation of the Canyon Lake 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 Canyon Lake. Factors considered in the Plan were identified through public involvement and review of statewide planning documents including TPWD's 2012 TORP (synonymous with SCORP) and the TCAP – Edwards Plateau Ecoregion. This Master Plan will ensure the long-term sustainability of the USACE managed recreation program and natural resources associated with Canyon Lake.

8.2 LAND CLASSIFICATION 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.

Although 346 public comments were received as a result of the first public scoping meeting, none of those comments contained a specific request or proposal to demonstrably change prior land classifications. In the absence of public or other agency suggestions/proposals to reclassify project lands, the land classifications presented in the Plan were formulated by the USACE Canyon Lake Project staff, Operations Division Staff and Regional Planning and Environmental Center (RPEC) staff assigned to the Master Plan PDT based on first-hand experience, professional training, and best management practices. There were 338 acres reclassified, and 1,189 acres update to the new land classification name. All changes reflect historic and projected public use and new guidance from ER 1130-2-550 and EP 1130-2-550. A summary of acreage changes from prior land classifications to the current

classifications is provided in Table 8.1, and key decision points in the reclassification of project lands are presented in Table 8.2.

Table 8.1 Change from Prior Land Classification to New Land Classification

Prior (1970) Land Classifications	Acres	New Land Classifications	Acres
Operation and Maintenance	333	Project Operations	333
Recreational Areas (Priority 1, 2, 3, & 4)	1,550	High Density Recreation	1,405
		Environmentally Sensitive Areas	430
Aesthetic and Multiple Use Recreation	1,382	Multiple Resource Management – Low Density Recreation	1,097
Permanent pool	8,306		8,306
Flowage Easement	3,620		3,620

***Note:** The new land classification acreage figures were measured using GIS technology and may vary slightly from official land acquisition records.

Table 8.2 Reclassification Proposals

Proposal	Description	Justification
Project Operations (PO)	No Project Operations Lands were reclassified	
High Density Recreation (HDR)	<p>Lands under the prior classification of Recreational Areas were converted to the new and similar classification of High Density Recreation but were reduced from 1,550 to 1,405 acres through the following reclassifications:</p> <ul style="list-style-type: none"> ○ 10 acres in North Park to ESA for scenic quality and GCWA habitat to ESA ○ 43 acres in Cranes Mill Park to ESA from crappie dock to Cranes Mill Park boundary for GCWA 	<p>The 145 park acres that were reclassified to ESA Historically, these lands have been managed for the benefit of wildlife and are places where GCWA habitat exists. These lands are more appropriately classified as ESA lands. The conversion of these lands will have no effect on current or projected public use.</p>

Proposal	Description	Justification
	<ul style="list-style-type: none"> ○ 92 acres north of Potters Creek park to ESA for scenic area, habitat, and buffer zone 	
Environmentally Sensitive Areas (ESA)	<p>The classification of 430 acres as Environmentally Sensitive Areas resulted from the following land classification changes:</p> <ul style="list-style-type: none"> ○ Reclassifying 285 acres of Aesthetics to ESA for unique aesthetics and cultural sites ○ Reclassifying 145 acres from HDR due to areas designated by USFWS as important habitat for the endangered Golden-cheeked Warbler (GCWA) 	<p>These classification changes were necessary to recognize those areas at the project having the highest ecological value, including areas of high value for protection of important habitat for the endangered GCWA as designated by the USFWS, to protect unique views, and cultural and archeological sites, specifically the spillway and gorge.</p> <p>The conversion of lands will have little to no effect on current or projected public use. Lands classified as ESA are given the highest order of protection among possible land classifications.</p>
MRML – Low Density Recreation (LDR)	<p>The 1,097 acres designated as Low Density Recreation were acres of the former classification of Aesthetic</p>	<p>The land areas in the former classification of Aesthetic were renamed to the similar land use of Low Density Recreation. These areas have historic land use patterns supporting the change. The conversion of these lands will have no effect on current or projected public use.</p>

Proposal	Description	Justification
Water Surface	<p>The classification of 8,306 acres of water surface of the lake at the conservation pool elevation is as follows:</p> <ul style="list-style-type: none"> • 31 acres of Restricted water surface at Canyon Lake include the water surface in front of the intake structure at the control tower at Canyon Dam and designated swimming areas in the parks around Canyon Lake (swim beaches at Canyon Park, Potters Creek, and Comal). Buoys mark the line in front of the dam. Keep-out buoys and floating barrier pipes mark the designated swimming areas in each park. • 178 acres of Designated No-Wake areas are in place near the 23 boat ramps and two marina areas at Canyon Lake. <p>There are 8,097 acres of Open Recreation water surface at Canyon Lake.</p>	<p>Previous master plans for Canyon Lake did not specify different classifications on the water surface, though these classifications were recognized in practice. This master plan revision recognizes and specifies these uses. The classification of water surfaces will have no effect on current or projected public use</p>

Note: The land classification changes described in this table are the result of changes to 62 individual parcels of land ranging from a few acres to over 100 hundred acres. Acreages were measured using GIS technology. The acreage numbers provided are approximate.

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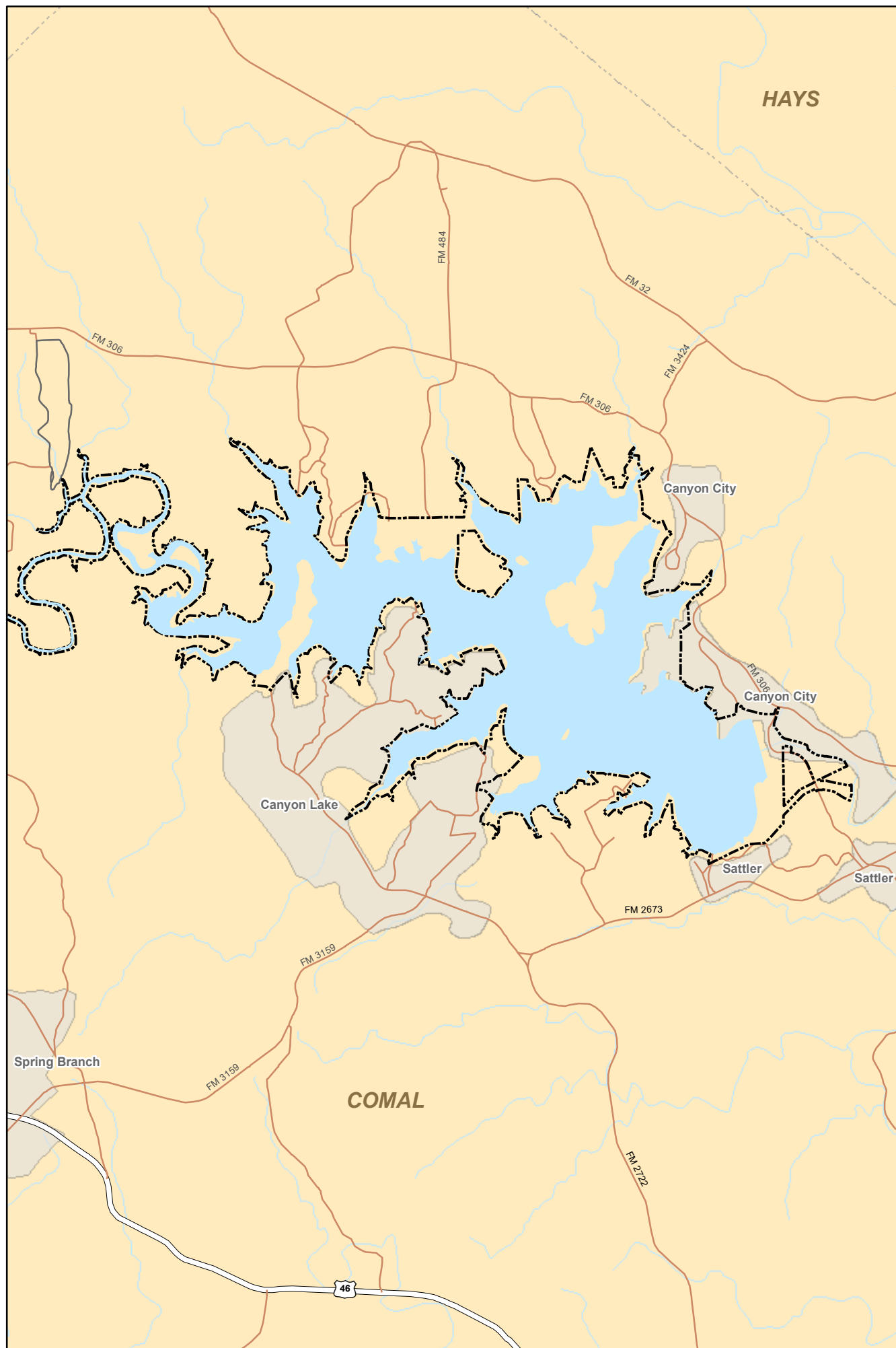
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APPENDIX A - LAND CLASSIFICATION, MANAGING AGENCIES, AND RECREATION MAPS

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INDEX TO MASTER PLAN MAPS GENERAL

MAP NO.	TITLE
CN16MP-OI-00	PROJECT LOCATION & INDEX TO MAPS
CN16MP-OM-01	AGENCY LAND MANAGEMENT
CN16MP-OW-01	WATER SURFACE CLASSIFICATIONS

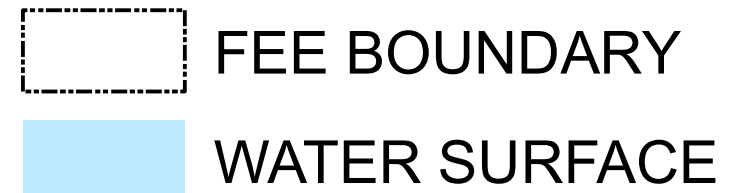
LAND CLASSIFICATION

MAP NO.	TITLE
CN16MP-OC-00	LAND CLASSIFICATION SHEET (00)
CN16MP-OC-01	LAND CLASSIFICATION SHEET (01)
CN16MP-OC-02	LAND CLASSIFICATION SHEET (02)
CN16MP-OC-03	LAND CLASSIFICATION SHEET (03)
CN16MP-OC-04	LAND CLASSIFICATION SHEET (04)
CN16MP-OC-05	LAND CLASSIFICATION SHEET (05)
CN16MP-OC-06	LAND CLASSIFICATION SHEET (06)
CN16MP-OC-07	LAND CLASSIFICATION SHEET (07)
CN16MP-OC-08	LAND CLASSIFICATION SHEET (08)
CN16MP-OC-09	LAND CLASSIFICATION SHEET (09)
CN16MP-OC-10	LAND CLASSIFICATION SHEET (10)
CN16MP-OC-11	LAND CLASSIFICATION SHEET (11)
CN16MP-OC-12	LAND CLASSIFICATION SHEET (12)
CN16MP-OC-13	LAND CLASSIFICATION SHEET (13)
CN16MP-OC-14	LAND CLASSIFICATION SHEET (14)

RECREATIONAL AREAS

MAP NO.	TITLE
CN16MP-OR-0A	USACE MANAGED RECREATIONAL AREAS
CN16MP-OR-0B	PRIVATELY MANAGED RECREATIONAL AREAS
CN16MP-OR-01	OVERLOOK PARK
CN16MP-OR-02	GUADALUPE PARK
CN16MP-OR-03	NORTH PARK
CN16MP-OR-04	JACOBS CREEK PARK
CN16MP-OR-05	CANYON PARK
CN16MP-OR-06	POTTERS CREEK PARK
CN16MP-OR-07	CRANES MILL PARK
CN16MP-OR-08	COMAL PARK

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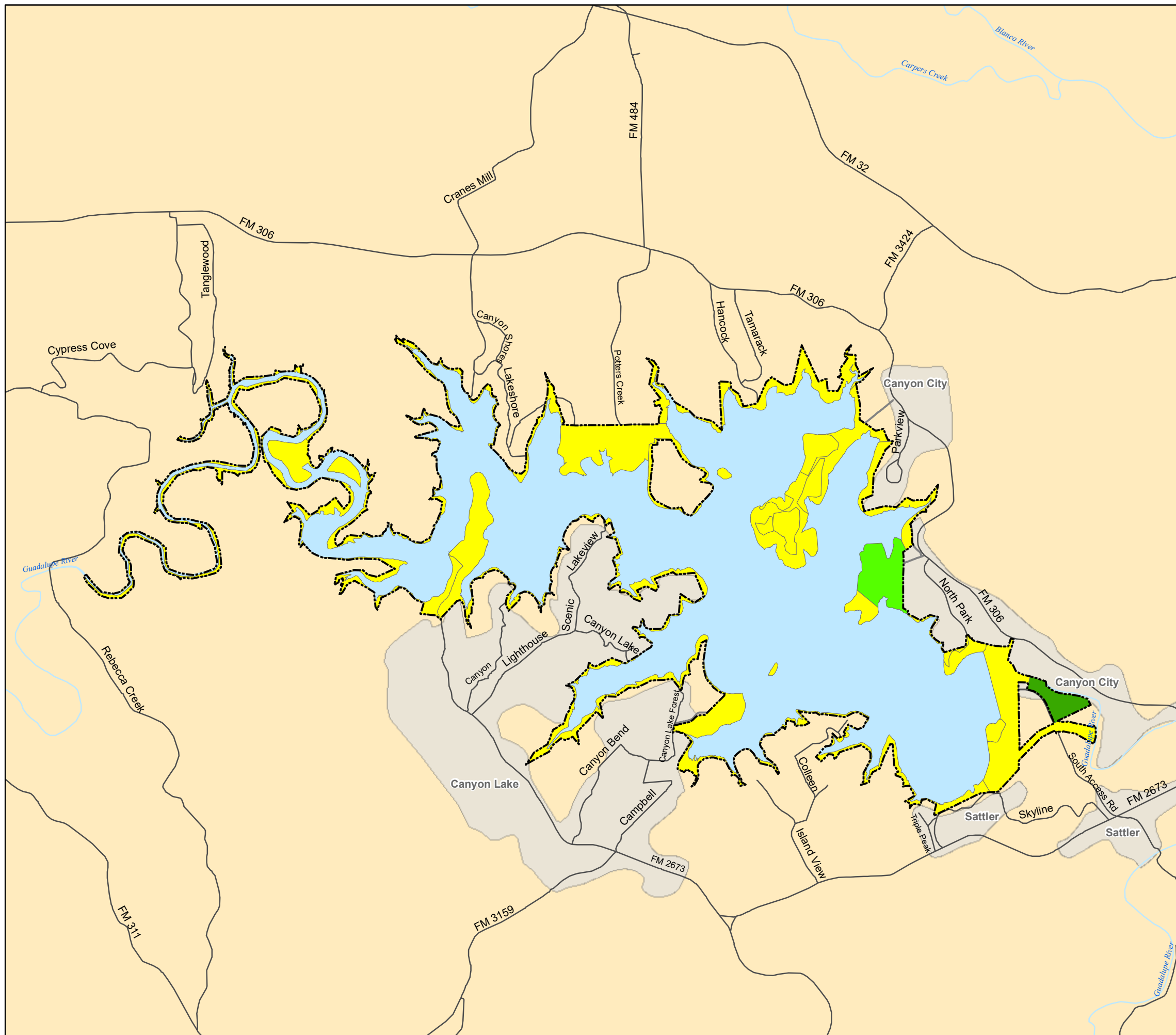
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GUADALUPE RIVER, TEXAS





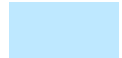
CANYON LAKE DAM AND RESERVOIR


CANYON LAKE MASTER PLAN

PROJECT LOCATION AND MAP INDEX

DATE: NOVEMBER 2017	MAP NO. CN16MP-OI-00
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-  FEE BOUNDARY
-  U.S. ARMY CORPS OF ENGINEERS
-  COMAL COUNTY
-  USAF JBSA
-  WATER SURFACE



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FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

AGENCY LAND MANAGEMENT


DATE:

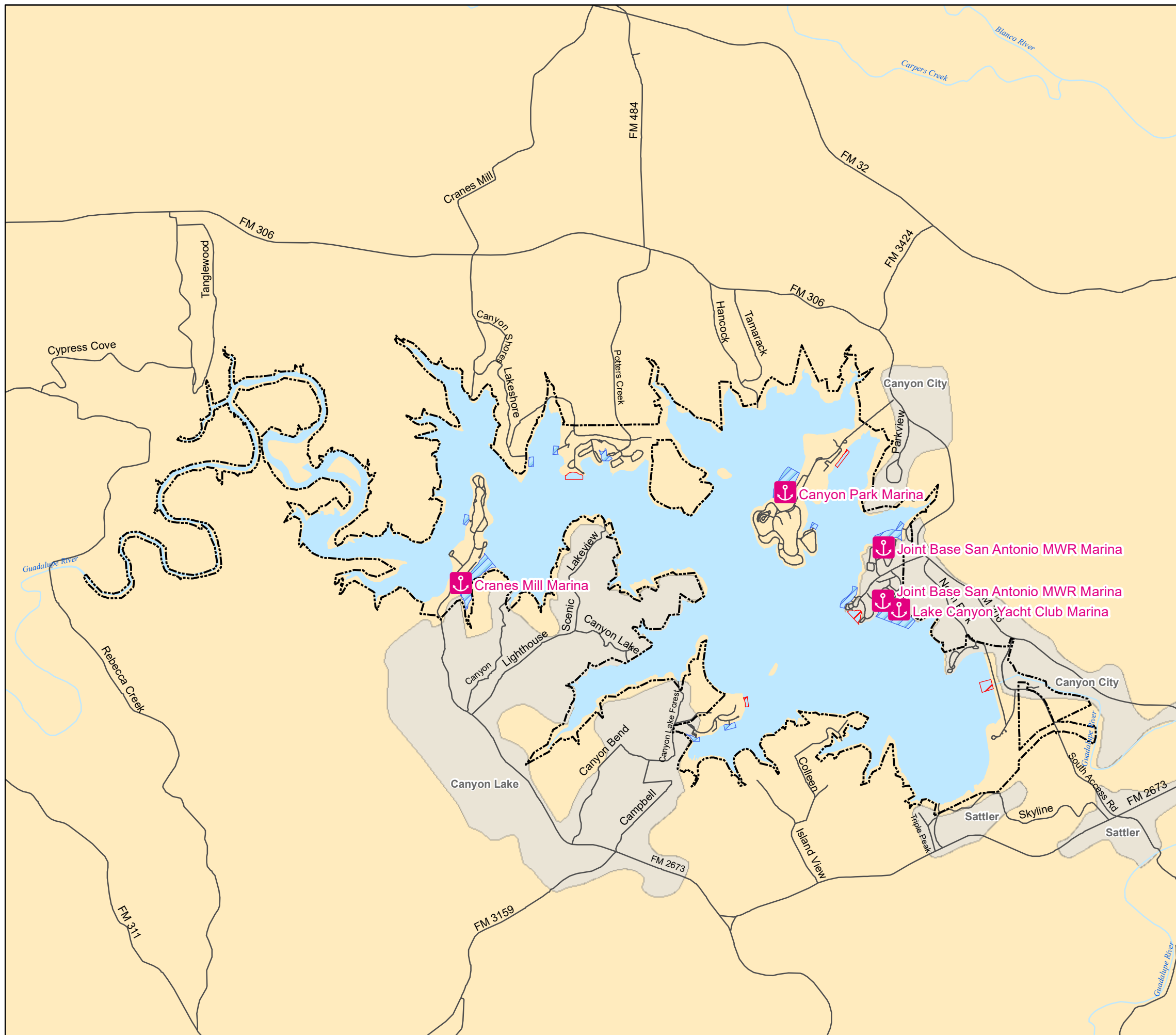
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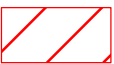
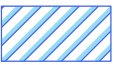
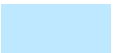
MAP NO.


CN16MP-OM-01

0 0.5 1 2 Miles






-  MARINAS / CONCESSIONS
-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE




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CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

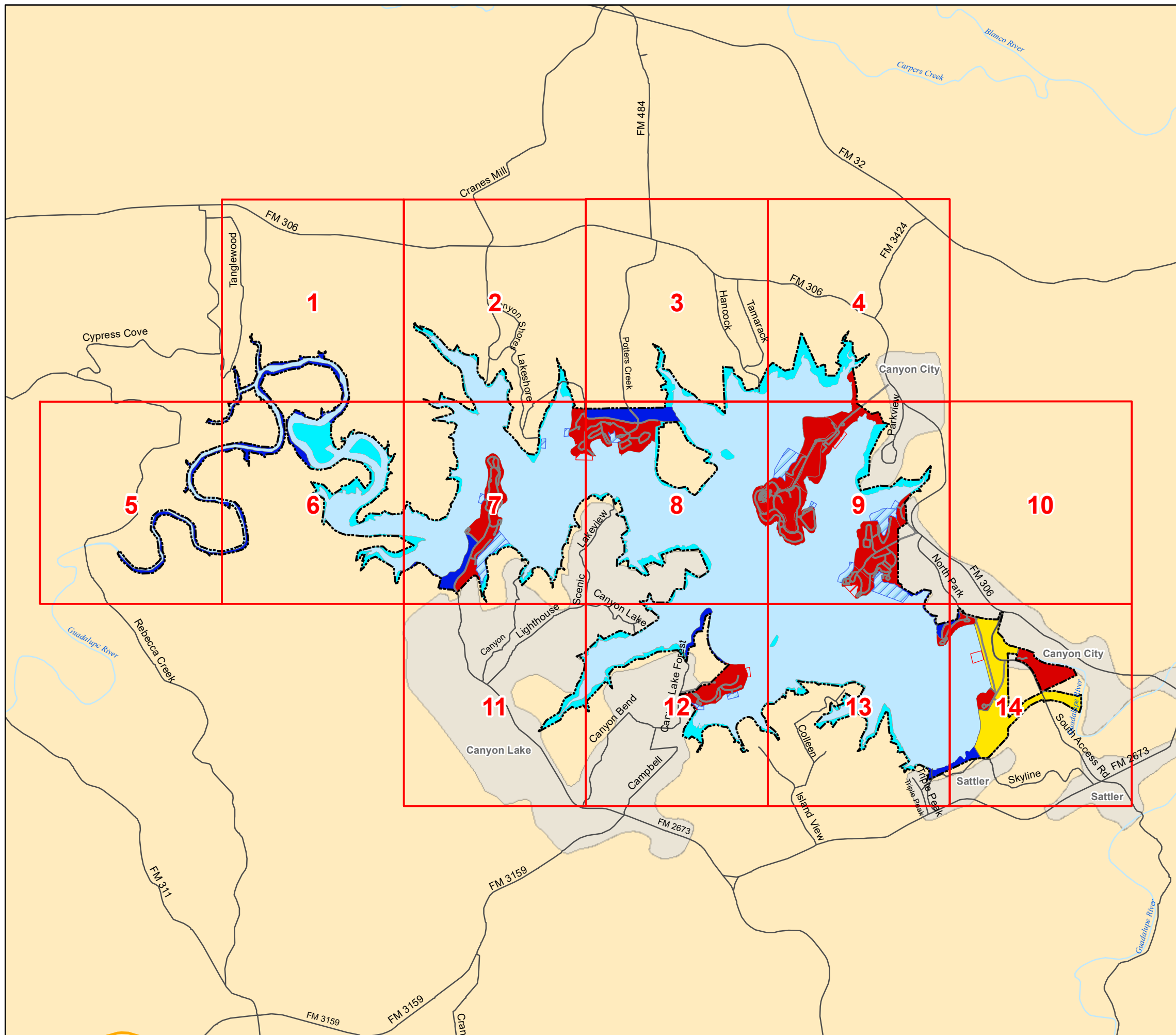
**CANYON LAKE DAM AND RESERVOIR
CANYON LAKE MASTER PLAN
WATER SURFACE CLASSIFICATIONS
AND MARINAS**

















0 0.5 1 2 Miles

DATE: NOVEMBER 2017	MAP NO. CN16MP-OW-01
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-  INDEX GRID
-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT
-  WATER SURFACE: OPEN RECREATION




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CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE MASTER PLAN

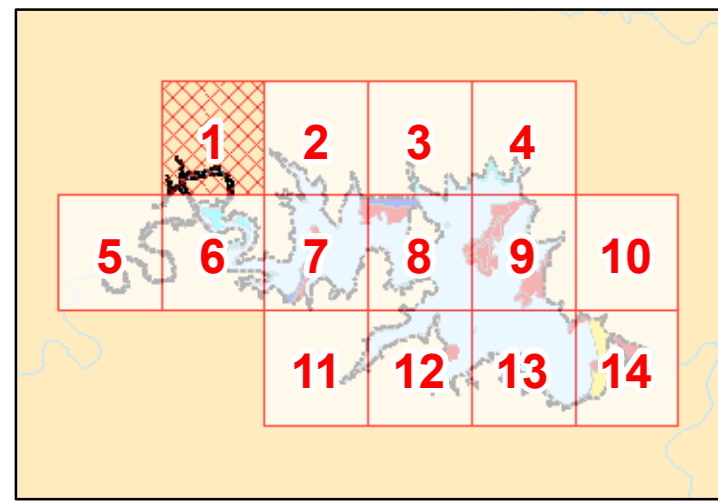
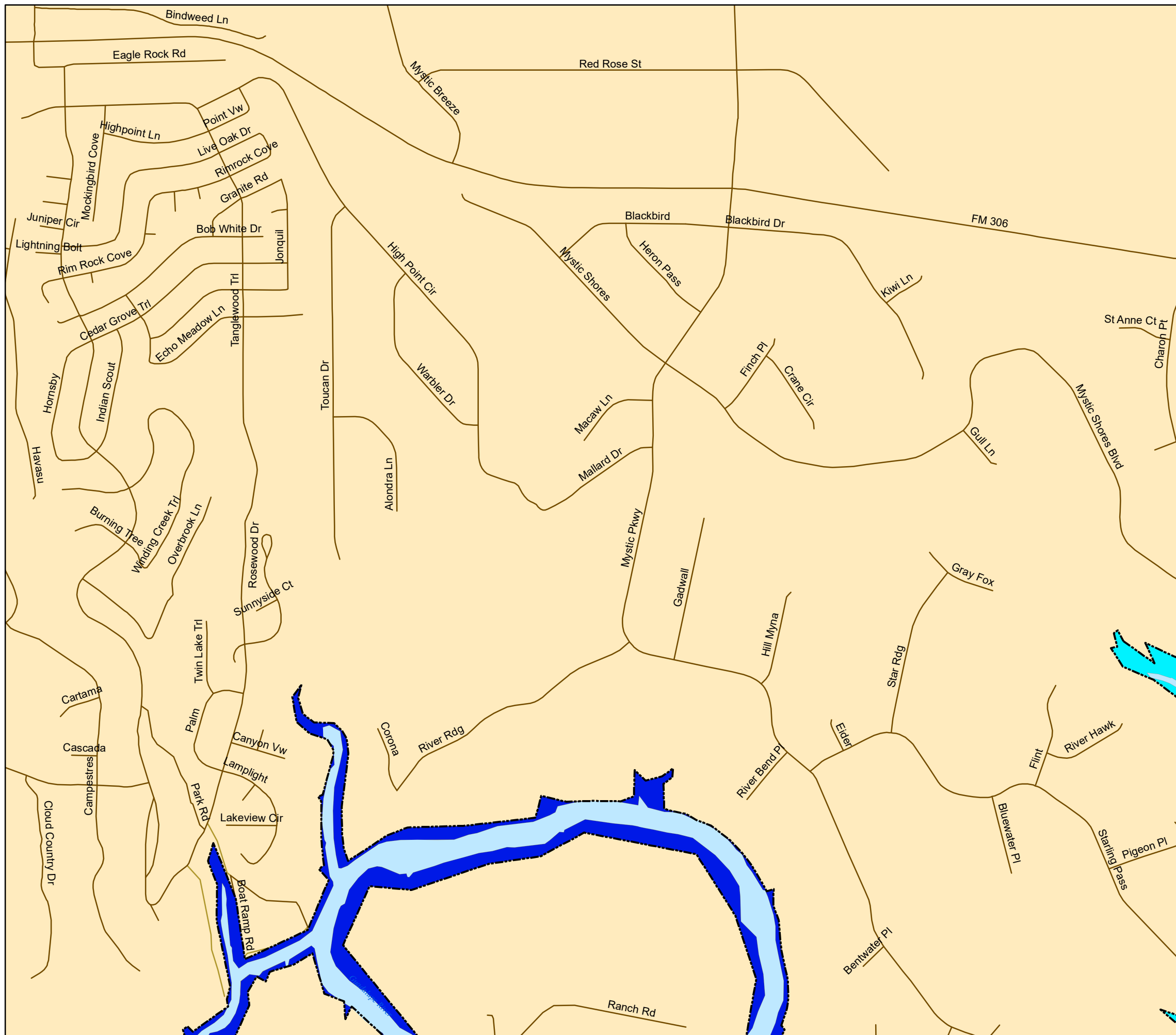
LAND CLASSIFICATION (INDEX SHEET 00)






0 0.5 1 2 Miles

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-00
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-  FEE BOUNDARY
-  WATER SURFACE: OPEN RECREATION
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

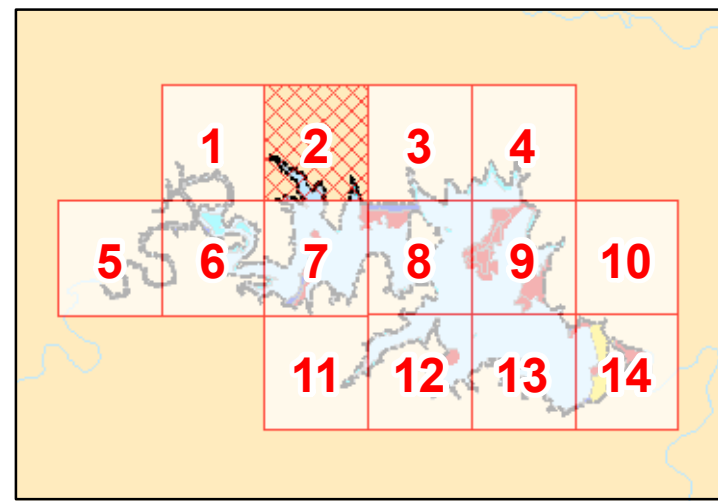
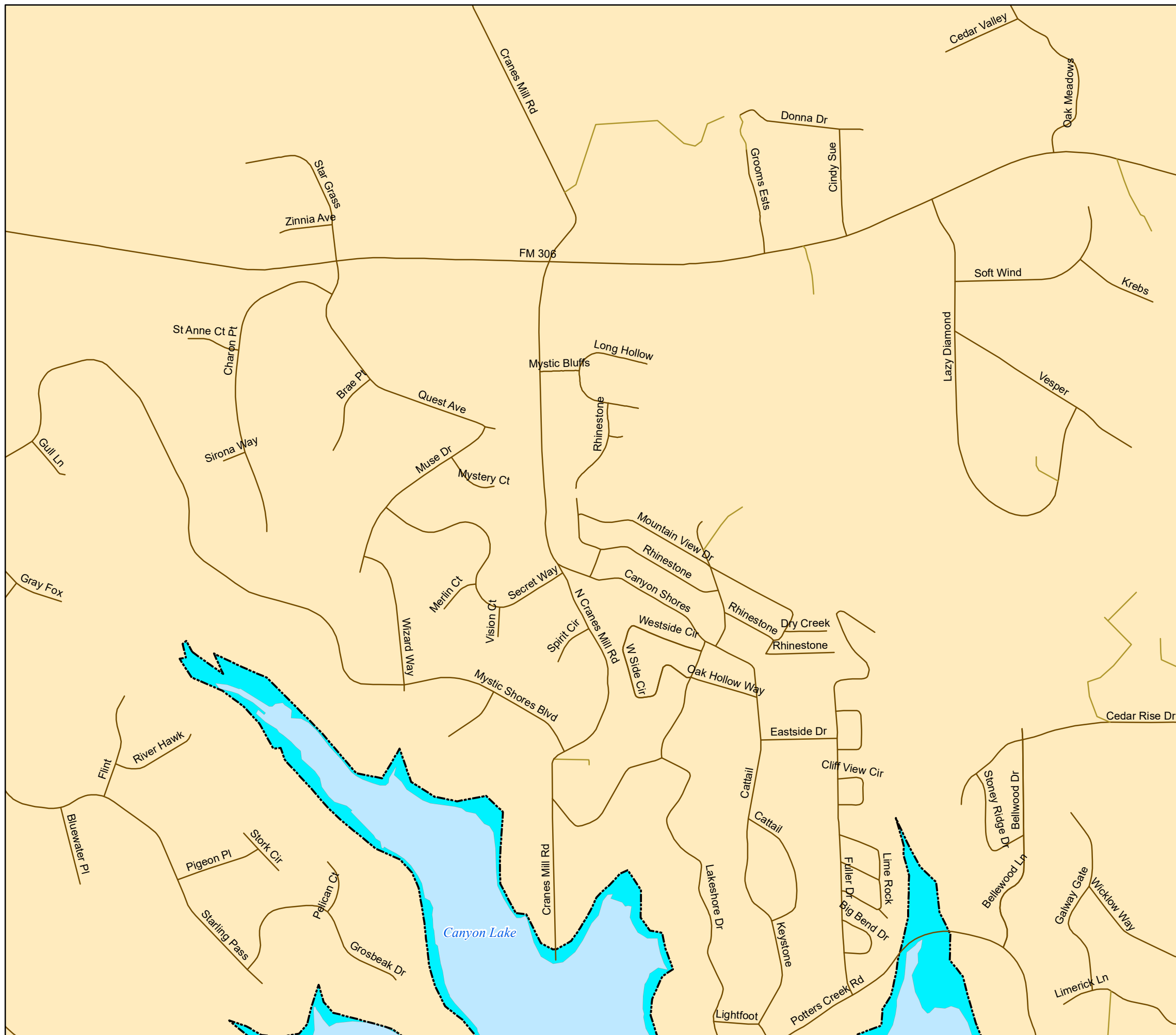
LAND CLASSIFICATION (INDEX SHEET 01)

DATE:


MAP NO.

NOVEMBER 2017

CN16MP-OC-01



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



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CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

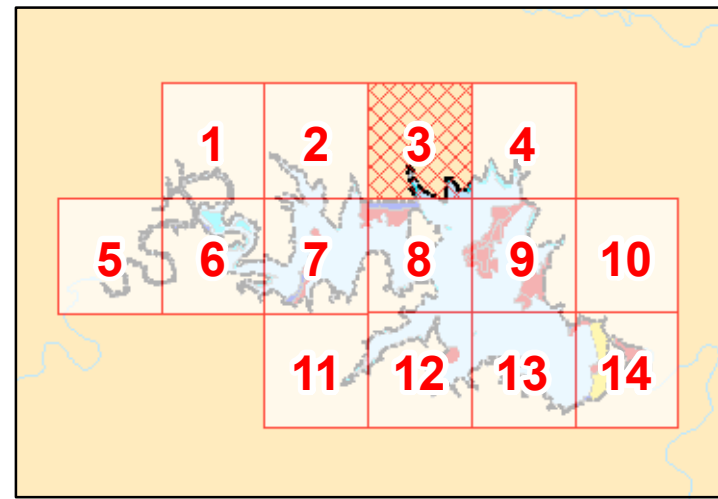
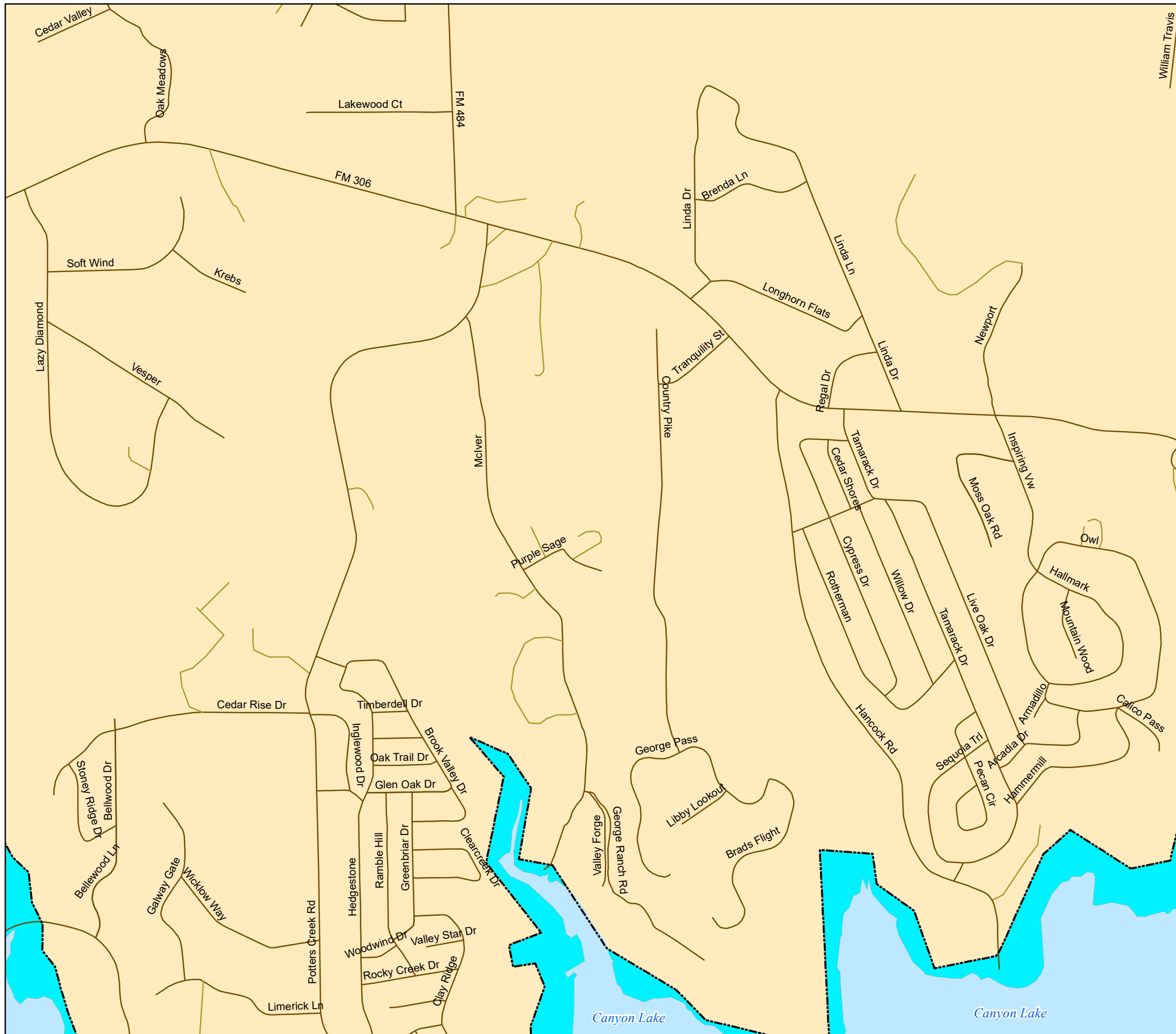
LAND CLASSIFICATION (INDEX SHEET 02)




0 750 1,500 3,000

Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-02
------------------------	-------------------------



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



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


FORT WORTH DISTRICT


CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

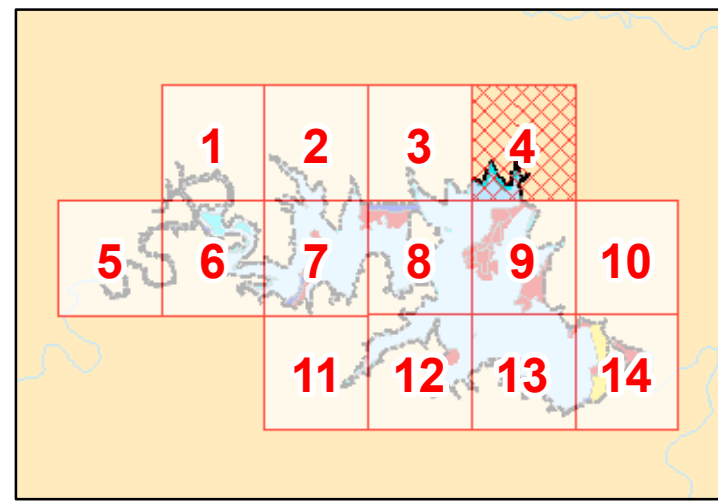
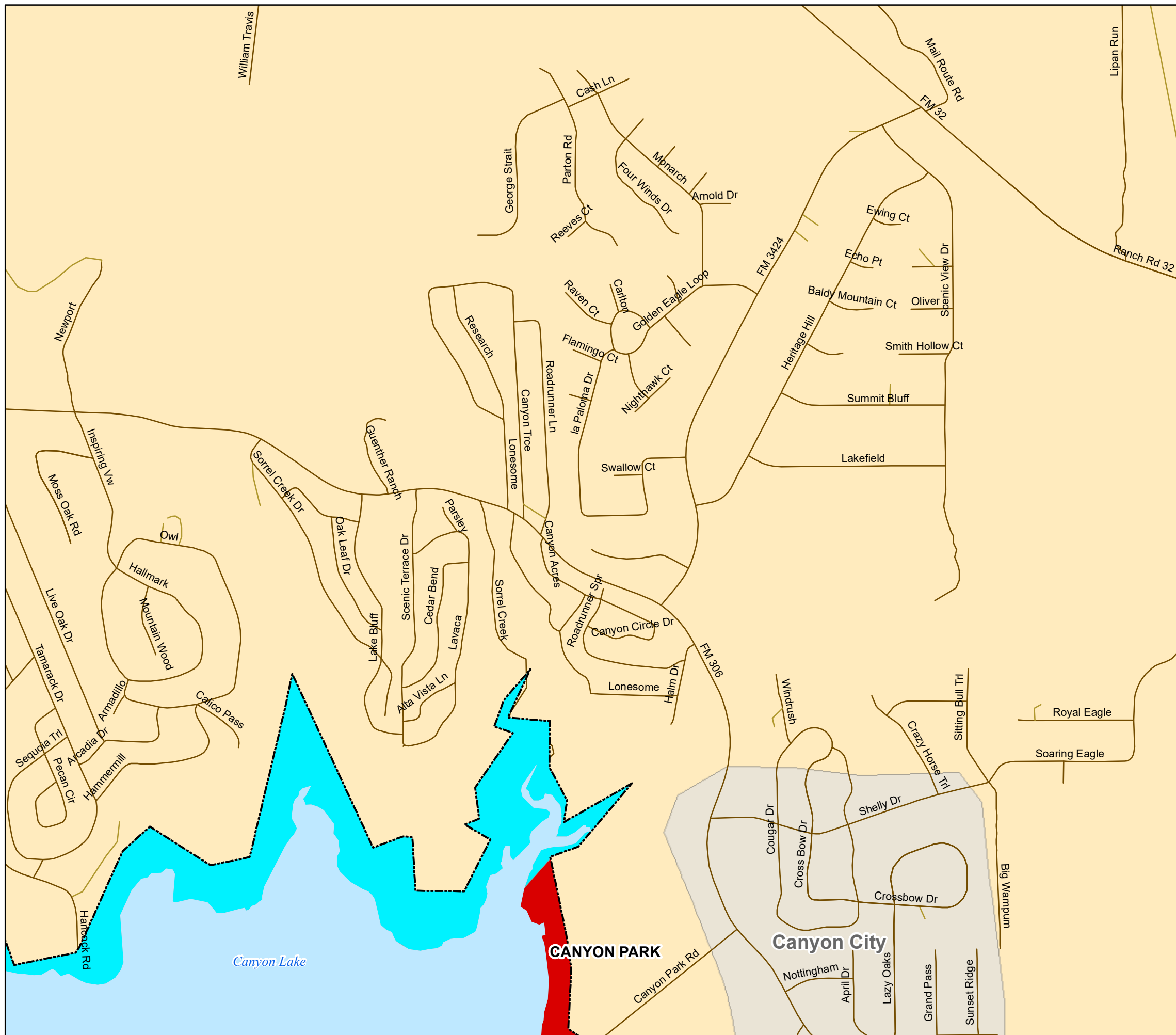
LAND CLASSIFICATION (INDEX SHEET 03)






0 750 1,500 3,000
Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-03
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-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE; OPEN RECREATION
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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


FORT WORTH DISTRICT

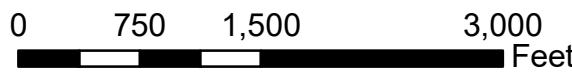
CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

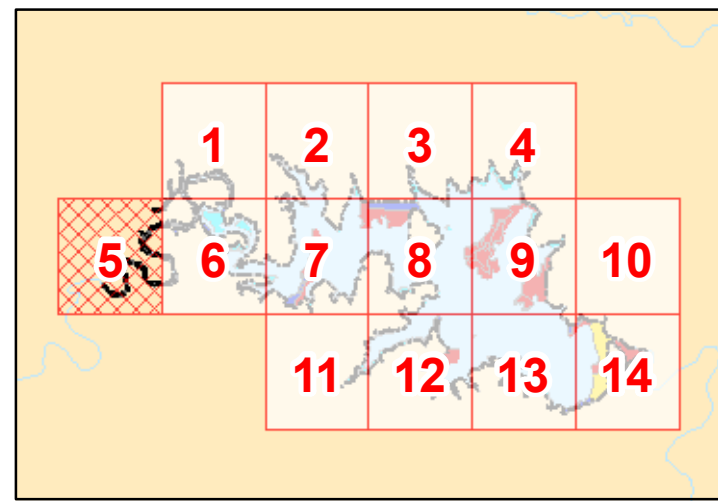
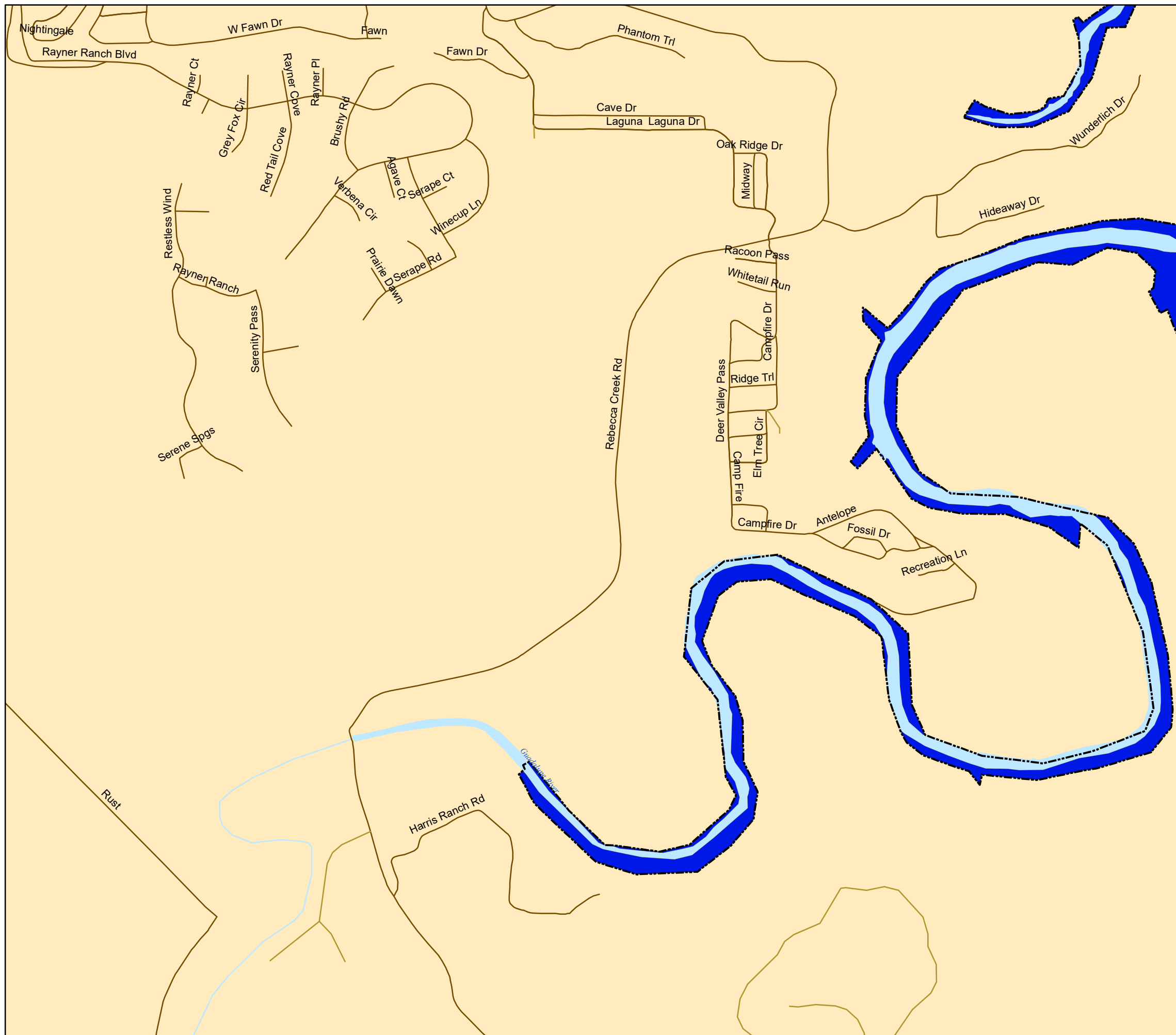
LAND CLASSIFICATION (INDEX SHEET 04)






0 750 1,500 3,000 Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-04
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-  FEE BOUNDARY
-  WATER SURFACE: OPEN RECREATION
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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


FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR
GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

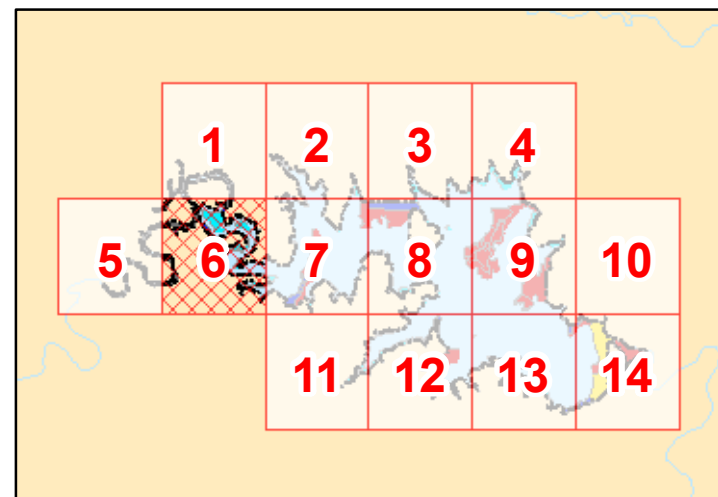
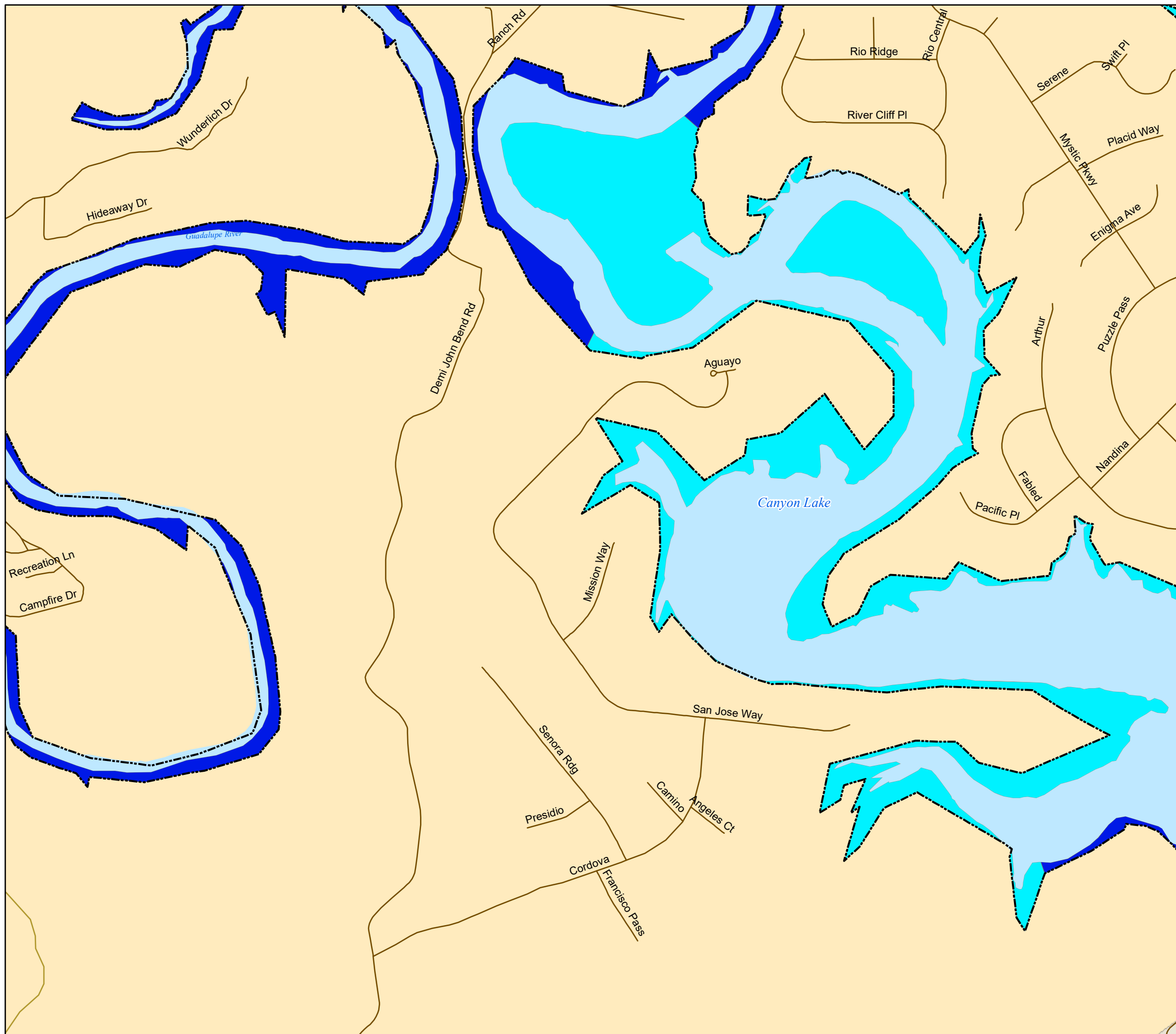
LAND CLASSIFICATION (INDEX SHEET 05)




0 750 1,500 3,000

Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-05
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-  FEE BOUNDARY
-  WATER SURFACE: OPEN RECREATION
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



**U.S. ARMY CORPS
OF ENGINEERS
FORT WORTH DISTRICT**

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

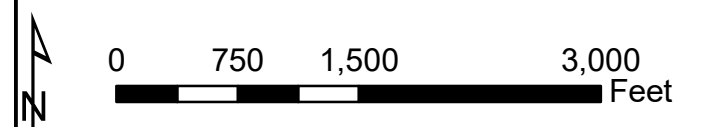
LAND CLASSIFICATION (INDEX SHEET 06)

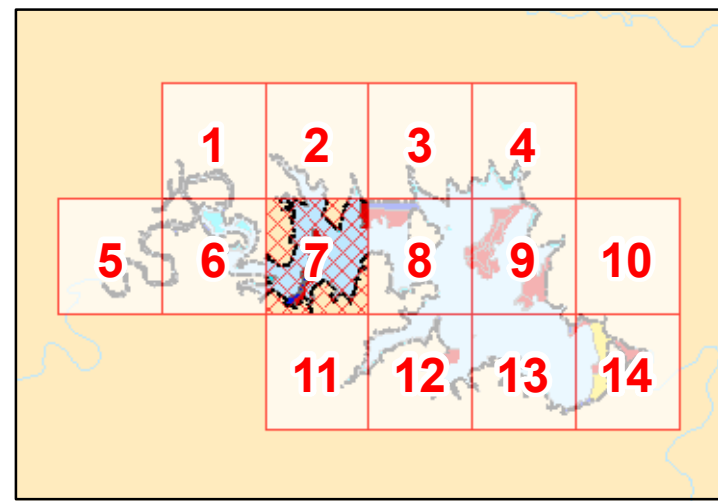
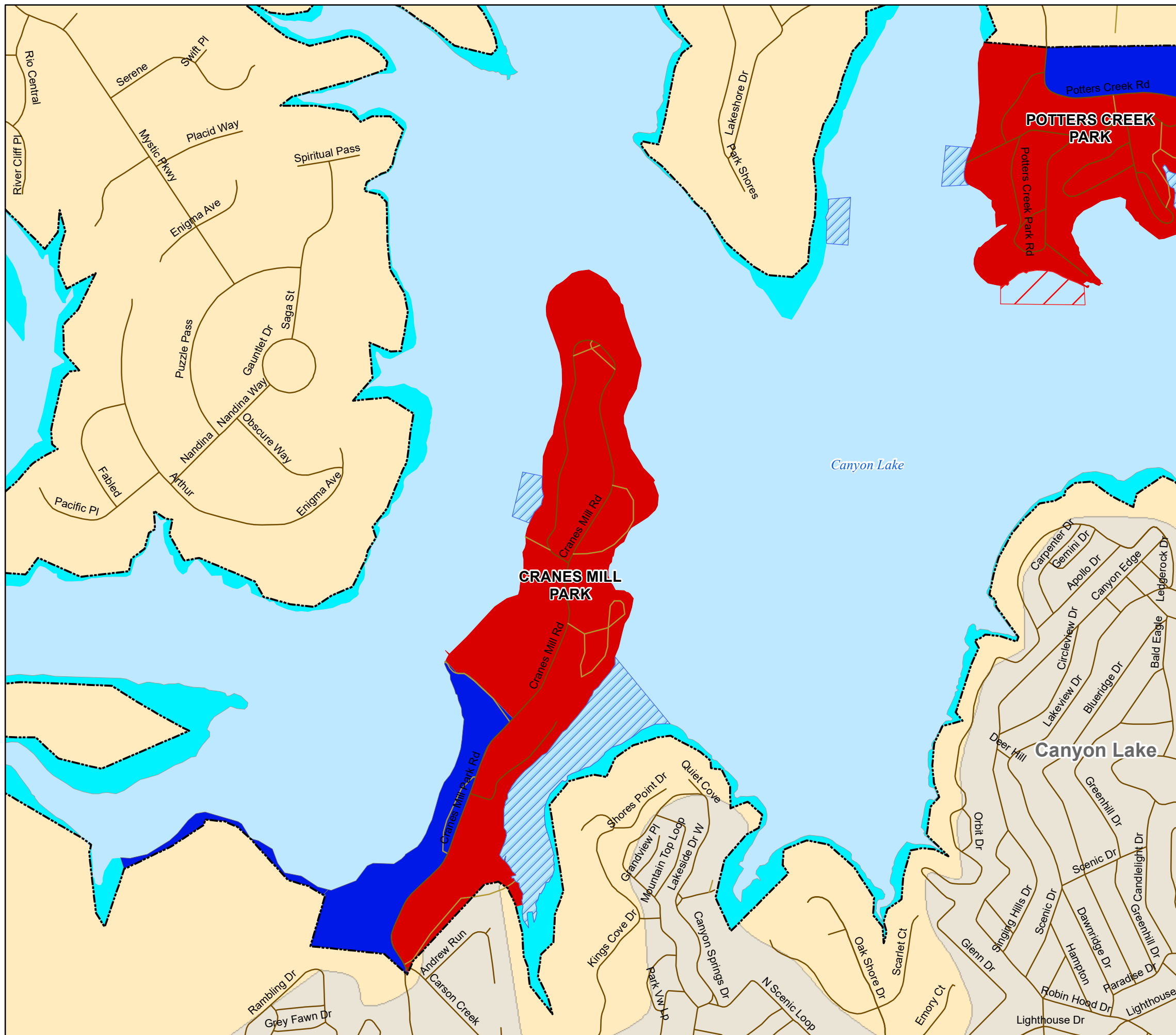
DATE:

MAP NO.


NOVEMBER 2017

CN16MP-OC-06





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



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


FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

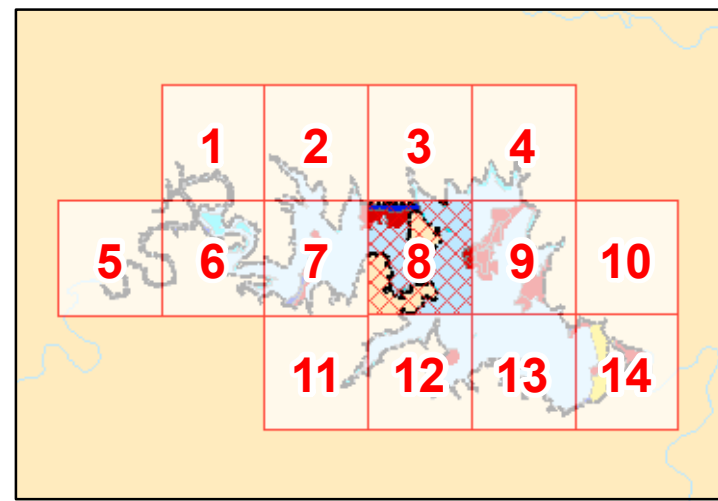
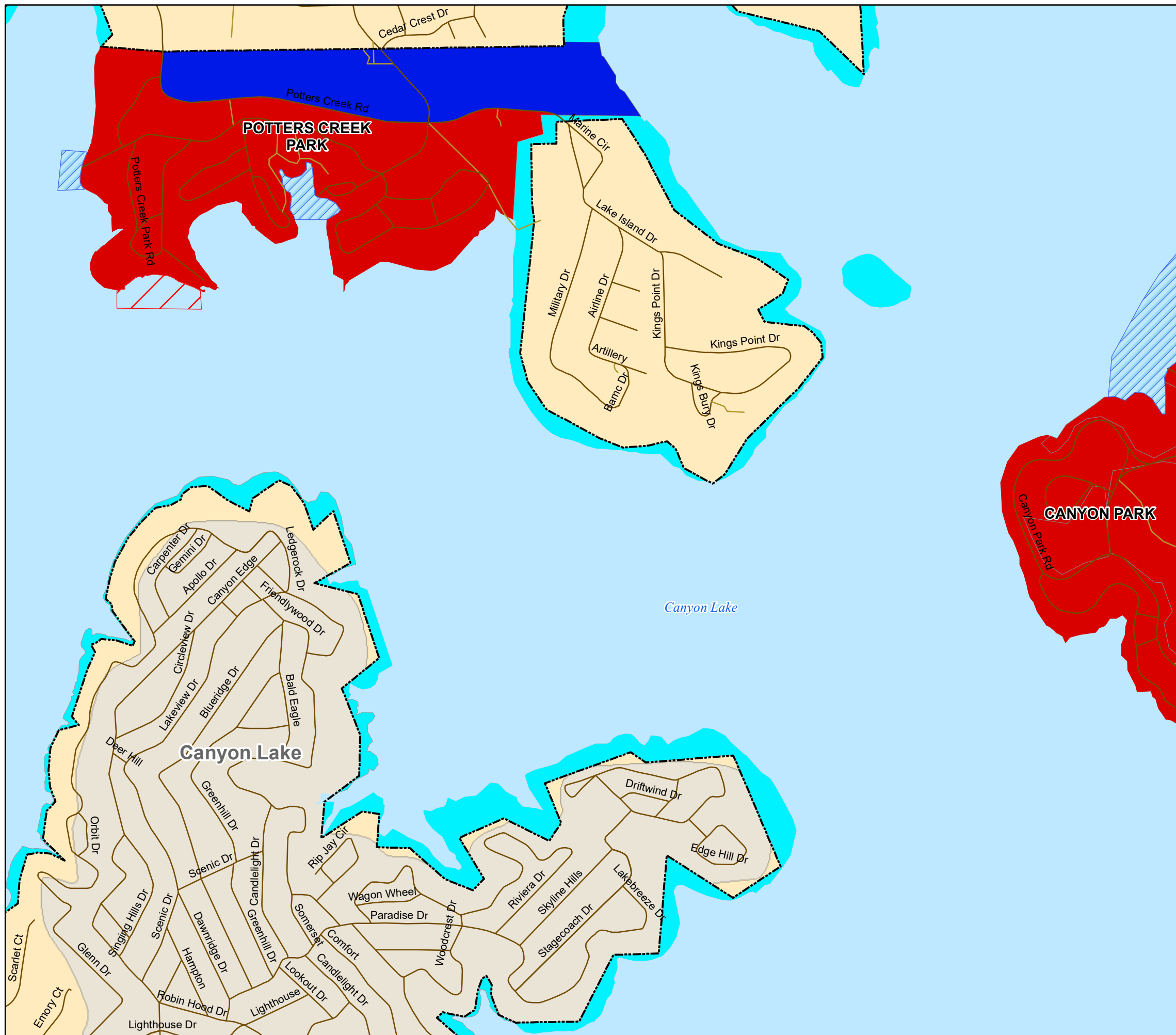
LAND CLASSIFICATION (INDEX SHEET 07)














0 750 1,500 3,000

Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-07
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-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE: OPEN RECREATION
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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

FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

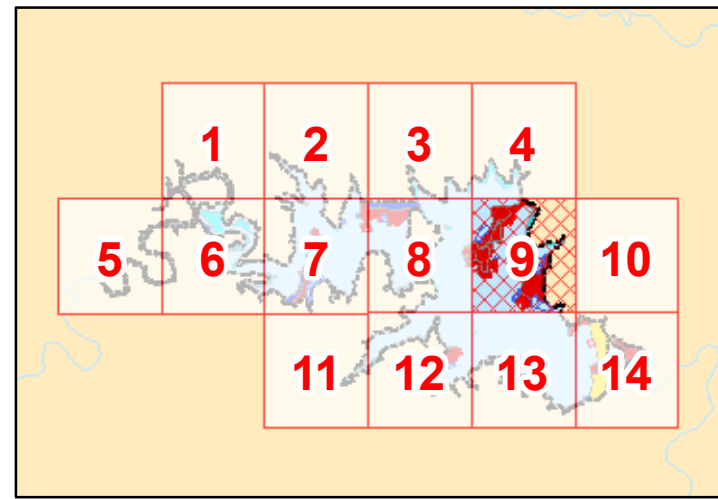
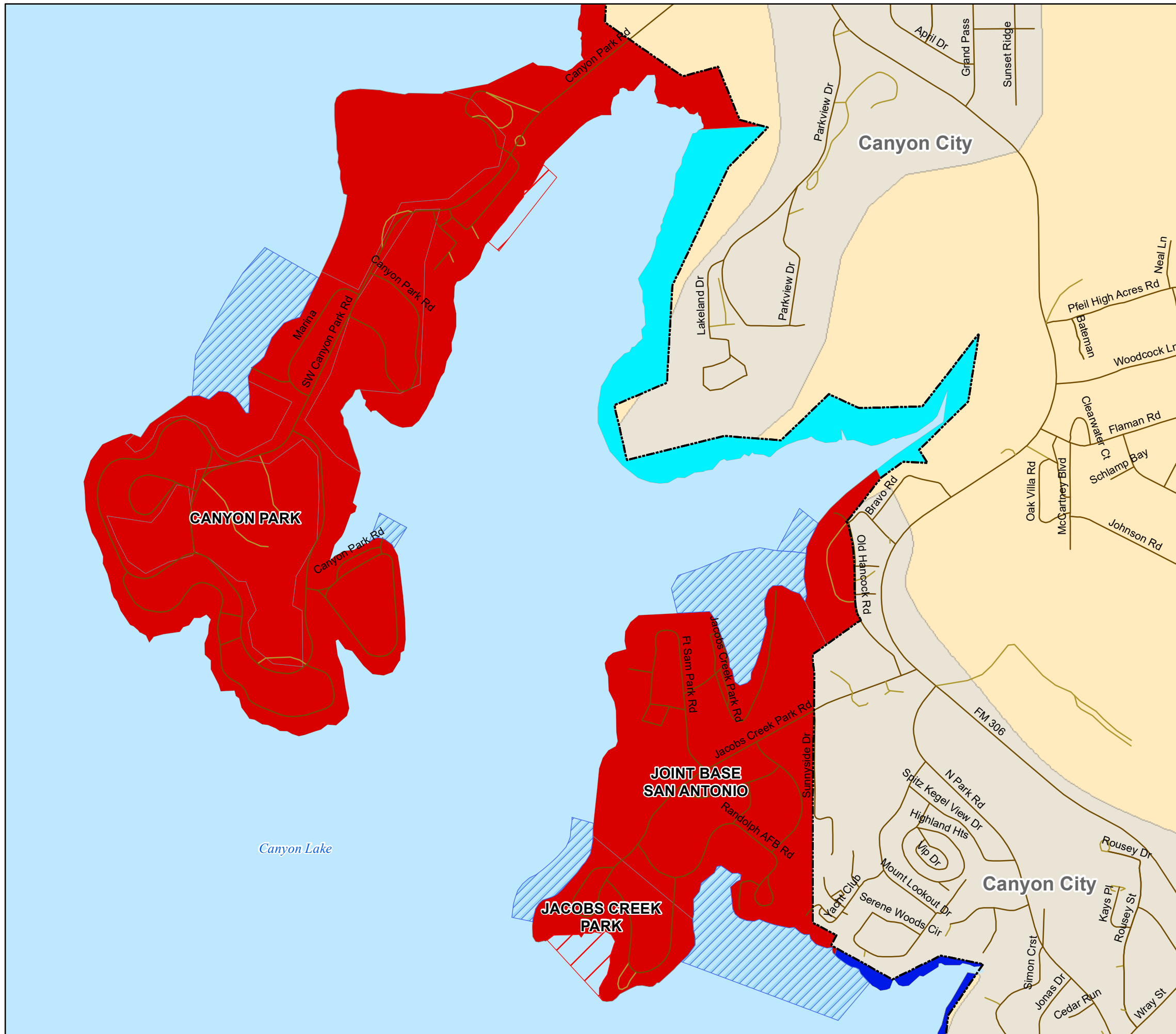
LAND CLASSIFICATION (INDEX SHEET 08)











DATE:


MAP NO.

NOVEMBER 2017

CN16MP-OC-08



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



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


FORT WORTH DISTRICT


CANYON LAKE DAM AND RESERVOIR
GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

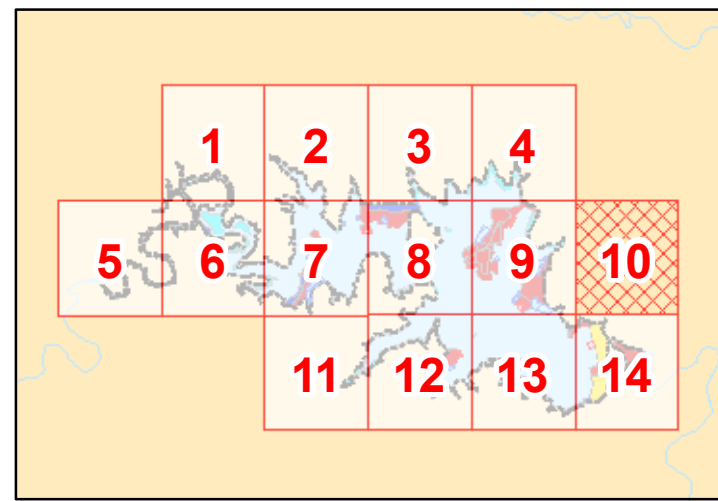
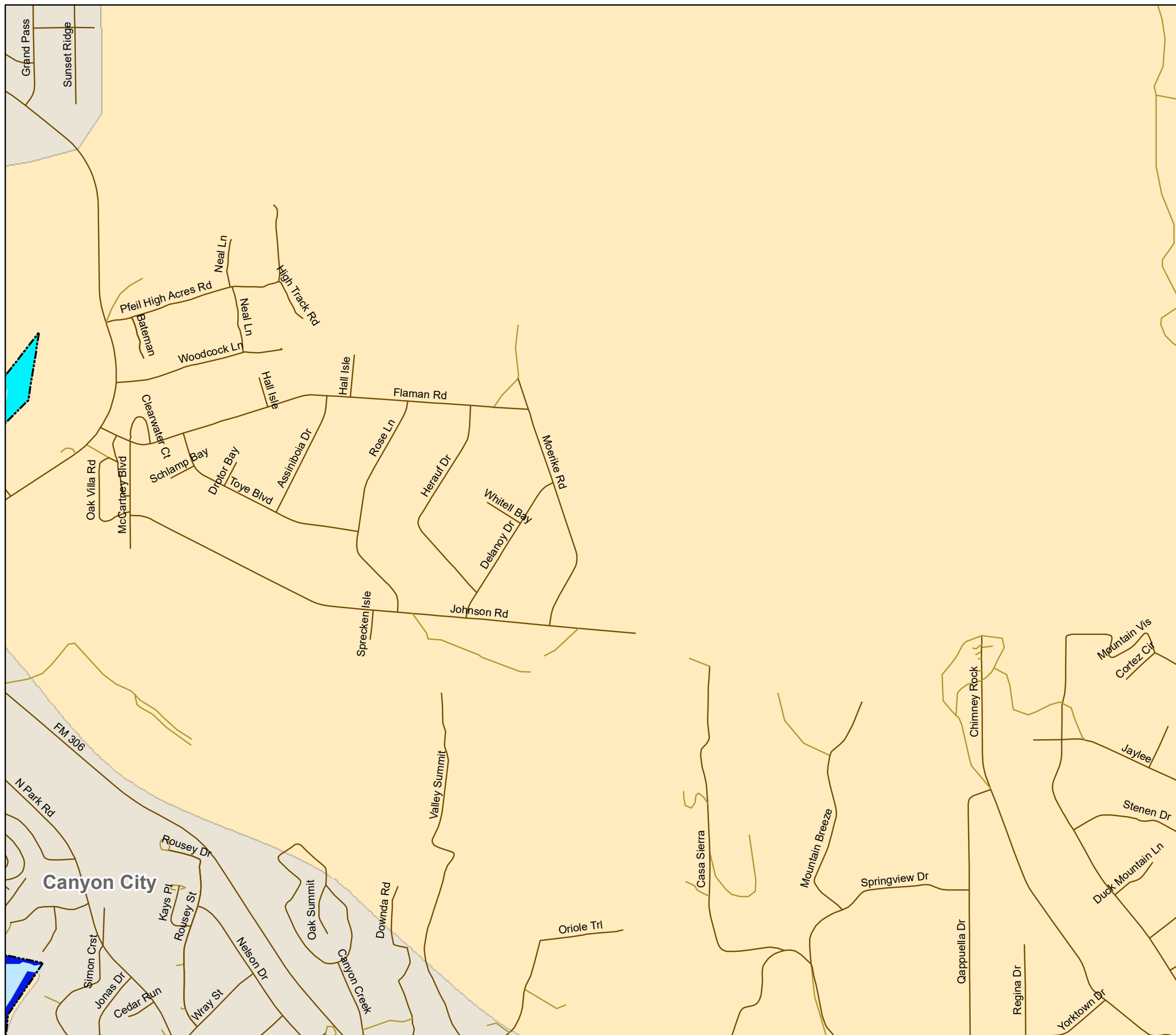
CANYON LAKE MASTER PLAN

LAND CLASSIFICATION (INDEX SHEET 09)






DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-09
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-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE: OPEN RECREATION
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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

FORT WORTH DISTRICT

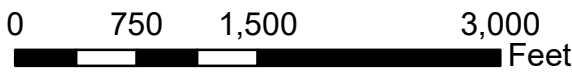
CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

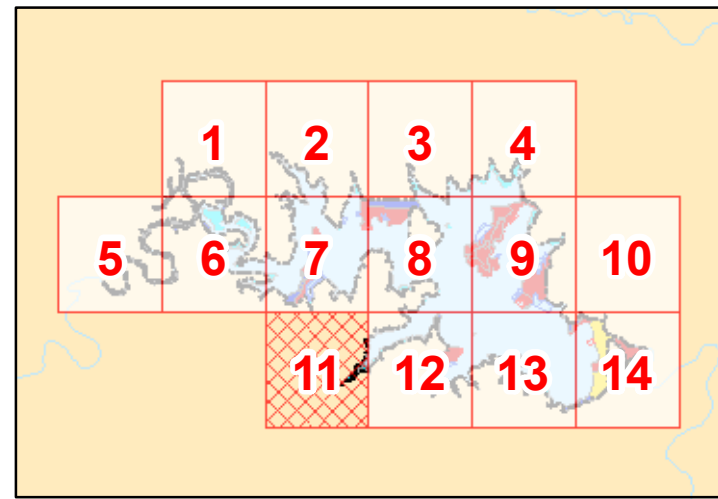
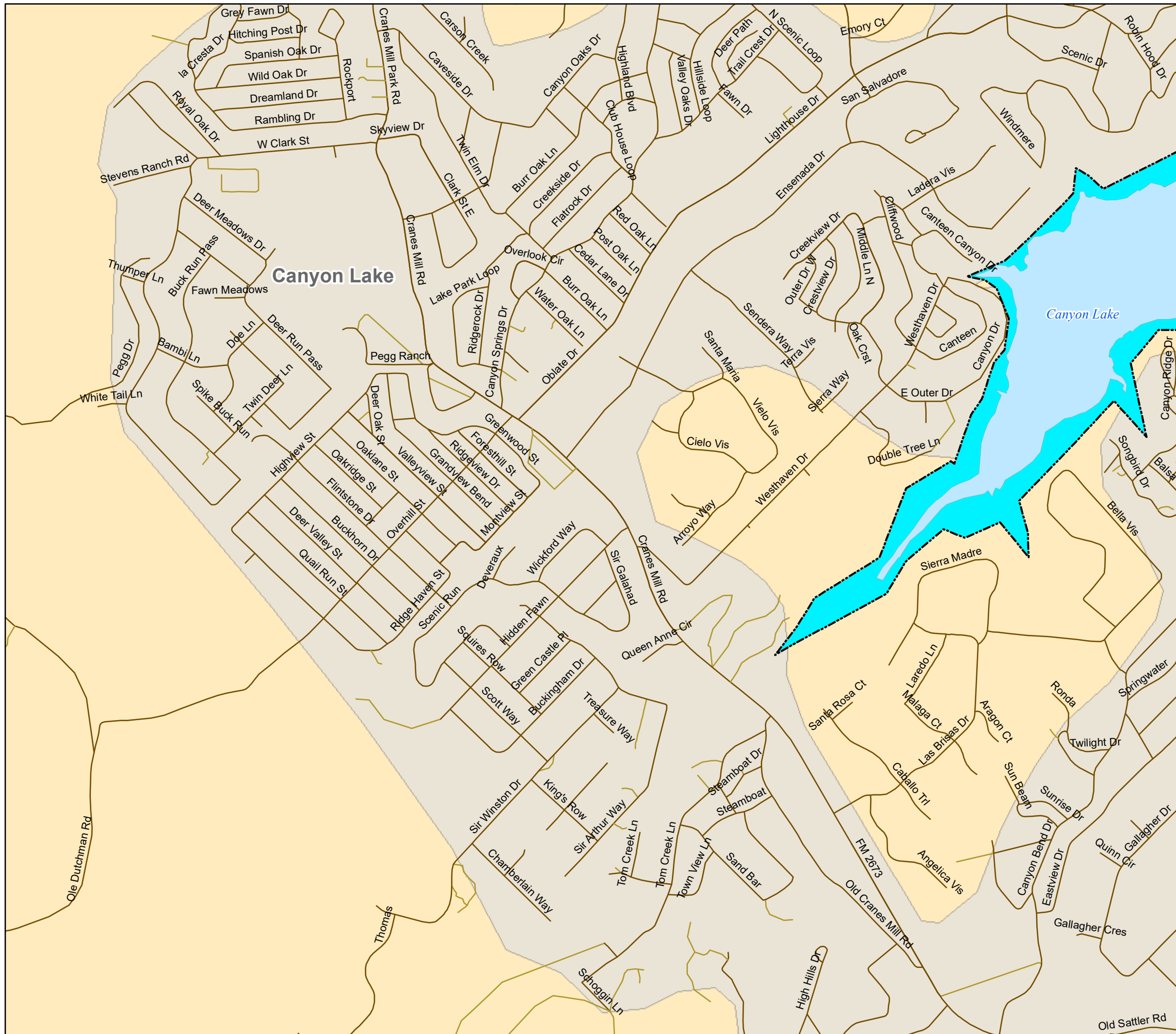
CANYON LAKE MASTER PLAN

LAND CLASSIFICATION (INDEX SHEET 10)


N



DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-10
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-  FEE BOUNDARY
-  WATER SURFACE: OPEN RECREATION
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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


FORT WORTH DISTRICT

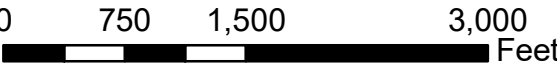
CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

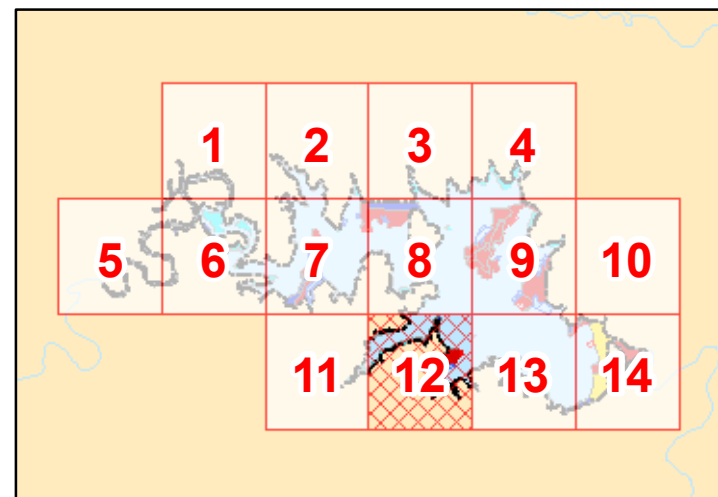
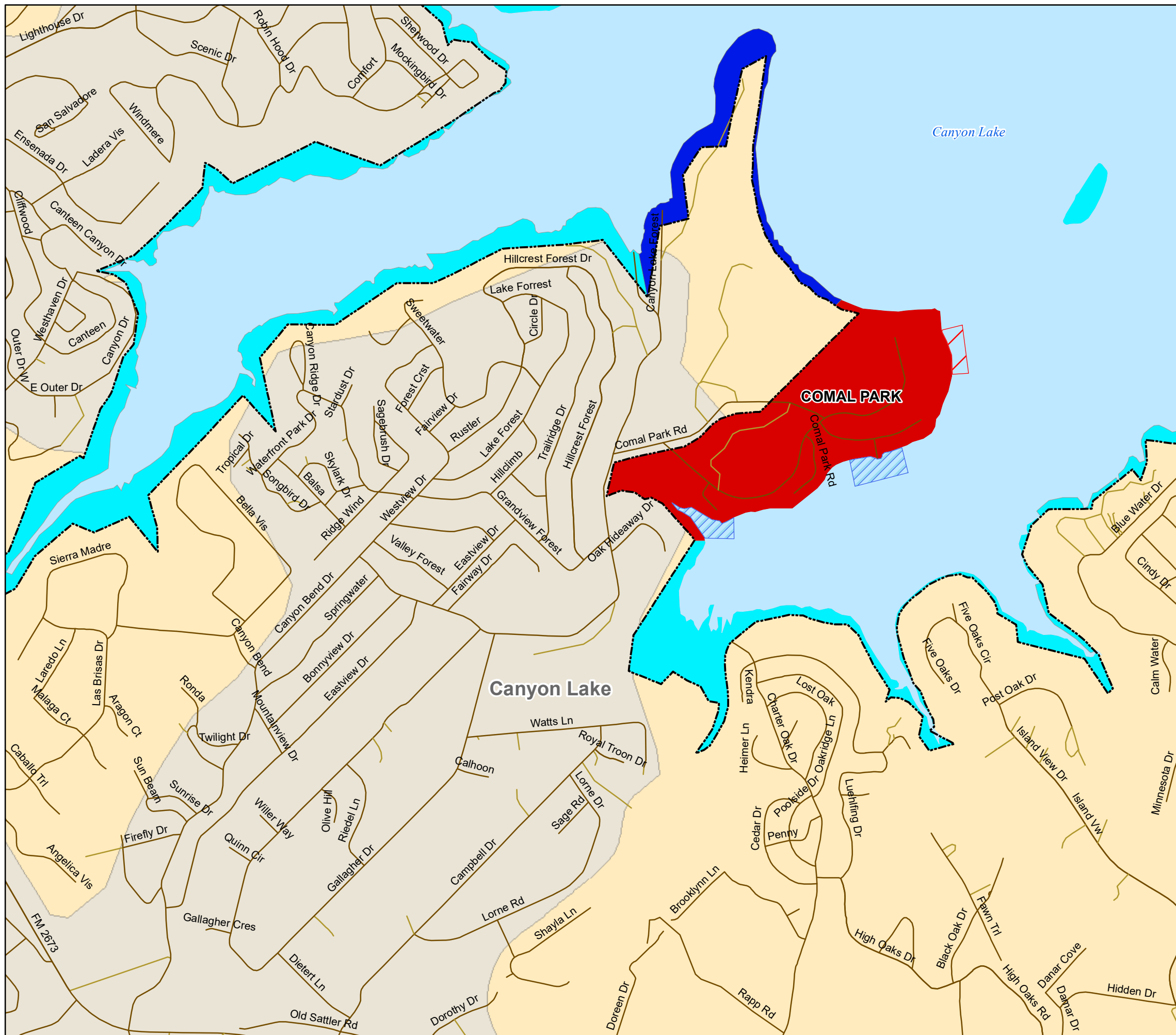
LAND CLASSIFICATION (INDEX SHEET 11)








0 750 1,500 3,000
Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-11
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-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE: OPEN RECREATION
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT



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


FORT WORTH DISTRICT

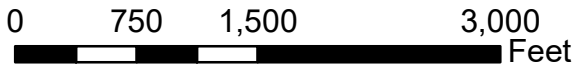
CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

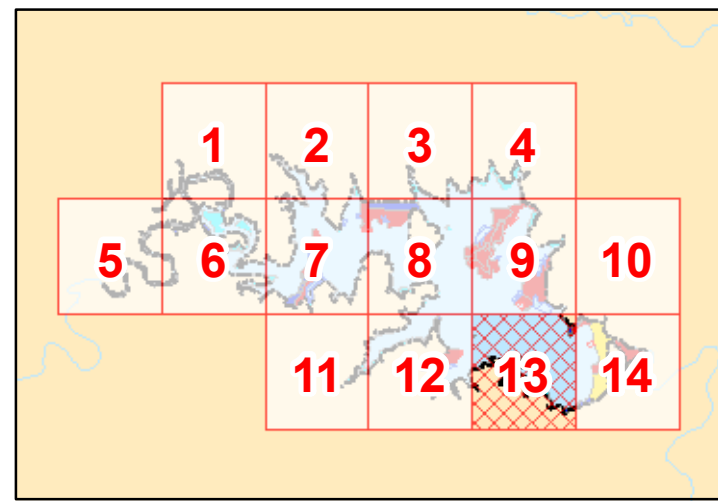
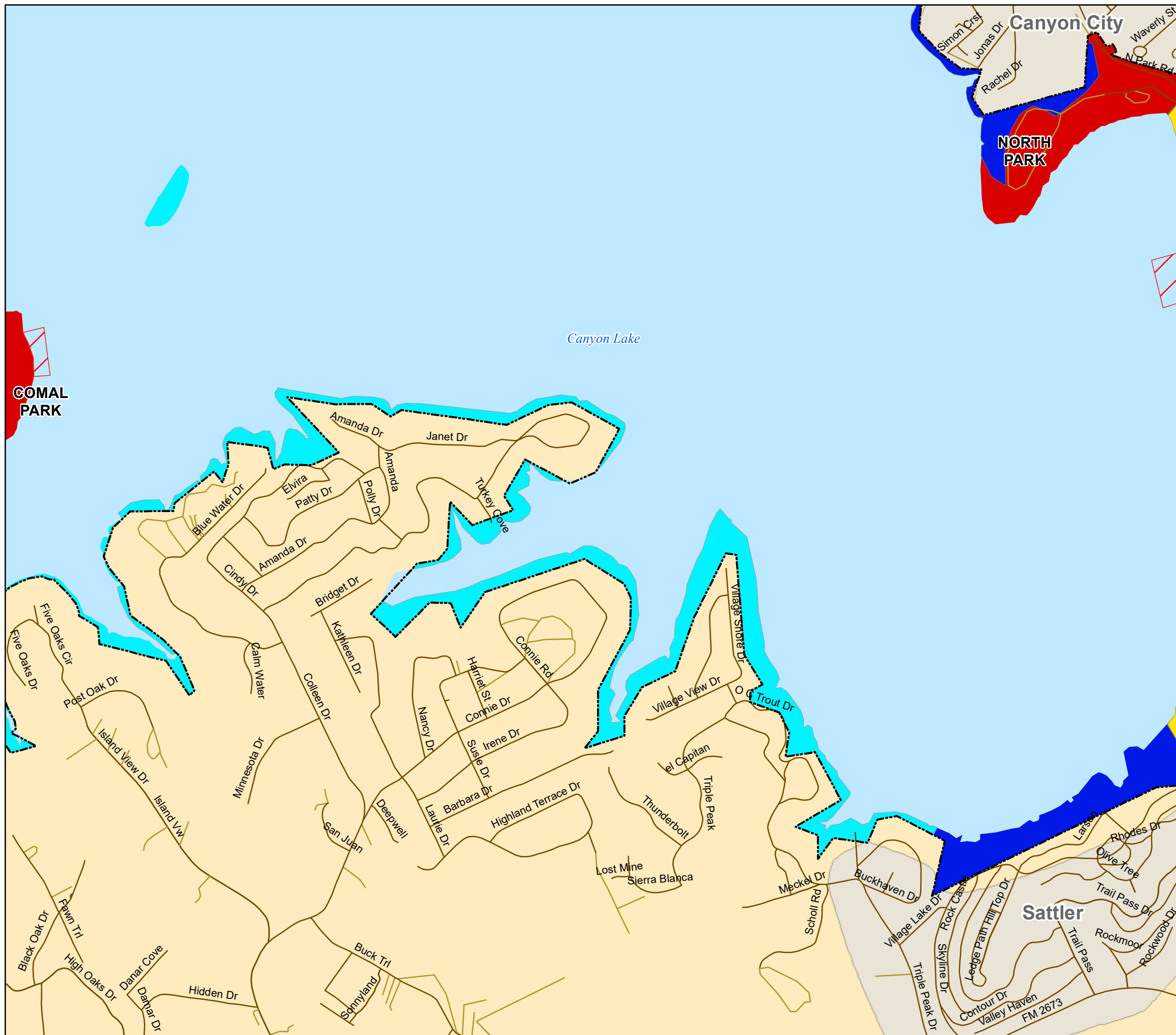
LAND CLASSIFICATION (INDEX SHEET 12)






0 750 1,500 3,000
Feet

DATE:	MAP NO.
NOVEMBER 2017	CN16MP-OC-12



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



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


FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR
GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

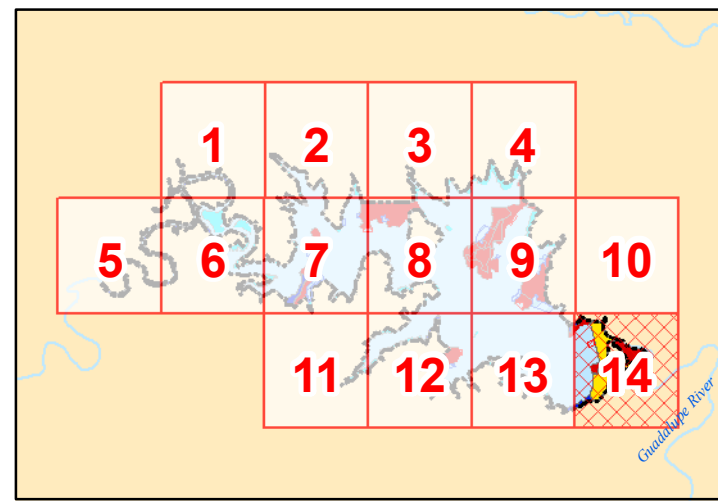
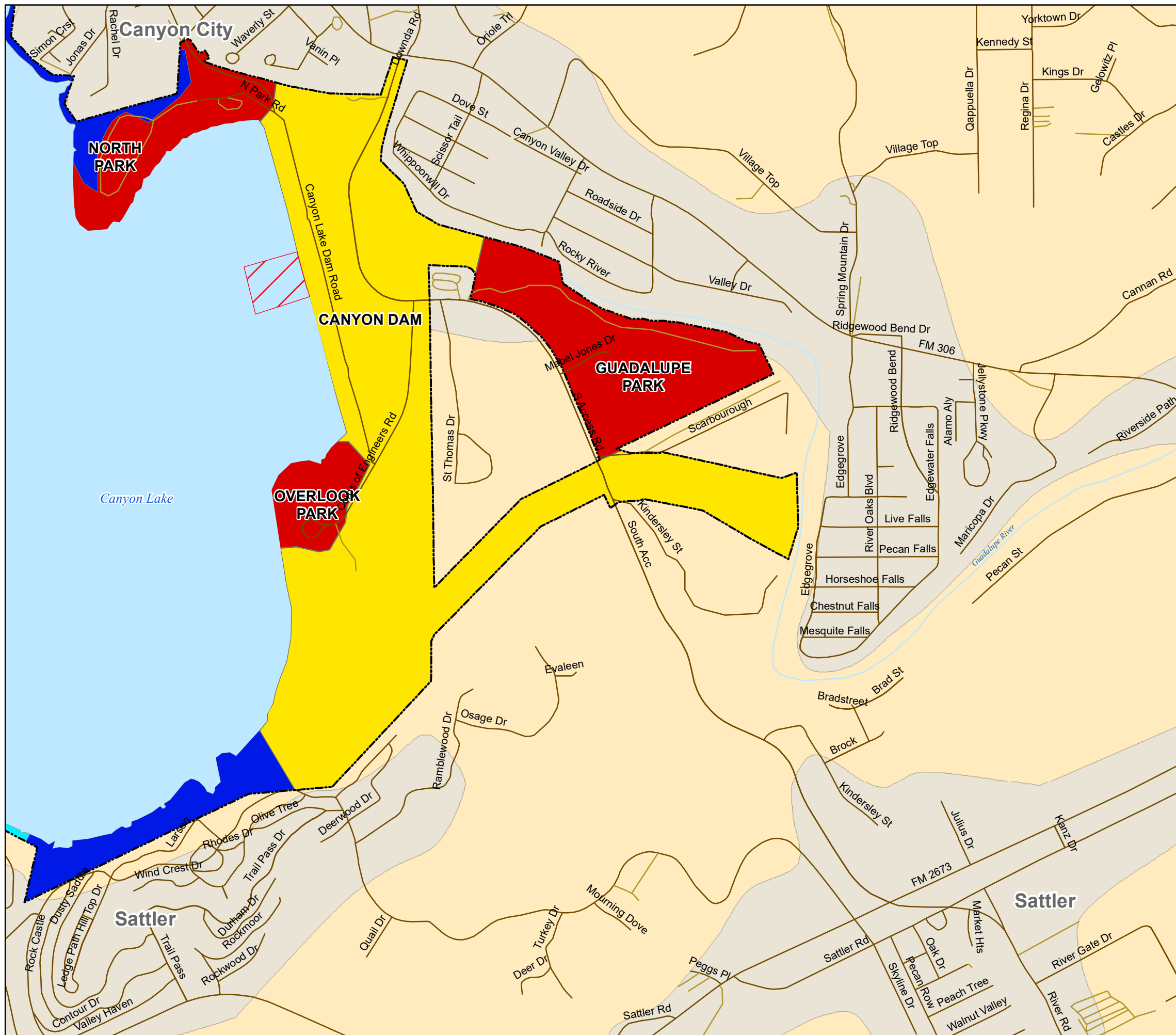
LAND CLASSIFICATION (INDEX SHEET 13)





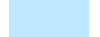








0 750 1,500 3,000

Feet

DATE: NOVEMBER 2017	MAP NO. CN16MP-OC-13
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-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: FISH AND WILDLIFE SANCTUARY
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  WATER SURFACE: OPEN RECREATION
-  PROJECT OPERATIONS
-  HIGH DENSITY RECREATION
-  ENVIRONMENTALLY SENSITIVE AREAS
-  LOW DENSITY RECREATION
-  VEGETATIVE MANAGEMENT




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

FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE MASTER PLAN

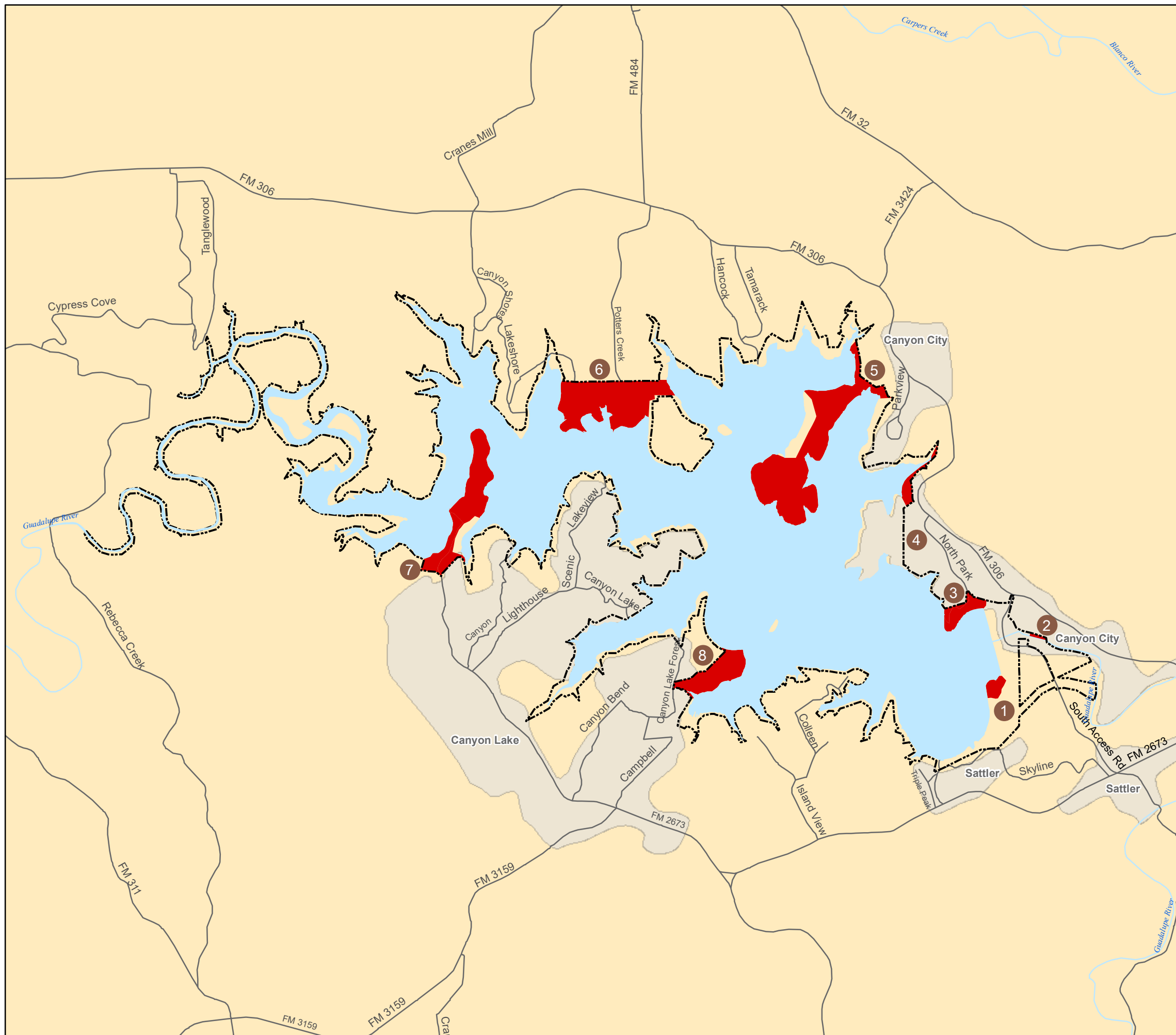
LAND CLASSIFICATION (INDEX SHEET 14)




0 750 1,500 3,000

Feet

DATE: <p style="text-align: center;">JULY 2017</p>	MAP NO. <p style="text-align: center;">CN16MP-OC-14</p>
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- 1 OVERLOOK PARK
- 2 GUADALUPE PARK
- 3 NORTH PARK
- 4 JACOBS CREEK PARK
- 5 CANYON PARK
- 6 POTTERS CREEK PARK
- 7 CRANES MILL PARK
- 8 COMAL PARK



**U.S. ARMY CORPS
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FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

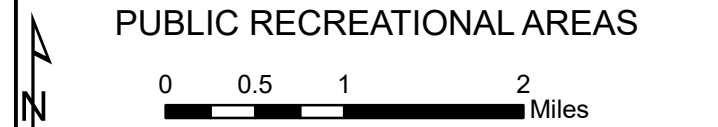
USACE MANAGED
PUBLIC RECREATIONAL AREAS

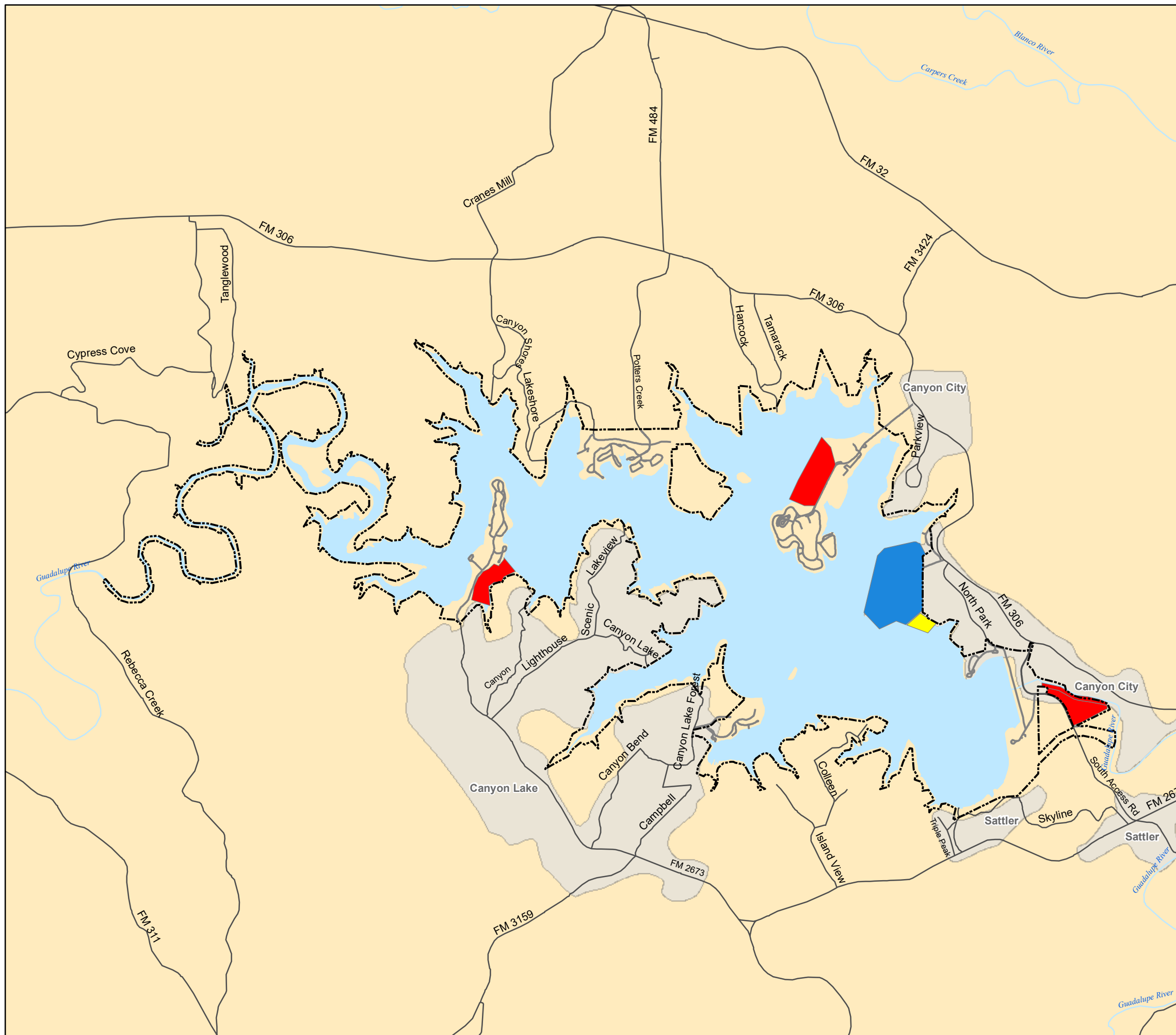
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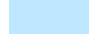
NOVEMBER 2017


MAP NO.

CN16MP-OR-0A





-  FEE BOUNDARY
-  CONCESSION LEASE REC AREA / OPEN TO PUBLIC
-  PRIVATE LEASE REC AREA / NOT OPEN TO PUBLIC
-  QUASI PUBLIC / SPECIAL INTEREST / NON-COMMERCIAL
-  WATER SURFACE




**U.S. ARMY CORPS
OF ENGINEERS
FORT WORTH DISTRICT**


CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

PRIVATELY MANAGED RECREATIONAL AREAS







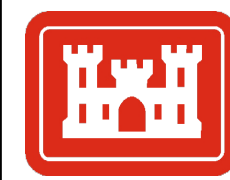
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Miles

DATE: NOVEMBER 2017	MAP NO. CN16MP-OR-0B
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ITEM	EXISTING
BOAT RAMP	
COURTESY DOCK	
GROUP CAMPSITES	
CAMPSITES	
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	
PICNIC SITES	
VAULT TOILET	
RESTROOMS	1
SHOWERS	
DUMP STATION	

 FEE BOUNDARY
 RESTROOM



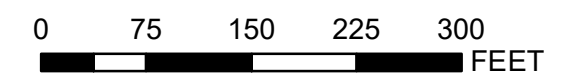
**U.S. ARMY CORPS
 OF ENGINEERS
 FORT WORTH DISTRICT**

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

RECREATIONAL AREAS
(OVERLOOK PARK)





DATE:
 NOVEMBER 2017

MAP NO.
 CN16MP-OR-01

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

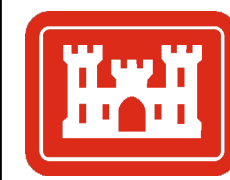


ITEM	EXISTING
BOAT RAMP	
COURTESY DOCK	
GROUP CAMPSITES	
CAMPSITES	
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	
PICNIC SITES	
VAULT TOILET	
RESTROOMS	
SHOWERS	
DUMP STATION	

-  FEE BOUNDARY
-  CONCESSION LEASE REC AREA / OPEN TO PUBLIC

GUADALUPE RIVER TRAIL

HIDDEN VALLEY SPORTS PARK
COMAL COUNTY



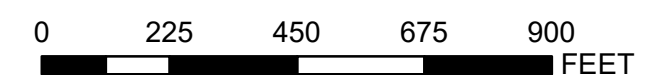
**U.S. ARMY CORPS
OF ENGINEERS
FORT WORTH DISTRICT**

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

RECREATIONAL AREAS
(GUADALUPE PARK)








DATE:
NOVEMBER 2017

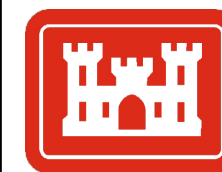
MAP NO.
CN16MP-OR-02

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



ITEM	EXISTING
BOAT RAMP	
COURTESY DOCK	
GROUP CAMPSITES	
CAMPSITES	19
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	
PICNIC SITES	
VAULT TOILET	1
RESTROOMS	
SHOWERS	
DUMP STATION	

-  FEE BOUNDARY
-  ENTRANCE STATION
-  CAMPSITE, TENT
-  SWIM BEACH
-  VAULT TOILET



**U.S. ARMY CORPS
OF ENGINEERS
FORT WORTH DISTRICT**

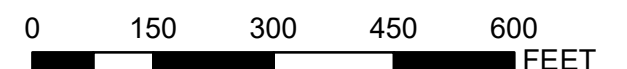
CANYON LAKE DAM AND RESERVOIR

GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

RECREATIONAL AREAS
(NORTH PARK)

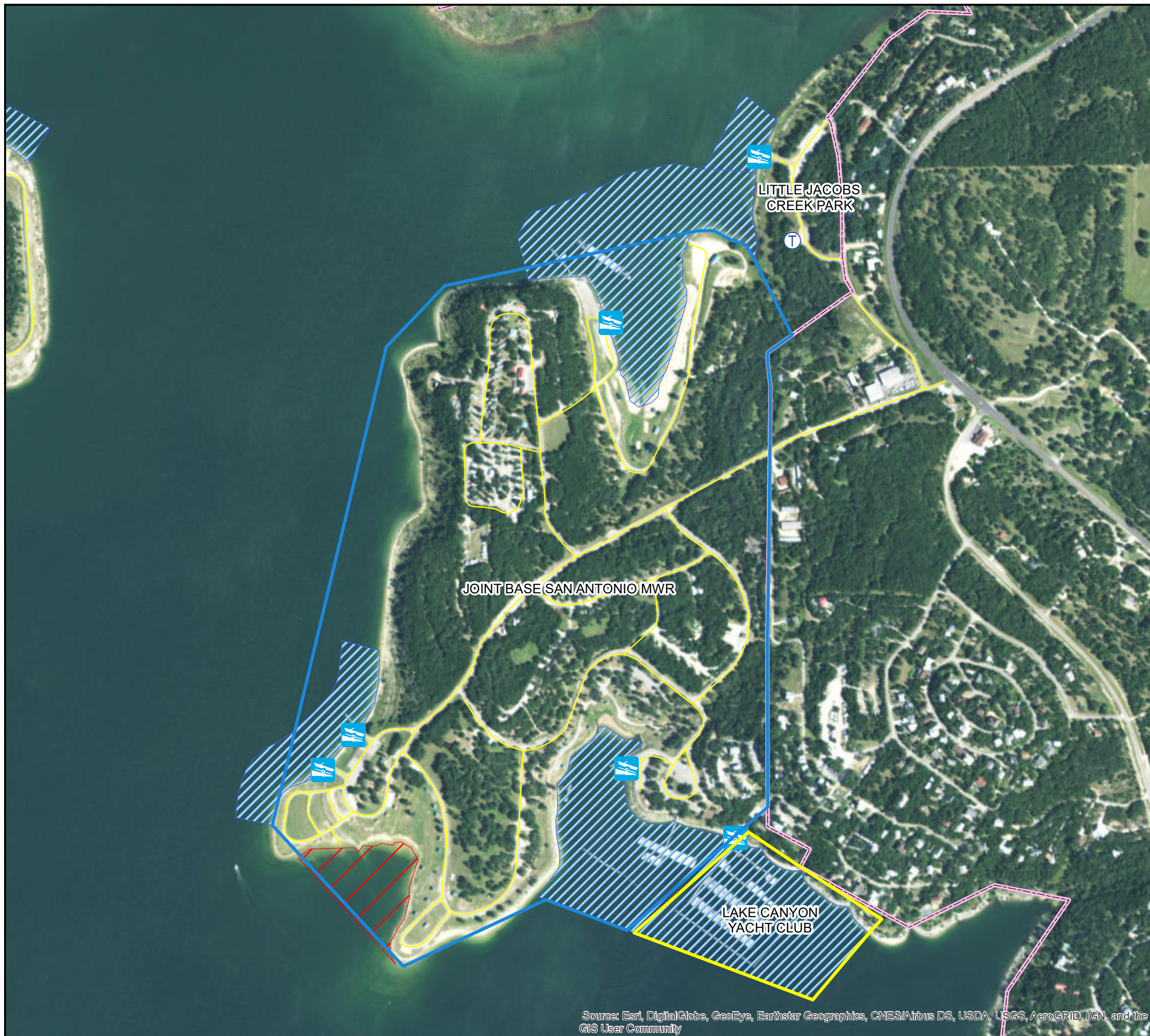


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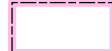






NOVEMBER 2017

MAP NO.

CN16MP-OR-03



ITEM	EXISTING
BOAT RAMP	4
COURTESY DOCK	3
GROUP CAMPSITES	30
CAMPSITES	
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	
PICNIC SITES	216
VAULT TOILET	1
RESTROOMS	
SHOWERS	
DUMP STATION	

-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  PRIVATE LEASE REC AREA / NOT OPEN TO PUBLIC
-  QUASI PUBLIC / SPECIAL INTEREST / NON-COMMERCIAL
-  BOAT RAMPS
-  VAULT TOILET



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

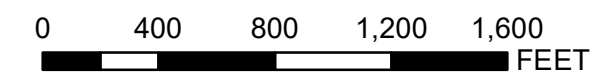
FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

**RECREATIONAL AREAS
(JACOBS CREEK PARK)**
















DATE:	MAP NO.
NOVEMBER 2017	CN16MP-OR-04

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



ITEM	EXISTING
BOAT RAMP	1
COURTESY DOCK	1
GROUP CAMPSITES	2
CAMPSITES	155
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	1
PICNIC SITES	
VAULT TOILET	12
RESTROOMS	
SHOWERS	
DUMP STATION	

-  FEE BOUNDARY
-  CONCESSION LEASE REC AREA / OPEN TO PUBLIC
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  CAMPSITES, TENT
-  CAMPSITES, GROUP
-  ENTRANCE STATION
-  BOAT RAMPS
-  COURTESY DOCK
-  SWIM BEACH
-  GROUP SHELTERS
-  VAULT TOILET



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



FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR
GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

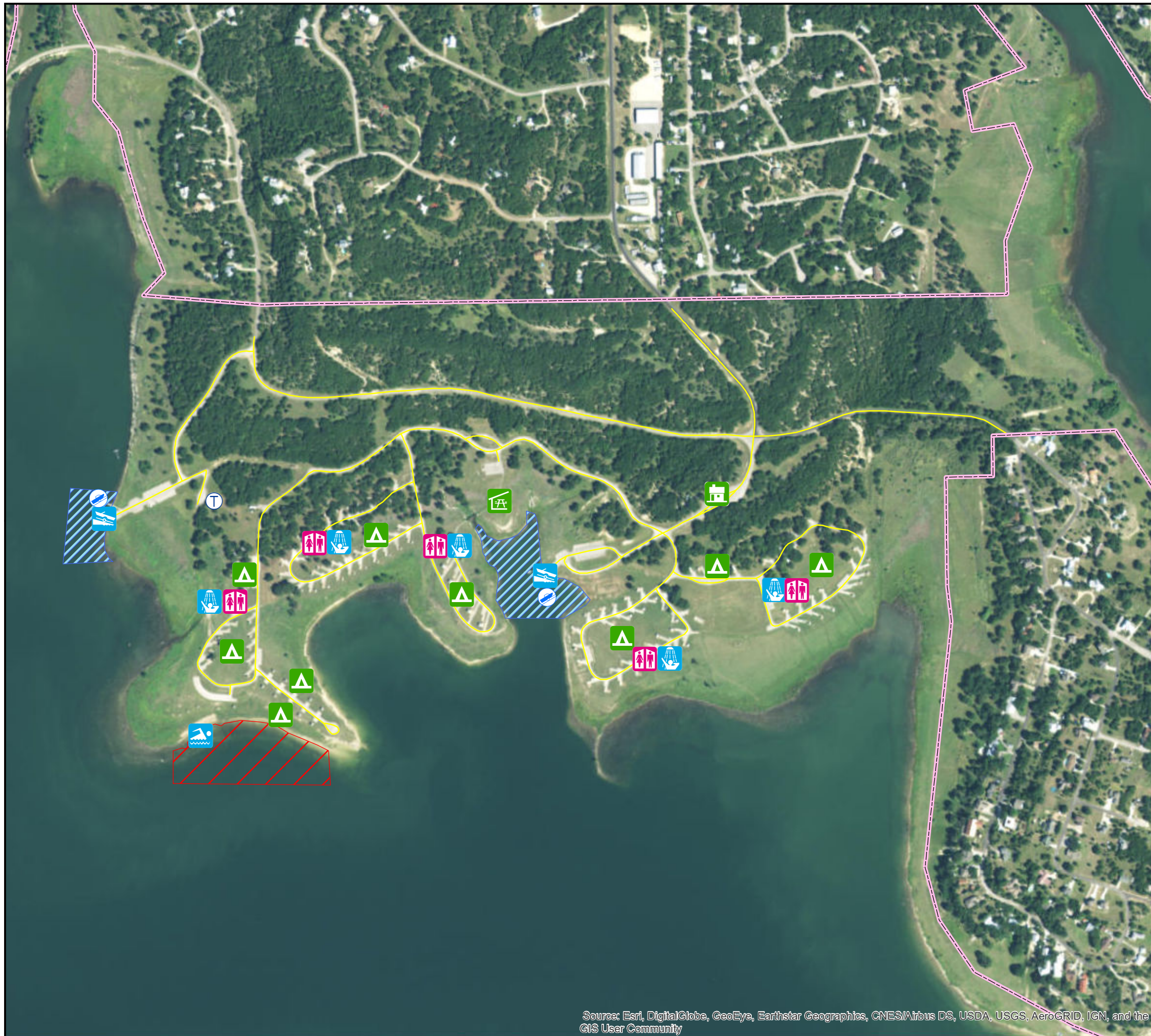
**RECREATIONAL AREAS
(CANYON PARK)**













DATE:
NOVEMBER 2017


MAP NO.
CN16MP-OR-05

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



ITEM	EXISTING
BOAT RAMP	2
COURTESY DOCK	1
GROUP CAMPSITES	17
CAMPSITES	132
ELECTRICAL HOOK-UP	131
GROUP PICNIC SHELTER	
PICNIC SITES	
VAULT TOILET	1
RESTROOMS	5
SHOWERS	5
DUMP STATION	2

-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  ENTRANCE STATION
-  CAMPSITES
-  BOAT RAMPS
-  COURTESY DOCK
-  SWIM BEACH
-  GROUP SHELTERS
-  RESTROOM
-  SHOWERS
-  VAULT TOILET



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

FORT WORTH DISTRICT

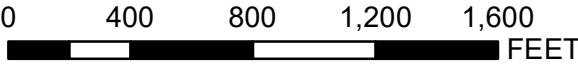
CANYON LAKE DAM AND RESERVOIR GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

RECREATIONAL AREAS
(POTTERS CREEK PARK)

N













DATE: NOVEMBER 2017	MAP NO. CN16MP-OR-06
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



ITEM	EXISTING
BOAT RAMP	1
COURTESY DOCK	1
GROUP CAMPSITES	
CAMPSITES	64
ELECTRICAL HOOK-UP	59
GROUP PICNIC SHELTER	
PICNIC SITES	
VAULT TOILET	
RESTROOMS	3
SHOWERS	2
DUMP STATION	1

-  FEE BOUNDARY
-  CONCESSION LEASE REC AREA / OPEN TO PUBLIC
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  ENTRANCE STATION
-  CAMPSITES
-  BOAT RAMPS
-  COURTESY DOCK
-  RESTROOM
-  SHOWERS



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


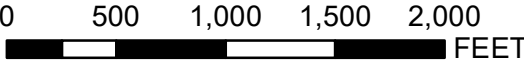
FORT WORTH DISTRICT

CANYON LAKE DAM AND RESERVOIR
GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

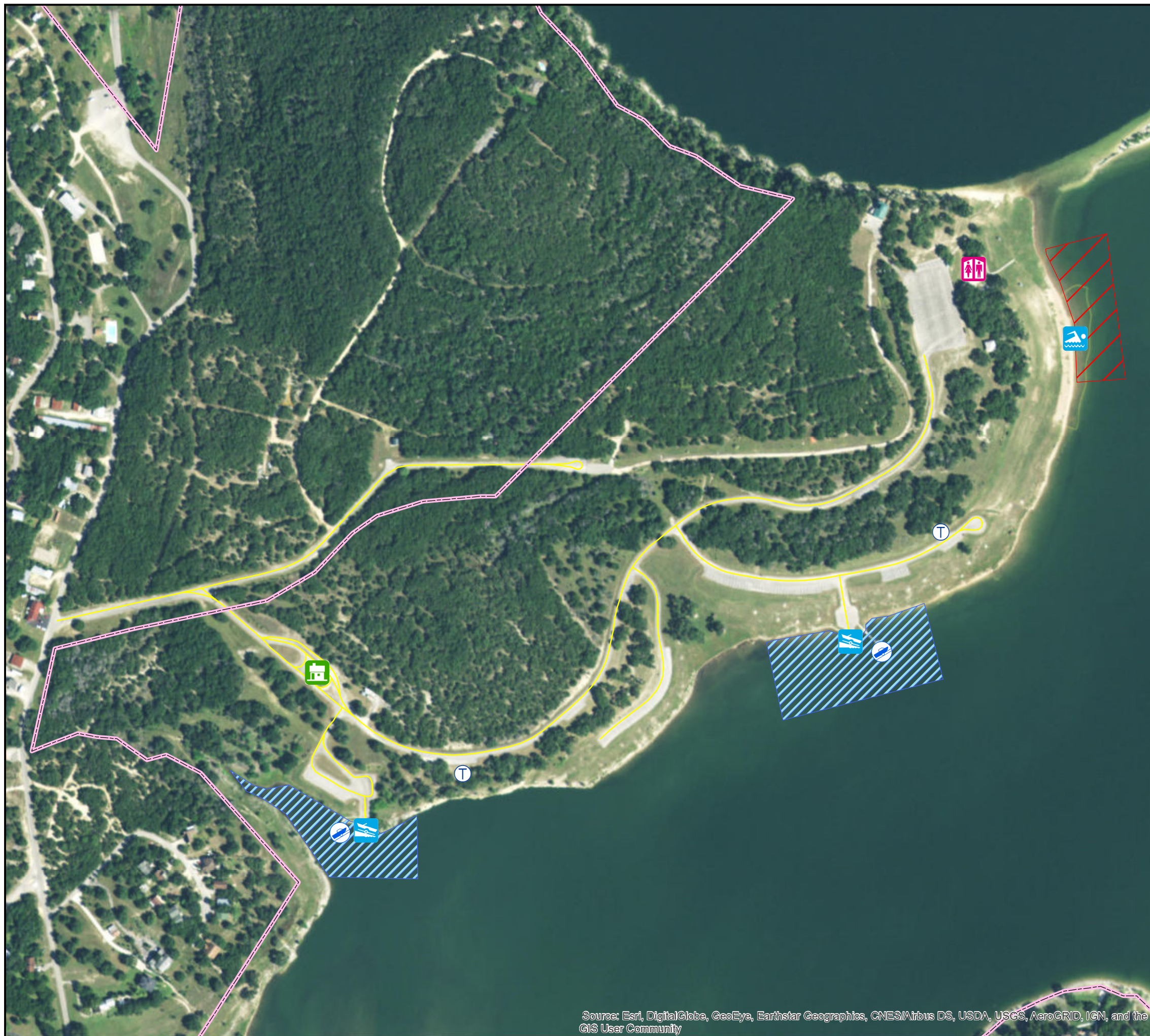
RECREATIONAL AREAS
(CRANES MILL PARK)










DATE:
NOVEMBER 2017

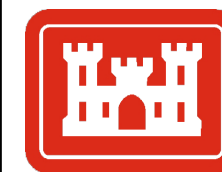
MAP NO.
CN16MP-OR-07

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



ITEM	EXISTING
BOAT RAMP	2
COURTESY DOCK	2
GROUP CAMPSITES	
CAMPSITES	
ELECTRICAL HOOK-UP	
GROUP PICNIC SHELTER	
PICNIC SITES	55
VAULT TOILET	2
RESTROOMS	1
SHOWERS	
DUMP STATION	

-  FEE BOUNDARY
-  WATER SURFACE: RESTRICTED
-  WATER SURFACE: DESIGNATED NO WAKE AREAS
-  ENTRANCE STATION
-  BOAT RAMPS
-  COURTESY DOCK
-  SWIM BEACH
-  RESTROOM
-  VAULT TOILET



**U.S. ARMY CORPS
OF ENGINEERS
FORT WORTH DISTRICT**

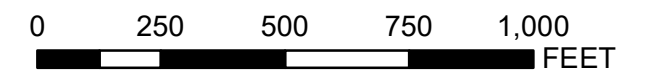
CANYON LAKE DAM AND RESERVOIR

GUADALUPE RIVER, TEXAS

CANYON LAKE DAM AND RESERVOIR

CANYON LAKE MASTER PLAN

RECREATIONAL AREAS
(COMAL PARK)



DATE:

NOVEMBER 2017

MAP NO.

CN16MP-OR-08

APPENDIX B - NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DOCUMENTATION

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Environmental Assessment for the Canyon Lake Master Plan Guadalupe River Basin



**Comal County, Texas
December 2017**



**US Army Corps
of Engineers®**
Fort Worth District

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**FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT FOR THE
CANYON LAKE MASTER PLAN
GUADALUPE RIVER BASIN
COMAL COUNTY, TEXAS**

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

The revised Master Plan will provide guidance for stewardship of natural resources and management for long-term public access to, and use of, the natural resources of Canyon Lake, 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 land uses would not be revised. With this alternative, no new resources analysis or land-use classifications would occur. The operation and management of Canyon Lake 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 classification changes associated with the Proposed Action include the following:

Proposal	Description	Justification
Project Operations (PO)	No Project Operations Lands were reclassified.	
High Density Recreation (HDR)	Lands under the prior classification of Recreational Areas were converted to the new and similar classification of High Density Recreation but were reduced from 1,550 to 1,405 acres through the following reclassifications:	The 145 park acres that were reclassified to ESA Historically, these lands have been managed for the benefit of wildlife and are places where GCWA habitat exists. These lands are more appropriately classified as ESA lands. The conversion of these lands will have no effect on current

Proposal	Description	Justification
	<ul style="list-style-type: none"> ○ 10 acres in North Park to ESA for scenic quality and GCWA habitat to ESA ○ 43 acres in Cranes Mill Park from HDR to ESA from crappie dock to the Cranes Mill Park boundary for GCWA habitat conservation ○ 92 acres north of Potters Creek park to ESA for scenic area, habitat, and buffer zone 	<p>or projected public use.</p>
<p>Environmentally Sensitive Areas (ESA)</p>	<p>The classification of 430 acres as Environmentally Sensitive Areas resulted from the following land classification changes:</p> <ul style="list-style-type: none"> ○ Renaming the existing 285 acres of Aesthetics to ESA for unique aesthetics and cultural sites ○ Reclassifying 145 acres of HDR to ESA due to areas designated by U.S. Fish and Wildlife Service (USFWS) as important habitat for the endangered Golden-cheeked Warbler (GCWA) 	<p>These classification changes were necessary to recognize those areas at the project having the highest ecological value, including areas of high value for protection of important habitat for the endangered GCWA as designated by the USFWS, to protect unique views, and cultural and archeological sites, specifically the spillway and gorge.</p> <p>The conversion of lands will have little to no effect on current or projected public use. Lands classified as ESA are given the highest order of protection among possible land.</p>
<p>MRML – Low Density Recreation (LDR)</p>	<p>The 1,097 acres designated as Low Density Recreation were acres of the former classification of Aesthetic</p>	<p>The land areas in the former classification of Aesthetic were retained as Low Density Recreation in areas where the historic land use patterns supported that retention. The conversion of these lands will have no effect on current or projected public use.</p>

Proposal	Description	Justification
Water Surface	<p>The classification of 8,306 acres of water surface of the lake at the conservation pool elevation is as follows:</p> <ul style="list-style-type: none"> ○ 31 acres of Restricted water surface at Canyon Lake include the water surface in front of the intake structure at the control tower at Canyon Dam and designated swimming areas in the parks around Canyon Lake (swim beaches at Joint Base San Antonio Rec Area, Canyon Park, Potters Creek, and Comal). Buoys mark the line in front of the dam. Keep-out buoys and floating barrier pipes mark the designated swimming areas in each park. ○ 178 acres of Designated No-Wake areas are in place near the 23 boat ramps and two marina areas at Canyon Lake. ○ There are 8,097 acres of Open Recreation water surface at Canyon Lake. 	<p>Previous master plans for Canyon Lake did not specify different classifications on the water surface, though these classifications were recognized in practice. This master plan revision recognizes and specifies these uses. The classification of water surfaces will have no effect on current or projected public use</p>

(1)The land classification changes described in this table are the result of changes to several 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.

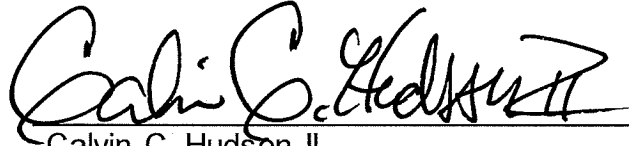
The Environmental Assessment (EA) and comments received from other agencies have been used to determine whether the Proposed Action requires the preparation of an Environmental Impact Statement (EIS). All environmental, social, and economic factors that are relevant to the recommended alternative were 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, health and safety, 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 Canyon Lake will have no significant adverse impact on the environment and will not constitute a major Federal action significantly affecting the quality of the human or natural environment. Therefore, an EIS will not be prepared.

26 MAR 18

Date



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

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ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the effects of revising the Master Plan for Canyon Lake. The EA will facilitate the decision-making process regarding the Proposed Action and alternatives.

- SECTION 1 INTRODUCTION* of the Proposed Action summarizes the purpose of and need for the Proposed Action, provides relevant background information, and describes the scope of the EA.
- SECTION 2 PROPOSED ACTION AND ALTERNATIVES* examines alternatives for implementing the Proposed Action and describes the recommended alternative.
- SECTION 3 AFFECTED ENVIRONMENT* describes the existing environmental and socioeconomic setting. *ENVIRONMENTAL CONSEQUENCES* identifies the potential environmental and socioeconomic effects of implementing the Proposed Action and alternatives.
- SECTION 4 CUMULATIVE IMPACTS* describes the impact on the environment that may result from the incremental impacts of the Proposed Action when added to other past, present, and reasonably foreseeable actions.
- SECTION 5 COMPLIANCE WITH ENVIRONMENTAL LAWS* provides a listing of environmental protection statutes and other environmental requirements.
- SECTION 6 IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES* identifies any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented.
- SECTION 7 PUBLIC AND AGENCY COORDINATION* provides a listing of individuals and agencies consulted during preparation of the EA.
- SECTION 8 REFERENCES* provides bibliographical information for cited sources.
- SECTION 9 ACRONYMS/ABBREVIATIONS*
- SECTION 10 LIST OF PREPARERS* identifies persons who prepared the document and their areas of expertise.
- APPENDIX A NEPA Coordination and Scoping*

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ENVIRONMENTAL ASSESSMENT

Master Plan Revision

Canyon Lake
Guadalupe River Basin
Comal County, Texas

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

The Canyon Lake project (including the lake and dam) is located in Comal County, Texas on the Guadalupe River, approximately 12 miles northwest of New Braunfels, Texas. The Canyon Lake dam extends in a north-south direction for a distance of approximately 1.3 miles. The dam and associated infrastructure, as well as all lands acquired for the Canyon Lake project, are Federally-owned and are administered by the U.S. Army Corps of Engineers (USACE).

Canyon Lake, formerly designated as Canyon Reservoir, was authorized by the River and Harbor Act of March 02, 1945 (Public Law 14, 79th Congress, 1st Session) and modified by the Flood Control Act of September 3, 1945 (Public Law 780, 83^d Congress, 2^d Session) to provide authority for local cash contributions during construction and to permit the construction of hydroelectric power facilities at non-Federal expense. Authority for the recreation program was granted under the Flood Control Act of December 22, 1944 (58 Stat. 889) as amended. Authority for the fish and wildlife program granted under the Fish and Wildlife Coordination Act of 1958 as amended. In October of 1957, the Federal Government contracted with the Guadalupe-Blanco River Authority granting them the right to use storage space between 909.0 mean sea level (msl), the top of the conservation pool, and 800.0 msl.

The dam and reservoir construction began in 1958 and was completed in 1964, and then was classified as 100% complete as of June 30, 1970, with the exception of additional recreation facilities. A contract for the embankment was awarded in the summer of 1960, and deliberate impoundment was initiated on June 16, 1964, reaching the top of the conservation pool level (909.0 msl) in April 1968. The Canyon Lake project is operated by USACE.

The dam consists of a rolled earthfill dam, 6,830 feet long, 224 feet high, with uncontrolled spillway, 1,260 feet wide saddle, one 10-foot diameter conduit controlled by 5 feet 8 inch x 10 feet slide gates, and flood control storage of 354,600 acre-feet. The dam is the tallest earth embankment built by USACE in Texas. The project also has eight recreation areas.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The Canyon Lake Master Plan, originally published in 1962 as Design Memorandum (DM) 9B, then revised as DM 9C in 1970, was sufficient for prior land use planning and management, but many changes are affecting the region. Outdoor recreation trends, regional land use, population, current legislative requirements and USACE management policy have evolved. In order to record the most current land uses, reflect land classifications associated with day-to-day operations, and measure any potential impacts resulting from land and recreation management actions relating to Canyon Lake (also referred to as the 'Project'), it is necessary to revise the existing Master Plan. Revision of the existing Master Plan is also needed to ensure compliance with USACE regulations and guidance.

The USACE began planning to revise the Canyon Lake Master Plan in late 2015. The objectives for a Master Plan revision were to 1) Revise land classifications to reflect public use trends, regional natural resource priorities and changes in USACE land management policies since 1970, 2) Prepare new resource management objectives, 3) Prepare a resource management plan for each land classification and 4) Revise the Master Plan to reflect current agency requirements for Master Plan documents in accordance with Engineer Regulation (ER) 1130-2-550, Change 7, 30 January 2013, and EP 1130-2-550, Change 5, 30 January 2013.

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

- Changes in national policies or public law mandates
- Operations and maintenance budget allocations
- Recreation area closures
- Facility and infrastructure improvements
- 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 recreation area comment card program

As part of the master planning process, the project delivery team evaluated public comments and current land uses, determined any necessary changes to land classifications, and formulated proposed alternatives. As a result of public coordination and a public information meeting, 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 Master Plan revision for Canyon Lake. The alternative considerations were formulated to include all of Canyon Lake 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 (1988).

PROPOSED ACTION AND ALTERNATIVES

The Project need is to revise the existing 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 classifications: Project Operations, High Density Recreation (HDR), Mitigation, Environmentally Sensitive Areas (ESAs), and Multiple Resource Managed Lands (MRML). MRMLs are divided into four subcategories: Low Density Recreation (LDR), Wildlife Management (WM), Vegetative Management (VM), and Future/Inactive Recreation Areas.

The Preferred Alternative or Proposed Action evaluated in this EA is compared to the No Action Alternative. The USACE guidance recommends the establishment of resource goals and objectives for purposes of development, conservation, and management of natural, cultural, and man-made resources for a project. Goals describe the desired end state of overall management efforts, whereas objectives are concise statements describing measurable and attainable management activities that support the stated goals. Goals and objectives are guidelines for obtaining maximum public benefits while minimizing adverse impacts on the environment and are developed in accordance with 1) authorized project purposes, 2) applicable laws and regulations, 3) resource capabilities and suitabilities, 4) regional needs, 5) other governmental plans and programs, and 6) expressed public desires. The five project-wide resource goals established for Canyon Lake that were used in determining the Proposed Action, as well as the nationwide USACE Environmental Operating Principles, are detailed in Section 3.1 of the Master Plan.

2.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

The No Action Alternative serves as a basis for comparison to the anticipated effects of the other action alternatives, and its inclusion in this EA is required by NEPA and CEQ regulations (40 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 Canyon Lake would continue as outlined in the current Master Plan. No new resource analysis or land-use classifications would occur at the Project.

2.2 ALTERNATIVE 2: PROPOSED ACTION

Under 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 foreseeable 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 objectives, and preparation of a resource plan describing how each land classification would be managed for the foreseeable future (See Figure in Appendix A of the Master Plan). The Proposed Action would result in the following land and water surface reclassifications (Table 2-1) covering all Federal lands at Canyon Lake:

- 333 acres Project Operations
- 1,405 acres HDR
- 430 acres ESA
- 1,097 acres MRML - LDR
- 0 acres MRML - WM
- 0 acres MRML - VM
- 0 acres MRML: Future/Inactive Recreation
- 31 acres Water Surface: Restricted
- 178 acres Water Surface: Designated No-wake
- 0 acres Water Surface: Fish and Wildlife Sanctuary
- 8,097 acres Water Surface: Open Recreation

Note: Acreages were measured using GIS technology and may vary from the official land acquisition records. Acreage varies depending on changes in lake levels, sedimentation and shoreline erosion. Total Water Surface: 8,307 acres - Miles of Shoreline: 95 miles.

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 2.1.

Table 2.1 Reclassification Proposals

Proposal	Description	Justification
Project Operations (PO)	No Project Operations Lands were reclassified.	
High Density Recreation (HDR)	Lands under the prior classification of Recreational Areas were converted to the new and similar classification of High Density Recreation but were reduced from 1,550 to 1,405 acres through the following reclassifications: <ul style="list-style-type: none"> ○ 10 acres in North Park to ESA for scenic quality and GCWA habitat to ESA 	The 145 park acres that were reclassified to ESA Historically, these lands have been managed for the benefit of wildlife and are places where GCWA habitat exists. These lands are more appropriately classified as ESA lands. The conversion of these lands will have no effect on current or projected public use.

Proposal	Description	Justification
	<ul style="list-style-type: none"> ○ 43 acres in Cranes Mill Park from HDR to ESA from crappie dock to the Cranes Mill Park boundary for GCWA habitat conservation ○ 92 acres north of Potters Creek park to ESA for scenic area, habitat, and buffer zone 	
Environmentally Sensitive Areas (ESA)	<p>The classification of 430 acres as Environmentally Sensitive Areas resulted from the following land classification changes:</p> <ul style="list-style-type: none"> ○ Renaming the existing 285 acres of Aesthetics to ESA for unique aesthetics and cultural sites ○ Reclassifying 145 acres of HDR to ESA due to areas designated by U.S. Fish and Wildlife Service (USFWS) as important habitat for the endangered Golden-cheeked Warbler (GCWA) 	<p>These classification changes were necessary to recognize those areas at the project having the highest ecological value, including areas of high value for protection of important habitat for the endangered GCWA as designated by the USFWS, to protect unique views, and cultural and archeological sites, specifically the spillway and gorge.</p> <p>The conversion of lands will have little to no effect on current or projected public use. Lands classified as ESA are given the highest order of protection among possible land.</p>
MRML – Low Density Recreation (LDR)	<p>The 1,097 acres designated as Low Density Recreation were acres of the former classification of Aesthetic</p>	<p>The land areas in the former classification of Aesthetic were retained as Low Density Recreation in areas where the historic land use patterns supported that retention. The conversion of these lands will have no effect on current or projected public use.</p>
Water Surface	<p>The classification of 8,306 acres of water surface of the lake at the conservation pool elevation is as follows:</p> <ul style="list-style-type: none"> ○ 31 acres of Restricted water surface at Canyon Lake include the water surface in front of the intake structure at the control tower at Canyon Dam and designated 	<p>Previous master plans for Canyon Lake did not specify different classifications on the water surface, though these classifications were recognized in practice. This master plan revision recognizes and specifies these uses. The classification of water surfaces will have no effect on current or projected public use.</p>

Proposal	Description	Justification
	<p>swimming areas in the parks around Canyon Lake (swim beaches at Joint Base San Antonio Rec Area, Canyon Park, Potters Creek, and Comal). Buoys mark the line in front of the dam. Keep-out buoys and floating barrier pipes mark the designated swimming areas in each park.</p> <ul style="list-style-type: none"> ○ 178 acres of Designated No-Wake areas are in place near the 23 boat ramps and two marina areas at Canyon Lake. ○ There are 8,097 acres of Open Recreation water surface at Canyon Lake. 	

(1)The land classification changes described in this table are the result of changes to several 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

The results of the public scoping process and planning team workshops formed the basis for the preferred alternative. In addition, the planning team determined that the following additional alternative, although ultimately eliminated from further consideration, should be explained to demonstrate that a wider range of alternatives were considered.

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

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

- 333 acres of Project Operations
- 1,550 acres of High Density Recreation
- 1,382 acres of MRML - Low Density Recreation

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

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AFFECTED ENVIRONMENT AND CONSEQUENCES

This section describes the natural and human environments that exist at the project and the potential impacts of the No Action Alternative (Alternative 1) and Proposed Action (Alternative 2), outlined in Section 2.0 of this document. Only those resources that have the potential to be affected by any of the alternatives are described, per CEQ guidance (40 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 or subject matter topic is not located, or is not a factor, within the project area. For example, no body of water in the Canyon Lake watershed is designated as a Federally Wild or Scenic River and no documented hazardous materials or authorized solid waste sites are present on USACE land at Canyon Lake, so these resources/topics 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

Canyon Lake was developed for flood control, water supply, hydroelectric power, recreation, and environmental stewardship and regulation of Guadalupe River flows. The USACE holds fee title to approximately 11,571 acres, and a flowage easement on additional lands up to elevation 948.0 NGVD estimated to be approximately 3,620 acres at Canyon Lake. Land uses associated with Canyon Lake are designated to support the overall goal of providing good stewardship of land and water resources while providing safe recreation opportunities and economic uses to the public. In order to implement authorized purposes and support regional management goals for recreation and natural resources, USACE maximizes resources through the use of cooperative agreements and leases with Federal, state, and local agencies, as well as private commercial recreation providers.

Canyon Lake has approximately 303 recorded outgrants in effect on USACE lands and flowage easements. An outgrant is a broad term used by USACE to describe a variety of real estate instruments wherein an interest in real property has been conveyed by USACE to another party. Outgrants include leases, licenses, easements, consents, permits, and others. Outgrants do not include the Shoreline Use Permits that authorize activities conducted by adjacent landowners, such as vegetation modification. Outgrants are further discussed in the revised Master Plan in Sections 2.6.1, 2.6.3, and 5.3.3.

3.1.1 Alternative 1: No Action Alternative

The No Action Alternative for Canyon Lake is defined as the USACE taking no action, which means the Master Plan would not be revised, and there would be no new resources analysis or land-use classifications. The operation and management of Canyon Lake would continue as outlined in the existing Master Plan. Although this alternative does not result in a Master Plan that meets current guidance and regulations, there would be no significant adverse impacts on land uses on project lands. However, minor long-term adverse impacts would occur if revised land classifications and new resource objectives are not implemented as regional land use trends indicate the continued expansion of urban development.

3.1.2 Alternative 2: Proposed Action

The objectives for revising the Canyon Lake Master Plan are to capture current land use, management, USACE policies, and regional trends and priorities that have evolved to meet day-to-day operational needs. The reclassification changes and 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, 430 acres would be reclassified as ESA compared to the No Action which contains none (see Table 2-1). The ESA reclassifications would afford protection to and potentially benefit wildlife, wildlife habitats, sensitive species habitat, and cultural resources. The protection and appropriate management of these areas aligns with Resource Goals B, C, D, and E as described in Section 3.2 of the revised Master Plan as well as numerous natural

resource objectives listed in Table 3.2 of the revised Master Plan. The reduction of HDR acres occurred in areas of parks with little to no recreational development. No decrease in recreational opportunities is expected. Maintaining the HDR areas and the reclassification of 1,097 acres from aesthetics to MRLM-LDR allows for continued outdoor recreation opportunities at Canyon Lake. New resource goals A, C, and E and several recreational objectives are supported by these reclassifications as described in Section 3.2 and Table 3.1 of the revised Master Plan. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative. The ESA classified areas serve as a direct method to actively manage and protect.

3.2 WATER RESOURCES

3.2.1 Hydrology and Groundwater

Canyon Lake is an impoundment on the Guadalupe River. The Guadalupe River and Canyon Lake drain the central hills and valleys of the Comal County. Cibolo Creek forms the southwestern boundary of the county and is the primary drainage channel for that area. Numerous streams north and east of Canyon Lake flow north into the Blanco River in Hays County. The Balcones Fault zone of the Edwards Aquifer is the primary source of groundwater in Comal County, but the Guadalupe streambed has been cut down below the level of the Edwards Aquifer limestone and thus does not contribute to the aquifers recharge. A brief description of the watershed is given in Sections 1.5 and 2.1.5 of the revised Master Plan as well as the Edwards Aquifer Authority's regulatory authority in the region.

3.2.2 Wetlands

In accordance with standard USACE natural resources inventory requirements, wetlands are inventoried using the USFWS *Classification of Wetlands and Deepwater Habitats of the United States*. The majority of wetlands within along the peripheries of the Canyon Lake fee boundary are in the palustrine system in the form of freshwater ponds and emergent and forested/shrub wetlands; however, wetlands classified in the lacustrine and riverine systems are also present (USFWS 2017). Table 3.1 lists the acreages of various types of wetlands present at Canyon Lake. Wetlands classified as palustrine are nontidal and are dominated by trees, shrubs, emergents, mosses, or lichens. Within these three systems (palustrine, lacustrine, and riverine), wetlands have been further classified by wetland type. The wetlands in the vicinity of Canyon Lake are also subject to different hydrologic regimes, including seasonally flooded, semi-permanently flooded, and permanently flooded.

Table 3.1 Wetland Classes

System	Wetland Type	Class Acres
Lacustrine	Lake	8124
Palustrine	Freshwater Forested/Shrub Wetland	97
Palustrine	Freshwater Emergent Wetland	33
Palustrine	Freshwater Pond	6
Riverine	Riverine	36

3.2.3 Water Quality

Water quality at Canyon Lake is dependent upon many factors as described in Section 2.2.8 of the revised Master Plan. Three named water body segments were identified using Texas Commission on Environmental Quality's (TCEQ) Surface Water Quality Viewer (TCEQ, 2017). Various water quality characteristics of water bodies identified in the viewer are monitored by TCEQ.

The Guadalupe River above Canyon Lake (Segment ID 1806) stretches from a point 1.7 miles downstream of Rebecca Creek Road in Comal County to the confluence of North Fork Guadalupe River and the South Fork Guadalupe River in Kerr County. Canyon Lake (Segment ID 1805) spans from Canyon Dam in Comal County to a point 1.7 downstream of Rebecca Creek Road in Comal County, up to normal pool elevation of 909 feet. Guadalupe River above Canyon Dam (Segment ID 1812) is described as from the confluence of the Comal River in Comal County to Canyon Dam in Comal County.

Under Sections 303(d) and 305(d) of the Clean Water Act, TCEQ compiles all water bodies in or bordering Texas for which effluent limitations are not stringent enough to implement water quality standards, and for which the associated pollutants are suitable for measurement by maximum daily load in a biannual report.

The 2014 Texas Integrated Report—Texas 303(d) list is the most recently published version available. Neither segments of the Guadalupe River described above are found in the 303(d) list. However, since 2006, several subsegments of Canyon Lake have been identified for having mercury in edible tissue. These subsegments include the cove around Jacob's Creek Park (1805_01), the north end of Crane's Mill Park peninsula to the south end of Canyon Park (1805_02), the upper end of the Canyon Lake segment (1805_03), and the lower end of the reservoir from the dam upstream to Canyon Park (1805_04).

3.2.4 Alternative 1: No Action Alternative

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

3.2.5 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of water resources. 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, 430 acres would be reclassified as ESA compared to the No Action which contains none (see Table 2-1). This directly supports resource goals B, D, and E and several natural resource management objectives including minimizing activities that disturb the aesthetic value and protect natural habitat, all of which are further described in Chapter 3 of the revised Master Plan. The reduction of HDR lands from 1,550 acres to 1,405 acres will limit future intensive development, thus reducing

the potential for erosion and sedimentation. Natural vegetation communities act as buffers to trap runoff, thus potentially reducing sedimentation. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

3.3 CLIMATE

Canyon Lake lies in a region characterized by long summers with high temperatures and short, mild winters. Additional climate information for the Canyon Lake area can be found in Section 2.1.2 of the revised Master Plan.

3.3.1 Alternative 1: No Action Alternative

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

3.3.2 Alternative 2: Proposed Action

Revision of the Canyon Lake Master Plan would have a potential long-term beneficial impact on GHG issues. For example, 430 acres would be classified as ESA compared to the No Action (see Table 2-1). The reclassification of lands to ESA 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 1,550 acres to 1,405 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 resource 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 Canyon Lake, the Master Plan and all associated documents would be reviewed and revised as necessary.

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 (CO₂)-equivalent (CO₂e) 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).

Executive Order (EO) 13693 sets forth requirements to be met by Federal agencies. The goal of EO 13693 is to maintain Federal leadership in sustainability and greenhouse gas emission reductions. In general, EO 13693 states Federal agencies shall, where life-cycle cost-effective, promote building energy conservation and

efficiency, steadily increase the use of renewable and alternative energy, improve water use efficiency, and reduce vehicle fleet greenhouse gas emissions.

The USACE has prepared an Adaptation Plan in response to previously existing related EOs and Climate Action Plan. The Adaptation Plan includes the following USACE policy statement:

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

3.4.1 Alternative 1: No Action Alternative

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

3.4.2 Alternative 2: Proposed Action

Under the Proposed Action, current Canyon Lake 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, 430 acres would be classified as ESA compared to the No Action (see Table 2-1). The reclassification of lands to ESA and from Aesthetics and HDR would allow current passive recreational uses to continue on the lands in questions with no net increase in emissions. The overall reduction in HDR acreage from 1,550 acres to 1,405 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 goals, primarily B and C, along with several recreational and natural resource management objectives regarding sustainability are supported by the proposed land classifications and are further described in Chapter 3 of the revised Master Plan. In the event that GHG issues become significant enough to impact the current operations at Canyon Lake, the 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 U.S. Environmental Protection Agency (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 (NO₂); 4) ozone (O₃); 5) particulate matter <10 microns (PM₁₀); and 6) sulfur dioxide (SO₂). Ground level or "bad" O₃ is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) 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 NO_x and VOC (USEPA 2011).

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

The geographical region surrounding the Canyon Lake project, including all USACE-administered lands is located within the State Implementation Plan for the San Antonio area (Comal, Guadalupe, Bexar, and Wilson Counties) (TCEQ, 2017b). Air quality attainment status was accessed on April, 24th, 2017 for the San Antonio area which showed all pollutants in attainment status except for the pending designation for the 2015 standard for Ozone (0.070 ppm). The region meets the National Air Quality Standards for the criteria pollutants designated in the CAA. Consequently, a conformity determination is not required.

Comal County is represented by the Alamo Area Council of Governments (AACOG, the Metropolitan Planning Organization for the San Antonio area), and because this area is vulnerable to being designated as non-attainment for ozone in the near future, the AACOG has applied to and been accepted by USEPA into the USEPA Ozone Advance Program. This program is a collaborative effort between USEPA, states, and local governments to enact expeditious emission reductions to help near non-attainment areas remain in attainment of the NAAQS.

3.5.1 Alternative 1: No Action Alternative

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

3.5.2 Alternative 2: Proposed Action

Existing operation and management of Canyon Lake is compliant with the CAA and would not change with the Master Plan revision. 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, 430 acres would be reclassified as ESA compared to the No Action which contains none (see Table 2-1). The reclassification of lands to ESA from Aesthetics and Recreational Areas would allow current passive recreational uses to continue on the lands in question with no net increase in emissions. The overall reductions in HDR acreage from 1,550 acres to 1,405 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 goals, primarily B and C, along with several recreational and natural resource management objectives regarding sustainability and the conservation of natural areas are supported by the proposed land

classifications and are further described in Chapter 3 of the revised Master Plan. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

Because of the air quality concerns within the project area, USEPA made a recommendation during the public comment period that best management practices be implemented in order to reduce potential short-term air quality impacts associated with construction activities. Furthermore USEPA stated, construction and waste disposal activities should be conducted in accordance with applicable local, state, and federal statutes and regulations. While the Canyon Lake Master Plan is conceptual in nature and does not entail or propose construction or earth moving activities, USACE will implement best management practices to reduce short term air quality impacts on future USACE activities, and work with entities requesting to construct projects on USACE fee lands to implement those best management practices as well.

3.6 TOPOGRAPHY, GEOLOGY, AND SOILS/PRIME FARMLANDS

3.6.1 Topography

Land forms surrounding Canyon Lake feature steep canyon walls and generally rugged topography. Additional topographical descriptions of the Canyon Lake area can be found in Section 2.1.4 of the revised Master Plan.

3.6.2 Geology

The geology of the Canyon Lake area is described in Section 2.1.3 of the revised Master Plan.

3.6.3 Soils/Prime Farmlands

The soil taxonomy developed by the US Department of Agriculture (USDA) and the National Cooperative Soil Survey organizes soils in a hierarchical system including the following categories: Order, Suborder, Great Group, Subgroup, Family and Series. The soil series provides the finest level of detail and is often aggregated into soils associations which combine one or more series. Approximately 21 soil associations have been identified surrounding Canyon Lake. The four most prevalent soils associations that occur on or near USACE lands at Canyon Lake are described in Table 3.2.

Table 3.2 Common Soils Associations and Series Found on USACE Lands at Canyon Lake

Soils Association/Series	Description
Brackett-Rock outcrop-Real Complex	8-30% slopes. Gravelly clay loam, well drained. Ecological site is clay loam. Not prime farmland.
Brackett-Rock outcrop-Comfort Complex	1-8% slopes. Gravelly clay loam. Well drained. Ecological site is low stony hill. Not prime farmland.
Comfort-Rock outcrop complex	1-8% slopes. Extremely stony clay. Well drained. Ecological site is low stony hill. Not prime farmland.
Eckrant-Rock outcrop association	8-30% slopes. Very cobbly clay. Well drained. Ecological site is steep rocky. Not prime farmland.

In general, much of the area consists of soils not considered prime farmland. However, to a lesser extent prime farmland soils such as Bolar and Sunev clay loams are present in the area.

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

3.6.4 Alternative 1: No Action Alternative

The No Action Alternative for Canyon Lake does not involve any activities that would contribute to changes in existing conditions, so there would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on topography, geology, soils or prime farmlands 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.

3.6.5 Alternative 2: Proposed Action

Topography, geology, and soils resources were considered during the process of refining the land reclassifications. No intrusive actions are proposed, and Canyon Lake 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 Canyon Lake 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 with prime or unique farmlands will 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, 430 acres would be reclassified as ESA compared to the No Action which contains none (see Table 2-1). The reduction of Recreation Areas from 1,550 acres to 1,405 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. As described in Chapter 3 of the revised Master Plan, resource goals B, C, D, and E and several natural resource management objectives, particularly those that concern addressing unauthorized uses of public land and evaluating erosion control and addressing sedimentation issues, are supported by the proposed land classifications.

3.7 NATURAL RESOURCES

Natural resources include the fisheries and aquatic resources, vegetation, and wildlife present in the vicinity of Canyon Lake. Outside of the lake and developed parks, the Federal lands at Canyon Lake project consist of relatively small, narrow tracts of land along the shorelines. Lands adjacent to property operated by USACE at Canyon Lake exhibit light to heavy residential and commercial development. While limited, Federal land at Canyon Lake serves as important breeding, refuge, and resting habitat for numerous fauna and flora.

3.7.1 Fisheries and Aquatic Resources

Fish habitat consists of large expanses of water, offshore humps, and limited amounts of standing timber, rock, coarse gravel, and mud or sand flats. Buttonbush (*Cephalanthus occidentalis*) and Willow (*Salix spp.*) are common shrubs along the shorelines in many areas, growing at or above the conservation pool level, and provide good spawning and nursery habitat when seasonally inundated. Aquatic vegetation needed by herbivorous fish is very sparse due to fluctuating water levels and steep topography. Additional habitat includes man-made structures such as riprap and marinas, as well as natural and artificial brush piles.

Further description of aquatic resources can be found in Section 2.2.3 of the revised Master Plan.

3.7.2 Wildlife

The major wildlife habitats are upland forests, bottomland forests, shorelines and wetlands, prairies and grasslands. Each of these vegetative types provides habitat for a variety of organisms. The transition zones between these areas are especially productive. Due to the quantity and diversity of aquatic and terrestrial habitats on public lands around Canyon Lake, there are many opportunities for consumptive recreation (fishing) and non-consumptive recreation (hiking, nature study/wildlife viewing, birdwatching, photography, outdoor education). Canyon Lake public lands are managed by natural resource professionals from USACE to preserve and enhance the natural beauty of the landscapes, manage habitats, promote vegetation succession for diversity and desirable species, control erosion and invasive species, protect Federally listed and state-listed rare and endangered species, and ensure natural wildlife food sources. In general, management efforts aim to improve and sustain the carrying capacity of lands and waters for diverse, healthy populations of native terrestrial and aquatic animal species.

Principal wildlife species include Mourning Dove (*Zenaida macroura*), grey and fox squirrel (*Sciurus carolinensis* and *Sciurus niger*), cottontail rabbit (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*), white-tailed deer (*Odocoileus virginianus*), waterfowl, Wild Turkey (*Meleagris gallopavo*), coyotes (*Canis latrans*), red and gray fox (*Vulpes vulpes* and *Urocyon cinereoargenteus*), skunk (*Mephitidae*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), and bobcat (*Lynx rufus*) among others. The variety of habitats at Canyon Lake also support numerous species of migratory waterfowl and wading birds, migratory neotropical and nearctic birds, upland game birds, raptors, and songbirds.

While hunting opportunities are limited to periodic controlled deer hunting in seasonally closed park areas, at Canyon Lake, fishing is managed in accordance with Federal and state fish and game regulations. Public safety is a top priority on all Project lands and waters.

Management efforts focus on producing native wildlife foods, as well as nesting and foraging habitat. Prescribed burns are conducted when conditions permit.

3.7.3 Vegetative Resources

Canyon Lake sits along the eastern fringe of the Balcones Canyonlands Level IV ecoregion and adjacent to the Northern Blackland Prairie (Omernik, 1987). The upland grasslands, forests, woodlands, and bottomland forests characteristic of these ecoregions cover approximately 2,815 acres of USACE lands.

Small patches of Oak-Juniper woodlands also exist within the Canyon Lake project fee boundary. The golden-cheeked warblers, a small federally endangered passerine bird, only breeds in the old growth Oak-Juniper woodlands of the Texas Hill Country. Urban development throughout their breeding range has led to extensive breeding habitat fragmentation. At Canyon Lake, Canyon, Cranes Mill, Jacob's Creek, and North Parks support small patches of potential breeding habitat for the Golden-cheeked Warbler. The largest stand of high quality Oak-Juniper habitat on Federal property exists along the banks, of the uncontrolled spillway. Golden-cheeked warblers were detected in this area in the spring of 2014. Larger stands of Oak-Juniper woodlands occur outside of, but adjacent to, the Canyon Lake boundary south and southeast of the project office, between North and Jacob's Creek Parks, along the southern bank of Guadalupe River as it flows into Canyon Lake, an area southwest of Crane's Mill Park, and northwest of Comal Park.

Additional vegetation information for Canyon Lake can be found in Section 2.2.1 of the revised Master Plan.

3.7.4 Alternative 1: No Action Alternative

The No Action Alternative for Canyon Lake 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 Hill Country forests, wetlands, prairies, or scenic areas, which could lead to a long-term moderate or major negative impacts as on natural resources as a result of implementing the No Action Alternative.

3.7.5 Alternative 2: Proposed Action

The reclassifications required for the Proposed Action would allow land management and land uses to be compatible with the goals of good stewardship of natural resources. The Proposed Action for revising the Canyon Lake Master Plan would allow project lands to continue supporting the USFWS and Texas Parks and Wildlife Department (TPWD) missions associated with wildlife conservation and implementation of operational practices that would protect and enhance wildlife and fishery populations. As detailed in Table 2-1, 430 acres of land will be reclassified to, in part, recognize the high value of the old growth Oak-Juniper forests of the Texas Hill Country, ensure their preservation, recognize important ecological resources, 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, 430 acres would be reclassified as ESA compared to the No Action (see Table 2-1), this is in direct alignment of several natural resource

management objectives regarding conservation and management of natural areas and as well as resource goals B, C, D, and E as described in Chapter 3 of the revised Master Plan. Reclassification of land to this land use 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 Texas Conservation Action Plan. The new resources objectives will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative.

3.8 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act of 1973 (16 U.S. Code [U.S.C.] § 1531 et seq., as amended) defines an endangered species as a species “in danger of extinction throughout all or a significant portion of its range.” A threatened species is a species “likely to become endangered within the foreseeable future throughout all or a significant portion of its range.” Proposed species are those that have been proposed in the *Federal Register* (FR) to be listed under Section 4 of the Endangered Species Act. Species may be considered endangered or threatened “because of any of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purpose; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affecting continued existence.” USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence. The candidate designation includes those species for which the USFWS has sufficient information to support proposals to list as endangered or threatened under the Endangered Species Act.

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

Table 2.4 in the revised Master Plan lists the species that have potential to occur in the Canyon Lake project area that are Federally-listed as a threatened or endangered species by the USFWS Information for Planning and Consultation report (Consultation Code: 02ETAU00-2016-SLI-0405) (USFWS 2017). Additional information regarding special status species may be found in Section 2.2.4 of the revised Master Plan. The report can be found in Appendix C of the revised Master Plan (USACE 2017). Correspondence with the USFWS is provided in Appendix A of this EA.

The only Federally listed species commonly occurring at Canyon Lake is the Golden-cheeked Warbler (*Dedroica chrysoparia* [GCWA]). The GCWA is a small neotropical songbird that nests exclusively in the Hill Country region of Texas. Adult male GCWAs are identified by their yellow cheek patches outlined in black with a thin black line through each eye. Adult females are similar in appearance, however their feather colors are far less conspicuous. Dense, old growth Oak-juniper woodlands are needed by GCWAs for nesting and forage. Golden-cheeked Warbler habitat information provided by USFWS revealed very little habitat on Federal property, mostly attributed to the narrow footprint of Canyon Lake fee property that surrounds the lake. Section 6.4 of the revised Master Plan further describes the occurrence of GCWAs at Canyon Lake.

Should Federal listing of species change in the future (e.g., delisting of the Golden-cheeked Warbler or other species or listing of new species), habitat management actions will be coordinated with the USFWS. Natural resources needs and management for listed species at Canyon Lake would change accordingly.

3.8.1 Alternative 1: No Action Alternative

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

3.8.2 Alternative 2: Proposed Action

Under the Proposed Action, the USACE would continue cooperative management plans with the USFWS to preserve, enhance, and protect critical wildlife habitat resources. 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, 430 acres would be reclassified as ESA compared to the No Action (see Table 2-1). Reclassification of land to these land use 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 will provide a level of consistency in beneficial management practices that would not occur with the No Action alternative. The ESA classified lands will directly protect and support GCWA habitat, as well as other natural areas at Canyon Lake. The ESA classified lands in the revised Master Plan support resource goals B, C, D, and E and multiple natural resource management objectives including actively managing and conserving GCWA habitat as noted in Chapter 3 of the revised Master Plan.

The Proposed Action would be in compliance with Section 7 of the Endangered Species Act, and any future activities that could potentially result in impacts on Federally listed species will be coordinated with USFWS through Section 7 of the Endangered Species Act.

3.9 INVASIVE SPECIES

Canyon Lake project lands and waters within the Guadalupe River Basin can be a pathway for the introduction of terrestrial and aquatic nuisance species due to the large volume of recreational boaters. Additional information regarding invasive species occurring on Canyon Lake Federal lands and waters is included in Section 2.2.5 of the Master Plan. Aquatic nuisance species considered to be of special concern by the TPWD include the zebra mussel (*Dreissena polymorpha*) and Giant Salvinia (*Salvinia molesta*). While both are present in Texas lakes, neither were known to occur at Canyon Lake until June of 2017 when the presence of zebra mussels was confirmed (TPWD 2017). After being alerted by local marina staff, TPWD fisheries biologists and game wardens found adult and juvenile zebra mussels, as well larvae in plankton samples from multiple sites. The presence of adult, juvenile, and larvae zebra mussels is an indicator of a fully established infestation at Canyon Lake.

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

Zebra mussels were introduced to North America via trans-Atlantic barges to the commercial waterways of the U.S. from Europe in the 1980s. Once established, the spread of zebra mussels to inland waters occurred via navigation system traffic, overland transportation of private boats from an infested water body to an uninfested water body, and natural downstream flows that carried the free-floating larval form of the species. Within the Fort Worth District, zebra mussels are known to occur at Belton, Bridgeport, Eagle Mountain, Lewisville, and Stillhouse Hollow Lakes. Signs are posted to educate the public concerning the presence of invasive species and assist in the prevention of spreading the species to other water bodies.

Both USACE and TPWD monitor and enforce aquatic nuisance species regulations in an effort to prevent the expansion/colonization of invasive species at Canyon Lake.

Sections 2.2.5 and 6.5 of the revised Master Plan further describe the prevalence of invasive species occurrence on Canyon Lake fee lands.

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 Canyon Lake 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 Master Plan are compatible with Canyon Lake invasive species management practices. Therefore, invasive species would continue to be managed to the extent possible. The objectives developed under the proposed action, specifically, monitoring for invasive species presence, addressing unauthorized uses of public lands which may spread invasive species, and evaluating erosion control as eroding lands provide colonization opportunities for invasive plant species, combined with public outreach and education objectives, as shown in Chapter 3 of the revised Master Plan, will result in minor, long-term beneficial impacts.

The addition of 430 acres classified as ESA may provide long-term benefits as these areas may receive additional invasive species management.

3.10 CULTURAL, HISTORICAL, AND ARCHAEOLOGICAL RESOURCES

Cultural resources preservation and management is an equal and integral part of all resource management at Civil Works operating projects. The term “cultural resources” is a broad term meant to include anything that is of cultural significance to humans and that has some historical value, and generally includes, but is not limited to, the following categories of resources: archaeological sites (historic and prehistoric), historic standing structures, traditional cultural properties, and sacred sites. The cultural, historical, and archaeological resources are described in detail in Section 2.3 of the Canyon Lake 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.

Section 2.3 of the Revised Master Plan describes known cultural resources at Canyon Lake.

3.10.1 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.

3.10.2 Alternative 2: Proposed Action

Impacts on cultural, historical, and archaeological resources were considered during the refinement processes of land reclassifications. Based on previous surveys of Canyon Lake, 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 the reclassification of 430 acres to ESA as those lands afford more protection against development and ground disturbing activities. Therefore, no significant adverse impacts on cultural, historical, and archaeological resources would occur as a result of implementing revisions to the Canyon Lake Master Plan. Any future ground-disturbing activities would take into account Section 106 of the National Historic Preservation Act (NHPA) and other applicable cultural resource statutes to insure that cultural resources are protected. Also, several cultural resources management objectives were developed to promote the protection of Canyon Lake's cultural resources and are described in Chapter 3 of the revised Master Plan.

3.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The zone of interest for the socioeconomic analysis consists of nine Texas counties including Comal, Bexar, Blanco, Guadalupe, Hays, Kendall, Bandera, Caldwell, and Travis. The population, education level, employment rates, income, and household characteristics of the area are discussed in detail in Section 2.4 of the Canyon Lake Master Plan and are incorporated herein by reference (USACE 2017).

3.11.1 Alternative 1: No Action Alternative

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

3.11.2 Alternative 2: Proposed Action

Canyon Lake is beneficial to the local economy through indirect job creation and local spending by visitors, and also offers a variety of recreation opportunities and uses innovative maintenance and planning programs to minimize usage fees. The 1,405 acres of HDR and 1,097 acres of MRML-LDR will continue to provide recreation opportunities. The 430 acres of ESA land also allow minimally invasive recreation activities such as wildlife viewing and hiking. 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.

In Chapter 3 of the revised Master Plan, recreational objectives support improving and modernizing recreation opportunities at Canyon Lake that promote continued visitation and related spending.

3.12 HEALTH AND SAFETY

As mentioned earlier in this document, Canyon Lake's authorized purposes include flood risk management, municipal and industrial water supply, hydroelectric

power generation, fish and wildlife conservation, and recreation. Canyon Lake has established public outreach programs to educate the public on water safety and conservation of natural resources and the revised Master Plan includes management objectives to reinforce these existing programs. In addition to the water safety outreach programs, the project has established recreation management practices in place to protect the public. These include safe boating and swimming regulations, and speed limit and pedestrian signs for park roads. USACE has solid waste management programs, as well as programs to ensure that water and wastewater systems within public use areas comply with state health regulations, in place for camping and day-use areas. Canyon Lake has personnel in place to enforce these policies, rules, and regulations during normal park hours.

3.12.1 Alternative 1: No Action Alternative

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

3.12.2 Alternative 2: Proposed Action

Under the Proposed Action, the required revisions to the Canyon Lake Master Plan would be compatible with project safety management plans. The project would continue to have reporting guidelines in place should water quality become a threat to public health. The Proposed Action would potentially result in long-term and moderate beneficial impacts on public health and safety through implementation of health and safety related management objectives and with the reclassification of 31 acres of open recreation water to restricted waters near the dam, water intake structure at the control tower, and at the Joint Base San Antonio Recreation Area, Canyon, Potter's Creek, and Comal Swim beaches for safety and security purposes. Additionally, no wake areas were designated in front of every boat ramp and marina. Several new recreational education and outreach objectives were developed to support ongoing efforts that provide for public health and safety and can be found in Chapter 3 of the revised Master Plan. Existing regulations and safety programs throughout the Canyon Lake area would continue to be enforced to ensure public safety. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on public health and safety as a result of implementing the Proposed Action.

3.13 RECREATION

The recreational opportunities and potential of Canyon Lake are considered to be of great importance within the project's zone of interest. Canyon Lake is within a one hour drive from the San Antonio metro area and only slightly further from the Austin metro area. As described in Section 2.5 of the Master Plan, Canyon Lake offers many recreational activities such as swimming, boating, fishing, picnicking, and camping, as well as multiple trails for hiking. Canyon Lake includes numerous parks, recreation areas, boat ramps, and marinas. Additional information regarding recreation at Canyon Lake can be found in Section 2.5 of the Master Plan.

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 recreational opportunities would be anticipated.

3.13.2 Alternative 2: Proposed Action

The primary objective for revising the Canyon Lake Master Plan is to capture current land use and management that has evolved to meet day-to-day operational needs. Under the Proposed Action, the required revisions to the Canyon Lake 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. The 1,405 acres of HDR and 1,097 acres of MRML-LDR will continue to provide recreation opportunities. The 430 acres of ESA land also allow minimally invasive recreation activities such as wildlife viewing and hiking. 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. There would be no short- or long-term; minor, moderate, or major; or beneficial or adverse impacts on recreational opportunities as a result of implementing the Proposed Action.

3.14 SUMMARY OF CONSEQUENCES AND BENEFITS

Table 3.3 provides a tabular summary of the consequences and benefits for the No Action and Proposed Action alternatives for each of the 13 assessed resource categories.

Table 3.3 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 USACE, USFWS, TPWD, and public comment.	Land classification changes and new resource objectives fully recognize passive use recreation trends and regional environmental values such as protection of old growth Oak-Juniper forests.
Water Resources Including Groundwater, Wetlands, and Water Quality	No effect on 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 Greenhouse Gases	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 430 acres of ESA.
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 and Rare species listed by TPWD.	The 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.
Cultural Resources	Moderate benefit to recognize current status of cultural resources.	Included cursory information about cultural resources that is inadequate for future management and protection.	Recognizes the presence of cultural resources and places emphasis on protection and management.	Reclassification of lands included 430 acres of ESA and specific resource objectives were included for protection of cultural resources.
Socioeconomics and Environmental Justice	No change	No effect	No effect	No added benefit
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 31 acres of water surface as restricted and designated no-wake for public safety purposes.
Recreation	Moderate benefits to outdoor recreation programs.	Fails to recognize current outdoor recreation trends.	Fully recognizes current outdoor recreation trends and places special emphasis on trails.	Specific management objectives focused on outdoor recreation opportunities and trends are included.

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

Canyon Lake is approximately 45 miles north of San Antonio, Texas and 65 miles southeast of Austin, Texas. Roadway expansions are being constructed and planned in anticipation that population growth along the Interstate 35 corridor between the two densely populated areas. Population projections from the Census Bureau shows the population in the zone of interest growing by approximately 1.2 million additional people by 2040.

The websites of several organizations were reviewed to determine significant planned or projected road projects within the vicinity of Canyon Lake. The agency websites review included Texas Department of Transportation (TXDOT), Alamo Regional Mobility Authority, and Comal County Engineer’s Office. The review of available information revealed two road projects of regional significance as follows:

- Expand Farm-to-Market 306 from two lanes to four lanes with continuous left turn lane, bike lanes, and sidewalks starting at the intersection of Farm-to-Market 306 to 0.5 mile north of Hunter Road. This project was recently completed.
- Expand Farm-to-Market 306 from two lanes to four lanes with continuous left turn lane, bike lanes, and sidewalks starting at the intersection of River Chase Way to Hoffman Lane. This project was recently completed.
- Expand Farm-to-Market 306 from I-35 to US Hwy 281 from two lanes to four lanes with continuous left turn lane and sidewalks. The section from I-35 to Hoffman Lane is finished as of June 2017 and construction is ongoing for the section from Hoffman Lane to River Chase Way.

Throughout Comal County, TXDOT's Project Tracker identified more than 60 projects ranging from routine maintenance operations to expanding roads with two lanes to four (TXDOT 2017). Status of TXDOT projects ranged from the planning phase to construction.

Reasonably foreseeable future development is difficult to predict with certainty in the Canyon Lake region. Given the proximity of Canyon Lake to one of the most densely populated areas in Texas, future development is anticipated due to increased recreational needs. The last five years of development would include the completion the large Creekside shopping center in New Braunfels, numerous housing subdivisions, a large shopping center in Bulverde on the lake's southwestern side, and planned development along US Hwy 281 with new subdivisions and shopping centers. In New Braunfels, the Verimundi project is one of the largest planned subdivisions in the county. A large Boy Scouts of America camp on Ranch Road 32 is being sold to developers for a new subdivision. Only a few lone tracks have not been subdivided.

Other potential recreation amenities within park areas and/or boat ramp locations include canoe/kayak launch facilities. Creation of new trails or expansion of existing trails is included in development plans as well as improvements to existing campsites and picnic sites.

As described in Section 6.8 of the revised Master Plan, for the past 15 years, the Guadalupe-Blanco River Authority (GBRA) has annually requested, and were granted, a variance in Operation of Canyon Reservoir such that water stored between 909.0 and 910.0 could be released slowly to support downstream summer recreational activities from May to October. In 2016, USACE informed GBRA that this variance could no longer be granted. In order to continue this annual change in operation a permanent, seasonal conservation pool rise, or reallocation, of two feet may be needed.

In 2002, regional flooding sent water over the uncontrolled spillway at Canyon Lake. The erosive forces of the water carved a massive gorge below the spillway revealing fossilized dinosaur tracks and the geologic features. Leasing the gorge from USACE, GBRA, in partnership with the Gorge Preservation Society, maintains the gorge and guides tours. GBRA has also purchase land above the gorge with plans to construct an environmental learning center. The 21 acre purchase featured a farmhouse, since removed, and a garage. This area will be redesigned and developed with facilities to support public education, awareness, and research regarding water resources within the basin.

4.2 Analysis of Cumulative Impacts

Impacts on each resource were analyzed according to how other actions and projects within the zone of interest might be affected by the No Action Alternative and Proposed Action. Impacts can vary in degree or magnitude from a slightly noticeable change to a total change in the environment. For the purpose of this analysis, the intensity of impacts will be classified as negligible, minor, moderate, or major. These intensity thresholds are defined in Section 3.0. Minor to moderate growth and development are expected to continue in the vicinity of Canyon Lake and cumulative

adverse impacts on resources would not be expected when added to the impacts of activities associated with the Proposed Action or No Action Alternative. A summary of the anticipated cumulative impacts is presented below.

4.2.1 Land Use

A major impact would occur if any action is inconsistent with adopted land use plans or if an action would substantially alter those resources required for, supporting, or benefiting the current use. Under the No Action Alternative, land use would not change. Although the Proposed Action would result in the reclassification of project lands, the reclassifications were developed to enhance regional goals associated with good stewardship of land and water resources that would allow for continued use and development of project lands. The seasonal water elevation changes that have been made at Canyon Lake over the past 15 years have occurred within the confines of the existing Canyon Lake flood pool. Land use, therefore, is already limited in this area due to frequent inundation. The planned environmental learning center would provide educational opportunities. Therefore, cumulative impacts on land use within the area surrounding Canyon Lake, when combined with past and proposed actions in the region, are anticipated to be minimal.

4.2.2 Water Resources

Canyon Lake was developed for flood control, water supply, hydroelectric power, fish and wildlife management, 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. The seasonal water elevation changes that have been made at Canyon Lake over the past 15 years have occurred within the confines of the existing Canyon Lake flood pool, the water resources within this area were previously exposed to frequent inundation during flood events. Therefore, negative cumulative impacts on water resources and water quality within the area surrounding Canyon Lake are not anticipated to increase when combined with past and proposed actions in the region.

4.2.3 Air Quality

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

4.2.4 Natural Resources

The significance threshold for natural resources would include a substantial reduction in ecological processes, communities, or populations that would threaten the long-term viability of a species or result in the substantial loss of a sensitive community that could not be offset or otherwise compensated. Past, present, and future projects are not anticipated to impact the viability of any plant species or community, rare or sensitive habitats, or wildlife as existing laws and regulations, including the Comal County Regional Habitat Conservation Plan, protect natural resources in the Canyon Lake area. The establishment of ESAs, as well as resource objectives that favor protection and restoration of valuable Oak-Juniper woodlands 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 Canyon Lake Master Plan when combined with past and proposed actions in the area. The revised Canyon Lake Master Plan may produce beneficial cumulative impacts on natural resources as the goals and objectives support land stewardship and sustainability.

4.2.5 Threatened and Endangered Species

The Proposed Action and No Action Alternative would not adversely impact threatened and endangered species within the area. Should Federally listed species change in the future (e.g., delisting of the Golden-cheeked Warbler or other species or listing of new species), associated requirements will be reflected in revised land management practices in coordination with the USFWS. The USACE would continue cooperative management plans with the USFWS and TPWD to preserve, enhance, and protect critical wildlife habitat resources. Very few new projects are proposed for USACE lands within the Canyon Lake project area, and past, present, and future projects are not anticipated to impact threatened and endangered species as they will be coordinated with the appropriate resource agencies and in accordance to the Comal County Regional Habitat Conservation Plan. Therefore, there would be no significant cumulative impacts on threatened and endangered species resulting from the revision of the Canyon Lake Master Plan when combined with past and proposed actions in the area. Minor benefits to threatened and endangered species may be observed from the revision of the Canyon Lake Master Plan when combined with the existing Comal County Regional Habitat Conservation Plan.

4.2.6 Invasive Species

Zebra mussels, until recently, were not present in Canyon Lake. Potential adverse impacts from the infestation of Canyon Lake include increased risk of zebra mussels spreading to adjacent or nearby water bodies, attaching to intake and dam structures, as well as other vessels in the lake. Current and future activities, such as recreational boating and other in-lake operations and maintenance activities, could result in the transport of zebra mussels to other water bodies. Continued information and education, as well as construction permit requirements, will help reduce the potential transport of these invasive species.

Invasive species control has and will continue to be conducted on various areas across the project lands. Implementing Best Management Practices (BMP) will help 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 Canyon Lake invasive species management practices. Therefore, cumulative impacts from invasive species within the area surrounding Canyon Lake are not anticipated to increase when combined with past and proposed actions in the region.

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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's ER 200-2-2, *Environmental Quality: Procedures for Implementing NEPA*. The revision of the Master Plan is consistent with the USACE's Environmental Operating Principles. The following is a list of applicable environmental laws and regulations that were considered in the planning of this project and the status of compliance with each:

Fish and Wildlife Coordination Act of 1958, as amended – Because no construction or change in operation of the reservoir is proposed, there is no plan to coordinate under the Act; however, information provided by USFWS and TPWD on fish and wildlife resources has been utilized in the development of this assessment.

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

EO 13186 (Migratory Bird Habitat Protection) – Sections 3a and 3e of EO 13186 direct Federal agencies to evaluate the impacts of their actions on migratory birds, with emphasis on species of concern, and to inform the USFWS of potential negative impacts on migratory birds. The Master Plan revision will not result in negative impacts on migratory bird habitat.

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

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

EO 13045 (Protection of Children from Environmental Health Risks and Safety risks) – Section 1 of EO 13045 directs Federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children as a high priority. The Master Plan revision will not affect child health or safety risk.

National Historic Preservation Act of 1966, as amended – Compliance with the NHPA of 1966, as amended, requires identification of all properties in the project area

listed in, or eligible for listing in, the National Register of Historic Places. All surveys and site salvages are coordinated with the Texas State Historic Preservation Office. Known sites are mapped and avoided by maintenance activities. Areas that have not undergone cultural resources surveys and/or evaluations will need to do so prior to any earth-moving or other potentially impactful activities. The Master Plan revision does not entail ground disturbance activities. Projects that do involve ground disturbance are coordinated with the appropriate agencies. The proposed Master Plan revision is compliant with the NHPA.

Clean Air Act of 1977 – The USEPA established NAAQS to protect public health and welfare. Existing operation and management of the reservoir is compliant with the CAA and will not change with the Master Plan revision.

Farmland Protection Policy Act (FPPA) of 1980 and 1995, and the CEQ Memorandum dated August 11, 1980, Prime or Unique Farmlands – The FPPA's purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. Prime Farmland is present on Canyon Lake project lands; however, no specific soil disturbing activities are proposed under this Master Plan Revision. Any future soil disturbing activities would be coordinated with the NRCS if those activities are proposed in prime farmlands.

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 Order directs Federal agencies to evaluate the potential impacts of proposed actions in floodplains. The operation and management of the existing Project complies with EO 13690 and 11988.

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.

IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

NEPA requires that Federal agencies identify “any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented” (42 U.S.C. § 4332). An irreversible commitment of resources occurs when the primary or secondary impacts of an action result in the loss of future options for a resource. Usually, this is when the action affects the use of a nonrenewable resource or it affects a renewable resource that takes a long time to renew. The impacts for this project from the reclassification of land would not be considered an irreversible commitment because much of the land could be converted back to prior use at a future date. An irretrievable commitment of resources is typically associated with the loss of productivity or use of a natural resource (e.g., loss of production or harvest). No irreversible or irretrievable impacts on Federally protected species or their habitat is anticipated from implementing revisions to the Canyon Lake Master Plan.

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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. One public scoping meeting was held to provide an avenue for the public and agency stakeholders to ask questions and provide comments on February 18th, 2016, in Canyon Lake, Texas. The USACE, Fort Worth District emailed coordination letters to agencies, tribes, and other stakeholders, including those who attended the first public meeting and left an email contact, and posted notices on the USACE webpage and other social media outlets. Agencies coordinated with include: TPWD, TCEQ, USFWS, USEPA, Tonkawa Tribe of Oklahoma, Comanche Nation of Oklahoma, Kiowa Tribe of Oklahoma, Mescalero Apache Tribe, Wichita and Affiliated Tribes, and the Texas State Historic Preservation Officer. Please refer to Appendix E of the Master Plan for a summary of comments received at the public meeting, and USACE's responses to those comments. The EA was coordinated with agencies having legislative and administrative responsibilities for environmental protection. USEPA provided a comment on the Draft FONSI and EA, which has been addressed in Sections 3.5 and 4.2.3. Appendix A of this EA includes the USACE news release, Notice of Availability and a copy of the correspondence from the agencies that provided comments and planning assistance for preparation of the EA.

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ACRONYMS/ABBREVIATIONS

°	Degrees
A.D.	Anno Domini
B.P.	Before Present
CAA	Clean Air Act
CAP	Climate Action Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
cm	Centimeters
CO ₂	Carbon Dioxide
CO ₂ e	CO ₂ -equivalent
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ER	Engineer Regulation
ESA	Environmentally Sensitive Area
F	Fahrenheit
FPPA	Farmland Protection Policy Act
FR	Federal Register
FY	Fiscal Year
GHG	Greenhouse Gas
GBRA	Guadalupe-Blanco River Authority
HDR	High Density Recreation
kW	Kilowatt
LDR	Low Density Recreation
MBTA	Migratory Bird Treaty Act
mg/L	Milligram Per Liter
mg/m ³	Milligram Per Cubic Meter
mW	Megawatt
mgd	Millions of Gallons Per Day
MRML	Multiple Resource Management Lands
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
Maintenance	OMBIL Operations and Business Information Link
TCAP	Texas Conservation Action Plan
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TXDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

VM Vegetation Management
WHO World Health Organization
WM Wildlife Management

LIST OF PREPARERS

Marcus Schimank –USACE, Canyon Lake Manager, 14 years of USACE experience

Terri Teaschner – USACE, Canyon Lake Natural Resource Specialist: 8 years of USACE experience

Don Wiese – USACE, Regional Planning and Environmental Center: 43 years of USACE experience

Mandy McGuire – USACE, Regional Planning and Environmental Center: 10 years of USACE experience

Brandon Wadlington –USACE, Regional Planning and Environmental Center: 2 years of USACE experience

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NEWS RELEASE

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG®

For Immediate Release: NR 17-019
July 10, 2017

Contact: Clay Church, 817-886-1314
clayton.a.church@usace.army.mil

U.S. Army Corps of Engineers host public meeting for the Canyon Lake Master Plan revision

FORT WORTH, Texas – The Fort Worth District, U.S. Army Corps of Engineers will host a public meeting July 20 to gain public comment on the draft revision of the Canyon Lake Master Plan.

The public meeting will be held at the Canyon Lake Resource & Recreation Center, 125 Mabel Jones Dr., Canyon Lake, Texas, 78133. A brief overview of proposed changes will be presented at 6 p.m., followed by an opportunity to view maps, ask questions, and provide written comment about the project. Public participation is a vital part of completing a successful revision to the Master Plan.

A 30-day public comment period will follow, with comment forms and the updated Master Plan made available for download by July 14 at the following website: <http://www.swf.usace.army.mil/About/Lakes-and-Recreation-Information/Master-Plan-Updates/Canyon-Lake/> and printed copy for review will be available at the Tye Preston Memorial Library, 16311 S. Access Road, Canyon Lake, Texas, 78133 and the Canyon Lake Office at 601 C.O.E. Road, Canyon Lake, Texas 78133.

Completed in 1964 as a flood control project, Canyon Lake also serves multiple-purposes including water supply, hydroelectric power generation, recreation, and environmental stewardship. The current Master Plan, dated December 1970, is in need of revision to address changes in land use, population, outdoor recreation trends, and USACE management policy that have occurred over the past 40 years.

The USACE Canyon Lake Master Plan is the land use document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the lake. The Master Plan defines the resource management goals and objectives for public use and resource conservation for the study area, which includes Canyon Lake and all adjacent USACE controlled recreational and natural resource properties. Revision of the Master Plan will not address the technical operational aspects of the lake as it relates to the primary missions of water supply, hydroelectric power generation, or flood risk management.

Key topics addressed in the revised Master Plan include updated and revised land use classification, new natural and recreational resource management goals and objectives, and recreation facility needs identification. Special topics addressed include invasive species management and threatened and endangered species habitat protection at Canyon Lake.

Questions pertaining to the proposed revision can be addressed to: Ernest Eberle, Project Manager, CESWF-OD-SO, U.S. Army Corps of Engineers, 1560 Thornberry Drive, Somerville, Texas, 77845; (979) 596-1622, or Ms. Rhonda Fields, Project Manager, CESWF-PEC-TP, U.S. Army Corps of Engineers, Fort Worth District, P.O. Box 17300, Fort Worth, Texas, 76102-0300; (817) 886-1681.

-30-



DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

JULY 10, 2017

NOTICE OF AVAILABILITY
DRAFT CANYON LAKE MASTER PLAN, FINDING OF NO SIGNIFICANT IMPACT, AND
ENVIRONMENTAL ASSESSMENT, GUADALUPE RIVER BASIN
COMAL COUNTY, TEXAS

The public is hereby notified of the availability of the draft Canyon Lake Master Plan (hereafter Plan), draft 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 lands and 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 Canyon Lake. 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 project operation and management. Prior to this proposed Plan revision, the original Plan for Canyon Lake was approved in December 1970.

A hard copy of the Draft Plan, FONSI, and EA will be available for review at the following locations beginning July 14, 2017: U.S. Army Corps of Engineers, Canyon Lake Office, 601 C.O.E. Road, Canyon Lake, Texas 78133 and Tye Preston Memorial Library, 16311 South Access Road, Canyon Lake, Texas 78133. The draft revised Plan will also be available July 14, 2017 at the following website:

<http://www.swf.usace.army.mil/About/Lakes-and-Recreation-Information/Master-Plan-Updates/Canyon-Lake/>

A public meeting will be held on July 20, 2017 at the Canyon Lake Resource & Recreation Center, 125 Mabel Jones Dr., Canyon Lake, TX 78133. A brief overview of proposed changes will be presented at 6 p.m., followed by an opportunity to view maps, ask questions, and provide written comments about the project. There will be a 30-day public comment period beginning on July 20, 2017 and running through August 21, 2017.

Please address any comments via email to CESWF-PER-Canyonlake@usace.army.mil or mail to Ernest Eberle, Project Manager, CESWF-OD-SO, U.S. Army Corps of Engineers, 1560 Thornberry Drive, Somerville, TX 77845 or Ms. Rhonda Fields, Project Manager, CESWF-PEC-TP, U.S. Army Corps of Engineers, Regional Planning and Environmental Center, P.O. Box 17300, Fort Worth, TX 76102-0300.

A handwritten signature in black ink, appearing to read "D. Sims".

Douglas C. Sims, RPA
Chief, Environmental Compliance Branch
Regional Planning and Environmental Center

From: [Sommer, Tanya](#)
To: [Wadlington, Brandon E CIV USARMY CESWF \(US\)](#)
Cc: [Patrick Connor](#)
Subject: [Non-DoD Source] Re: Canyon Lake Master Plan revision & species effect determination
Date: Wednesday, June 28, 2017 4:03:20 PM

Hello Brandon,

The US Fish and Wildlife Service does not have any comments or concerns with the proposed land class changes at Canyon Lake.

Thank for giving us the opportunity to comment on your proposed changes.

Sincerely,
Tanya

On Tue, Jun 27, 2017 at 10:51 AM, Wadlington, Brandon E CIV USARMY CESWF (US) <BRANDON.E.WADLINGTON@usace.army.mil> <<mailto:BRANDON.E.WADLINGTON@usace.army.mil>> > wrote:

Good morning Tanya

If you have any questions on the proposed land class changes at Canyon Lake or the master plan process in general please call/email anytime.

I know you guys don't comment on No Effects but if you support our ESA or wildlife management land class designations, even a quick email for the EA appendix helps us out.

Again call/email anytime if you have questions.

Brandon

Brandon Wadlington
Biologist
Coastal Section, Environmental Compliance Branch
Regional Planning and Environmental Center
US Army Corps of Engineers
Office: 817-886-1720
Mobile: 817-609-5131
Brandon.wadlington@usace.army.mil <<mailto:Brandon.wadlington@usace.army.mil>>

--

Tanya Sommer
U.S. Fish and Wildlife Service
Austin Ecological Services Field Office
Phone: 512-490-0057 ext. 222

Cell: 512-850-0980



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 6

**1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733**

August 21, 2017

Ernest Eberle, Project Manager
U.S. Army Corps of Engineers
1560 Thornberry Drive
Somerville, Texas 77845

Subject: Draft Canyon Lake Master Plan, Finding of No Significant Impact and Environmental Assessment

Dear Mr. Eberle:

The Environmental Protection Agency's Region 6 office in Dallas, Texas, has received the draft Finding of No Significant Impact (FNSI) and Environmental Assessment (EA) prepared by your agency to assess the potential significant adverse environmental impacts from revisions to the Master Plan for Canyon Lake.

It is our understanding from the information provided that the Master Plan provides direction for the appropriate management, use, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources at Canyon Lake. Prior to this proposed revision to the Master Plan, the original Master Plan was approved in December 1970.

Attached you will find our comments for your consideration in preparation of the final EA and FNSI. Please provide your responses to our comments in a dedicated section of the final EA to insure that our comments were addressed. We appreciate the opportunity to review and comment the draft, and look forward to receipt of the final. Should you have any questions or need additional information pertaining to our comments, please contact me by phone at (214) 665-8565 or by email at Houston.robert@epa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Houston".

Robert Houston, Chief
Special Projects Section (6EN-WS)
Compliance Assurance and Enforcement
Division

Enclosure

DETAILED COMMENTS
on the
DRAFT FINDING of NO SIGNIFICANT IMPACT
and
ENVIRONMENTAL ASSESSMENT
for the
MASTER PLAN, CANYON LAKE

Air Quality

Section 3.5: Air Quality (Environmental Assessment/Master Plan Revision pg. 14)

As described in this Environmental Assessment, Comal County is currently in attainment of all National Ambient Air Quality Standards (NAAQS). As a result, general conformity regulations do not apply and an applicability analysis is not necessary. This section correctly notes pending designations for the 0.070 parts per million 2105 Ozone NAAQS. We add that Comal County is represented by the Alamo Area Council of Governments (AACOG, the Metropolitan Planning Organization for the San Antonio area), and because the San Antonio area is vulnerable to being designated as non-attainment for ozone in the next few years, the AACOG has applied to and been accepted by EPA into the EPA Ozone Advance program.

The Advance program is a collaborative effort between EPA, states and local governments to enact expeditious emission reductions to help near non-attainment areas remain in attainment of the NAAQS. This further reflects the sensitivity of ozone levels in the area, and the need for federally-funded projects in the San Antonio area to consider emissions which contribute to the formation of ozone. For more information on the AACOG's enrollment in EPA's Ozone Advance program see the following information:

https://ww.epa.gov/sites/production/files/2016-01/documents/alamosign_up.pdf

and

<https://ww.epa.gov/advance/texas-san-antonio>

Because of the air quality concerns of the significant population center within the project area, EPA recommends that best management practices be implemented in order to reduce potential short-term air quality impacts associated with construction activities. Furthermore, construction and waste disposal activities should be conducted in accordance with applicable local, state, and federal statutes and regulations.

APPENDIX C - TRUST RESOURCES REPORT – USFWS

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Canyon Lake Master Plan

IPaC Trust Resources Report

Generated May 23, 2016 02:36 PM MDT, IPaC v3.0.7

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.

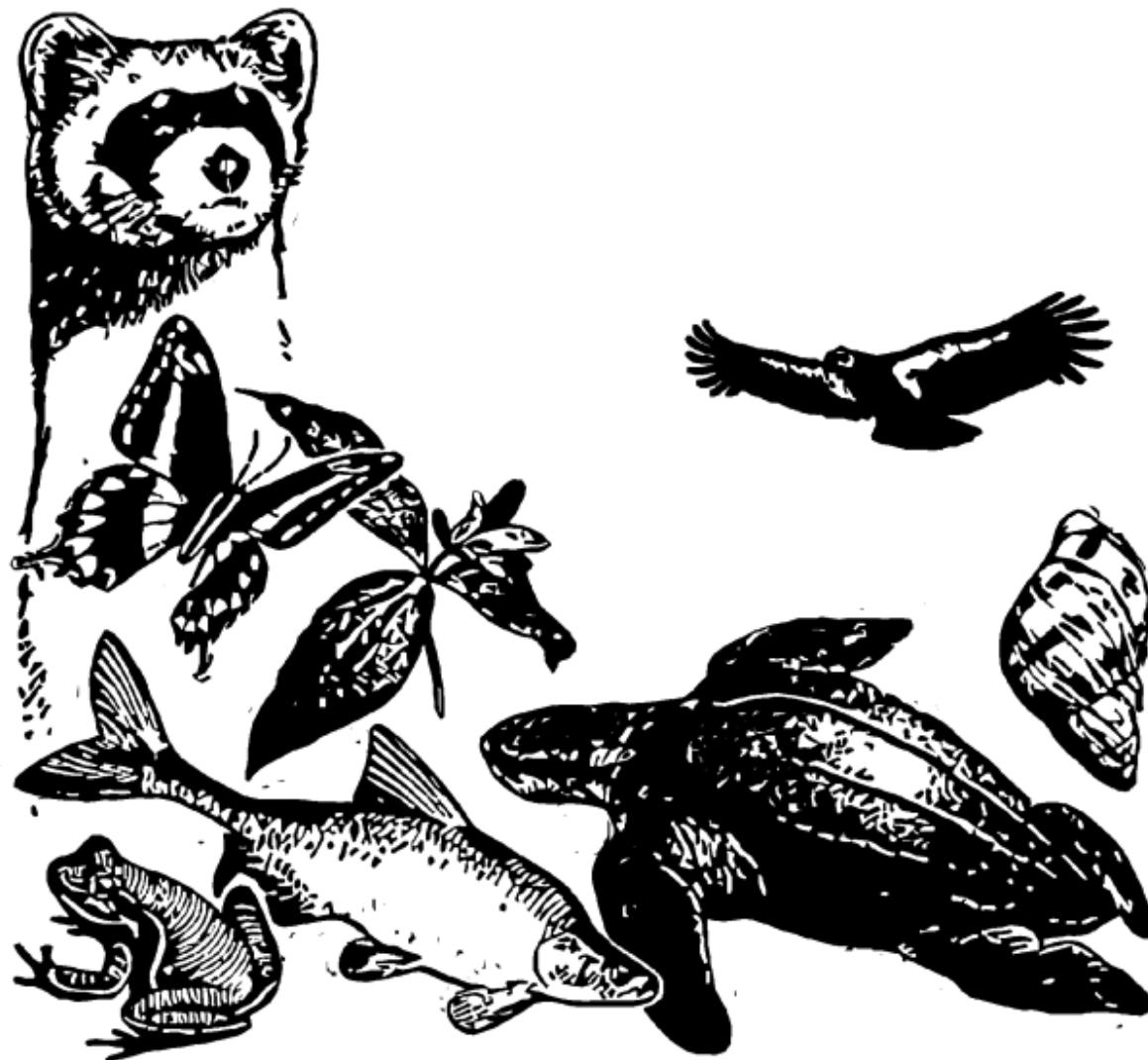


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- Project Description [1](#)
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- Refuges & Hatcheries [11](#)
- Wetlands [12](#)

U.S. Fish & Wildlife Service

IPaC Trust Resources Report



NAME

Canyon Lake Master Plan

LOCATION

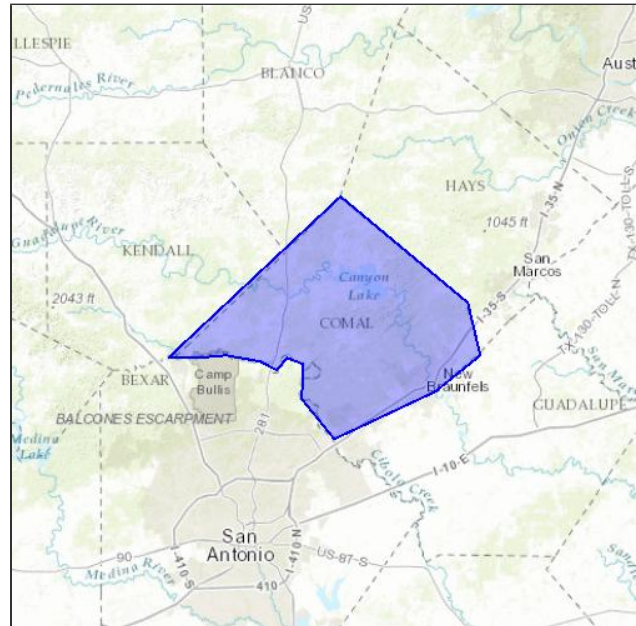
Texas

DESCRIPTION

Comal County

IPAC LINK

<https://ecos.fws.gov/ipac/project/MVRU4-XJGSZ-D4HFF-2H7GE-WILFCA>



U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

(512) 490-0057

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the [Endangered Species Program](#) of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

[Section 7](#) of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Amphibians

Austin Blind Salamander *Eurycea waterlooensis* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D033

Barton Springs Salamander *Eurycea sosorum* Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D010

San Marcos Salamander *Eurycea nana* Threatened

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D001

Texas Blind Salamander *Typhlomolge rathbuni* Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=D001

Arachnids

Braken Bat Cave Meshweaver *Cicurina venii* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J01D

Cokendolpher Cave Harvestman *Texella cokendolpheri* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J016

Government Canyon Bat Cave Meshweaver *Cicurina vespera* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J01B

Government Canyon Bat Cave Spider *Neoleptoneta microps* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J018

Madla's Cave Meshweaver *Cicurina madla* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J019

Robber Baron Cave Meshweaver *Cicurina baronia* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=J01A

Birds

Black-capped Vireo *Vireo atricapilla* Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07T

Golden-cheeked Warbler (=wood) *Dendroica chrysoparia* Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07W

Least Tern *Sterna antillarum* Endangered

THIS SPECIES ONLY NEEDS TO BE CONSIDERED IF THE FOLLOWING CONDITION APPLIES

Wind Energy Projects

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07N

Piping Plover *Charadrius melodus* Threatened

THIS SPECIES ONLY NEEDS TO BE CONSIDERED IF THE FOLLOWING CONDITION APPLIES

Wind Energy Projects

CRITICAL HABITAT

There is final critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B079

Red Knot *Calidris canutus rufa* Threatened

THIS SPECIES ONLY NEEDS TO BE CONSIDERED IF THE FOLLOWING CONDITION APPLIES

Wind Energy Projects

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DM

Whooping Crane *Grus americana* Endangered

CRITICAL HABITAT

There is final critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B003

Clams

Golden Orb *Quadrula aurea* Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=F04J

Smooth Pimpleback *Quadrula houstonensis* Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=F04G

Texas Fatmucket *Lampsilis bracteata* Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=F04I

Texas Fawnsfoot *Truncilla macrodon* Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=F04E

Texas Pimpleback *Quadrula petrina* Candidate

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=F04F

Crustaceans

Peck's Cave Amphipod *Stygobromus (=Stygonectes) pecki* Endangered

CRITICAL HABITAT

There is final critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=K019

Fishes

Fountain Darter *Etheostoma fonticola* Endangered

CRITICAL HABITAT

There is final critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=E00T

San Marcos Gambusia *Gambusia georgei* Endangered

CRITICAL HABITAT

There is final critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=E021

Flowering Plants

Bracted Twistflower *Streptanthus bracteatus* Candidate

CRITICAL HABITAT

No **critical habitat** has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q1R7

Texas Wild-rice *Zizania texana* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q24A

Tobusch Fishhook Cactus *Sclerocactus brevihamatus* ssp. *tobuschii* Endangered

CRITICAL HABITAT

No **critical habitat** has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q1SV

Insects

[no Common Name] Beetle *Rhadine exilis* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0RF

[no Common Name] Beetle *Rhadine infernalis* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0P1

Comal Springs Dryopid Beetle *Stygoparnus comalensis* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0MI

Comal Springs Riffle Beetle *Heterelmis comalensis* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0MH

Helotes Mold Beetle *Batrisodes venyivi* Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0PT

Critical Habitats

This location overlaps all or part of the critical habitat for the following species:

Comal Springs Dryopid Beetle *Stygoparnus comalensis*

Final designated critical habitat

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0M1#crithab

Comal Springs Riffle Beetle *Heterelmis comalensis*

Final designated critical habitat

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0MH#crithab

Peck's Cave Amphipod *Stygobromus (=Stygonectes) pecki*

Final designated critical habitat

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=K019#crithab

Migratory Birds

Birds are protected by the [Migratory Bird Treaty Act](#) and the [Bald and Golden Eagle Protection Act](#).

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.^[1] There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
<http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Conservation measures for birds
<http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Year-round bird occurrence data
<http://www.birdscanada.org/birdmon/default/datasummaries.jsp>

The following species of migratory birds could potentially be affected by activities in this location:

Audubon's Oriole <i>Icterus graduacauda</i> Year-round	Bird of conservation concern
Bald Eagle <i>Haliaeetus leucocephalus</i> Season: Wintering http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B008	Bird of conservation concern
Bell's Vireo <i>Vireo bellii</i> Season: Breeding http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0JX	Bird of conservation concern
Burrowing Owl <i>Athene cunicularia</i> Season: Wintering http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0NC	Bird of conservation concern
Chestnut-collared Longspur <i>Calcarius ornatus</i> Season: Wintering	Bird of conservation concern

Dickcissel <i>Spiza americana</i> Season: Breeding	Bird of conservation concern
Fox Sparrow <i>Passerella iliaca</i> Season: Wintering	Bird of conservation concern
Harris's Sparrow <i>Zonotrichia querula</i> Season: Wintering	Bird of conservation concern
Hudsonian Godwit <i>Limosa haemastica</i> Season: Migrating	Bird of conservation concern
Lark Bunting <i>Calamospiza melanocorys</i> Season: Wintering	Bird of conservation concern
Le Conte's Sparrow <i>Ammodramus leconteii</i> Season: Wintering	Bird of conservation concern
Least Bittern <i>Ixobrychus exilis</i> Season: Breeding http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B092	
Lesser Yellowlegs <i>Tringa flavipes</i> Season: Wintering http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0MD	Bird of conservation concern
Lewis's Woodpecker <i>Melanerpes lewis</i> Season: Wintering http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0HQ	Bird of conservation concern
Little Blue Heron <i>Egretta caerulea</i> Season: Breeding	Bird of conservation concern
Loggerhead Shrike <i>Lanius ludovicianus</i> Year-round http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0FY	Bird of conservation concern
Orchard Oriole <i>Icterus spurius</i> Season: Breeding	Bird of conservation concern
Painted Bunting <i>Passerina ciris</i> Season: Breeding	Bird of conservation concern
Peregrine Falcon <i>Falco peregrinus</i> Season: Wintering http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0FU	Bird of conservation concern
Prothonotary Warbler <i>Protonotaria citrea</i> Season: Breeding	Bird of conservation concern
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> Year-round	Bird of conservation concern
Rufous-crowned Sparrow <i>Aimophila ruficeps</i> Year-round http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0MX	Bird of conservation concern

Scissor-tailed Flycatcher *Tyrannus forficatus*

Season: Breeding

Bird of conservation concern

Short-eared Owl *Asio flammeus*

Season: Wintering

Bird of conservation concern

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0HD

Sprague's Pipit *Anthus spragueii*

Season: Wintering

Bird of conservation concern

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?sPCODE=B0GD

Wildlife refuges and fish hatcheries

There are no refuges or fish hatcheries in this location

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

This location overlaps all or part of the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish & Wildlife Service office or visit the [NWI map](#) for a full list.

Freshwater Emergent Wetland

[PEM1A](#)

[PEM1Ah](#)

[PEM1B](#)

[PEM1Fx](#)

[PEMAx](#)

Freshwater Forested/shrub Wetland

[PFO1A](#)

[PFO1Ah](#)

[PFO1B](#)

[PFO1C](#)

[PFO2C](#)

[PFO2F](#)

[PFO5Fh](#)

[PSS1A](#)

[PSS1Ah](#)

[PSS1Ax](#)

Freshwater Pond

[PAB3Fx](#)

[PAB3Hx](#)

[PUBFh](#)

[PUBFx](#)

[PUBH](#)

[PUBHh](#)

[PUBHx](#)

[PUSA](#)

[PUSAh](#)

[PUSAx](#)

[PUSC](#)

[PUSCh](#)

[PUSCx](#)

[PUSKh](#)

[PUSKx](#)

Lake

[L1UBHh](#)

[L2USAh](#)

[L2USCh](#)

Riverine

[R2RSA](#)

[R2UBH](#)

[R2USA](#)

[R4SBA](#)

[R4SBC](#)

A full description for each wetland code can be found at the National Wetlands Inventory website: <http://107.20.228.18/decoders/wetlands.aspx>



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

Phone: (512) 490-0057 Fax: (512) 490-0974

<http://www.fws.gov/southwest/es/AustinTexas/>

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/>

In Reply Refer To:

May 23, 2017

Consultation Code: 02ETAU00-2016-SLI-0405

Event Code: 02ETAU00-2017-E-01523

Project Name: Canyon Lake Master Plan Revision

Subject: Updated 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, that may occur within the county of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please note that new information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. 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. Also note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

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

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

While a Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment, the Federal Agency must notify the Service in writing of any such designation. The Federal agency shall also independently review and evaluate the scope and content of a biological assessment prepared by their designated non-Federal representative before that document is submitted to the Service.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by a federally funded, permitted or authorized activity, the agency is required to consult with the Service pursuant to 50 CFR 402. The following definitions are provided to assist you in reaching a determination:

- No effect - the proposed action will not affect federally 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, 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.
- May affect, but 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 effect. The Federal agency or the designated non-Federal representative should consult with the Service to seek written concurrence that adverse effects are not likely. 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. For this determination, the effect of the action is neither discountable nor insignificant. If the overall effect of the proposed action is beneficial to the listed species but the action is also likely to cause some adverse effects to individuals of that species, then the proposed action “is likely to adversely affect” the listed species. The analysis should consider all interrelated and interdependent actions. An “is likely to adversely affect” determination requires the Federal action agency to initiate formal section 7 consultation with our office.

Regardless of the determination, the Service recommends that the Federal agency maintain a complete record of the evaluation, including steps leading to the determination of effect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related information. 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>.

Migratory Birds

For projects that may affect migratory birds, the Migratory Bird Treaty Act (MBTA) implements various treaties and conventions for the protection of these species. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Migratory birds may nest in trees, brushy areas, or other areas of 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, nests, or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to conducting work. If a nest is found, and if possible, the Service recommends a buffer of vegetation remain around the nest until the young have fledged or the nest is abandoned.

For additional information concerning the MBTA and recommendations to reduce impacts to migratory birds please contact the U.S. Fish and Wildlife Service Migratory Birds Office, 500 Gold Ave. SW, Albuquerque, NM 87102. A list of migratory birds may be viewed at <https://www.fws.gov/birds/management/managed-species/migratory-bird-treaty-act-protected-species>. Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at:

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-document>. Additionally, wind energy projects should follow the wind energy guidelines

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-document>) for minimizing impacts to migratory birds and bats.

Finally, 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

<https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/guidance-document>

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(s):

- Official Species List

Official Species List

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

This species list is provided by:

Austin Ecological Services Field Office

10711 Burnet Road, Suite 200

Austin, TX 78758-4460

(512) 490-0057

Project Summary

Consultation Code: 02ETAU00-2016-SLI-0405

Event Code: 02ETAU00-2017-E-01523

Project Name: Canyon Lake Master Plan Revision

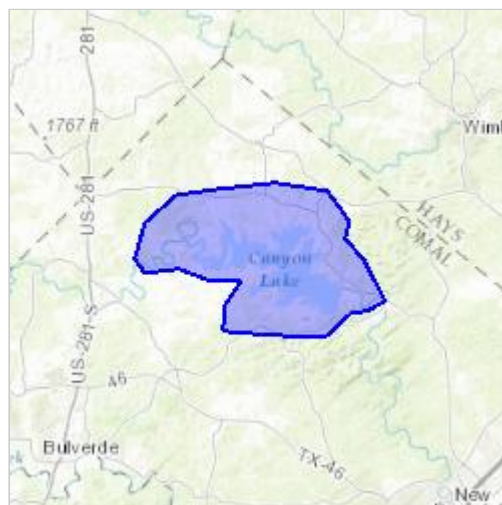
Project Type: LAND - MANAGEMENT PLANS

Project Description: The Canyon Lake Master Plan (Canyon Lake, Comal County, Texas) is the long-term strategic land use management document that guides the comprehensive management and development of all the project's recreational, natural, and cultural resources. Under the guidance of ER-1130-2-550 Change 7, the Plan guides the efficient and cost-effective development, management, and use of project lands. It is a dynamic tool that provides for the responsible stewardship and sustainability of the project's resources for the benefit of present and future generations. The Plan works in tandem with the Operational Management Plan (OMP), which is the implementation tool for the resource objectives and development needs identified in the Master Plan. The Master Plan guides and articulates the USACE responsibilities pursuant to federal laws. Efforts are under way to revise the current Canyon Lake Master, last revised in 1970. The Master Plan revision will update land classifications, plan for the modernization of existing parks, and inform the management of wildlife and other resource lands within USACE managed property at Canyon Lake for the next 25 years.

Project Location:

Approximate location of the project can be viewed in Google Maps:

<https://www.google.com/maps/place/29.88999138145363N98.27386660957464W>



Counties: Comal, TX

Endangered Species Act Species

There is a total of 17 threatened, endangered, or candidate 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. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area. Please contact the designated FWS office if you have questions.

Birds

NAME	STATUS
<p>Black-capped Vireo (<i>Vireo atricapilla</i>) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5716</p>	Endangered
<p>Golden-cheeked Warbler (=wood) (<i>Dendroica chrysoparia</i>) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33</p>	Endangered
<p>Least Tern (<i>Sterna antillarum</i>) Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/8505</p>	Endangered
<p>Piping Plover (<i>Charadrius melodus</i>) Population: except Great Lakes watershed There is a final critical habitat designated for this species. Your location is outside the designated critical habitat. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot (<i>Calidris canutus rufa</i>) No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none"> ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Whooping Crane (<i>Grus americana</i>) Population: Wherever found, except where listed as an experimental population There is a final critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/758</p>	Endangered

Amphibians

NAME	STATUS
<p>San Marcos Salamander (<i>Eurycea nana</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/6374</p>	Threatened
<p>Texas Blind Salamander (<i>Typhlomolge rathbuni</i>)</p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/5130</p>	Endangered

Fishes

NAME	STATUS
<p>Fountain Darter (<i>Etheostoma fonticola</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/5858</p>	Endangered

Clams

NAME	STATUS
<p>Golden Orb (<i>Quadrula aurea</i>)</p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/9042</p>	Candidate
<p>Texas Fatmucket (<i>Lampsilis bracteata</i>)</p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/9041</p>	Candidate
<p>Texas Pimpleback (<i>Quadrula petrina</i>)</p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/8966</p>	Candidate

Insects

NAME	STATUS
<p>Comal Springs Dryopid Beetle (<i>Stygoparnus comalensis</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/7175</p>	Endangered
<p>Comal Springs Riffle Beetle (<i>Heterelmis comalensis</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/3403</p>	Endangered

Crustaceans

NAME	STATUS
<p>Peck's Cave Amphipod (<i>Stygobromus (=Stygonectes) pecki</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/8575</p>	Endangered

Flowering Plants

NAME	STATUS
<p>Bracted Twistflower (<i>Streptanthus bracteatus</i>)</p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/2856</p>	Candidate
<p>Texas Wild-rice (<i>Zizania texana</i>)</p> <p>There is a final critical habitat designated for this species. Your location is outside the designated critical habitat.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/805</p>	Endangered

Critical habitats

There are no critical habitats within your project area.

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APPENDIX D - SPECIES OF GREATEST CONSERVATION NEED

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EDWARDS PLATEAU SPECIES OF GREATEST CONSERVATION NEED

Scientific Name	Common Name	Status		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place	Endemic in Texas
		Federal	State		
<p>MAMMALS</p> <p>State of the practice resources are listed in each taxa line for more detailed information</p> <p>W.B. Davis and D.J. Schmidly. 1997 and 1994. Mammals of Texas (online and in print). Texas Tech University (1997) and Texas Parks and Wildlife Department (1994). http://www.nsr.ttu.edu/tmot1/Default.htm (accessed 2011)</p>					
<i>Antrozous pallidus</i>	Pallid bat			Shrubland	N
<i>Conepatus leuconotus</i>	Hog-nosed skunk			Barren/Sparse Vegetation,	N
<i>Corynorhinus townsendii</i>	Townsend's big-eared bat			Shrubland	N
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog			Grassland	N
<i>Eptesicus fuscus</i>	Big brown bat			Caves/Karst, Artificial Refugia	N
<i>Geomys texensis bakeri</i>	Frio pocket gopher			Riparian	N
<i>Geomys texensis texensis</i>	Llano pocket gopher			Riparian	Y
<i>Lutra canadensis</i>	River otter			Riparian	N
<i>Mormoops megalophylla</i>	Ghost-faced bat			Desert Scrub, Riparian, Caves/Karst	N
<i>Mustela frenata</i>	Long-tailed weasel			Shrubland, Savanna/Open Woodland	N
<i>Mustela nigripes</i>	Black-footed ferret	LE		Grassland	N
<i>Myotis velifer</i>	Cave myotis			Caves/Karst,	N
<i>Nasua narica</i>	White-nosed coati		T	Forest, Desert Scrub, Riparian	N
<i>Parastrellus hesperus</i>	Canyon Bat (western pipistrelle)			Riparian, Barren Sparse Vegetation	N
<i>Perimyotis subflavus</i>	Tricolored Bat (eastern pipistrelle)			Caves/Karst, Artificial Refugia, Woodland	N
<i>Puma concolor</i>	Mountain lion			Shrubland, Savanna/Open Woodland,	N
<i>Spilogale gracilis</i>	Western spotted skunk			Woodland, Desert Scrub	N
<i>Spilogale putorius</i>	Eastern spotted skunk			Savanna/Open Woodland, Grassland	N
<i>Sylvilagus aquaticus</i>	Swamp rabbit			Riparian, Freshwater Wetland	N
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat			Cave/Karst, Artificial Refugia	N
<i>Taxidea taxus</i>	American badger			Savanna/Open Woodland, Forest	N
<i>Ursus americanus</i>	Black bear	SAT	T	Woodland, Desert Scrub, Shrubland	N
<i>Vulpes velox</i>	Swift fox			Grassland	N
<p>BIRDS</p> <p>The Birds of North America Online (A. Poole, Ed.). 2005 (with current updates by species). Retrieved from The Birds of North America Online database: http://bna.birds.cornell.edu/BNA/ (accessed 2011). Supported by information from the Cornell Lab of Ornithology.</p> <p>BIRDS ONLY: instead of endemism these numbers are for taxonomic sorting</p>					
<i>Colinus virginianus</i>	Northern Bobwhite			Woodland	4
<i>Cyrtonyx montezumae</i>	Montezuma Quail			Grassland, Shrubland	5
<i>Meleagris gallopavo</i>	Wild Turkey			Forest, Riparian, Agricultural	8
<i>Circus cyaneus</i>	Northern Harrier			Grassland, Shrubland	23
<i>Buteogallus anthracinus</i>	Common Black-Hawk		T	Woodland, Riparian	24
<i>Parabuteo unicinctus</i>	Harris's Hawk			Desert Scrub, Grassland, Shrubland	25
<i>Buteo lineatus</i>	Red-shouldered Hawk			Wetland	26
<i>Buteo albonotatus</i>	Zone-tailed Hawk		T	Barren/Sparse Vegetation, Riparian	30
<i>Aquila chrysaetos</i>	Golden Eagle			Desert Scrub, Grassland, Shrubland	32
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow			Woodland, Forest, Riparian	66
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher			Agricultural, Developed	71
<i>Lanius ludovicianus</i>	Loggerhead Shrike			Savanna/Open Woodland, Agricultural,	73
<i>Vireo bellii</i>	Bell's Vireo			Desert scrub, Shrubland, Riparian	74
<i>Vireo atricapilla</i>	Black-capped Vireo	LE	E	Shrubland	75
<i>Poecile carolinensis</i>	Carolina Chickadee			Woodland, Forest, Riparian, Developed: Urban/Suburban/Rural	76
<i>Anthus spragueii</i>	Sprague's Pipit	C		Shrubland, Agricultural	80
<i>Parula pitayumi</i>	Tropical Parula		T	Forest, Riparian	82
<i>Dendroica chrysoparia*</i>	Golden-cheeked Warbler	LE	E	Woodland	83
<i>Dendroica dominica</i>	Yellow-throated Warbler			Woodland, Forest, Riparian	84
<i>Seiurus motacilla</i>	Louisiana Waterthrush			Woodland, Forest, Riparian	89
<i>Aimophila cassinii</i>	Cassin's Sparrow			Grassland, Shrubland	92
<i>Aimophila ruficeps</i>	Rufous-crowned Sparrow			Grassland	95
<i>Spizella pusilla</i>	Field Sparrow			Woodland	96
<i>Ammodramus savannarum</i>	Grasshopper Sparrow			Grassland, Agricultural	97
<i>Chondestes grammacus</i>	Lark Sparrow			Woodland	98
<i>Ammodramus leconteii</i>	Le Conte's Sparrow			Grassland	101
<i>Zonotrichia querula</i>	Harris's Sparrow			Shrubland, Agricultural	103
<i>Piranga rubra</i>	Summer Tanager			Forest, Riparian, Developed:	106
<i>Passerina ciris</i>	Painted Bunting			Shrubland, Agricultural	107
<i>Spiza americana</i>	Dickcissel			Grassland, Agricultural	108
<i>Sturnella magna</i>	Eastern Meadowlark			Woodland	109
<i>Icterus spurius</i>	Orchard Oriole			Woodland, Riparian	111

Scientific Name	Common Name	Status		General Habitat Type(s) in Texas	Endemic in Texas
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REPTILES AND AMPHIBIANS					
				State of the practice resources are listed in each taxa line for more detailed information	
				J.E. Werler and J.R. Dixon. 2000. Texas Snakes: Identification, Distribution, and Natural History. University of Texas Press, Austin. 519 pgs. J.R. Dixon. 1987. Amphibians and Reptiles of Texas. Texas A&M University Press, College Station. 434 pp.	
<i>Anaxyrus (Bufo) woodhousii</i>	Woodhouse's toad			woodland, forest, freshwater wetland	N
<i>Apalone mutica</i>	smooth softshell turtle			wetland	N
<i>Apalone spinifera</i>	spiny softshell turtle			wetland	N
<i>Cheylydra serpentina</i>	Common snapping turtle			riparina, riverine	N
<i>Crotalus atrox</i>	Western diamondback rattlesnake			grassland, shrubland, savanna,	N
<i>erebennus</i>	Texas Indigo Snake		T	shrubland, savanna	N
<i>Eurycea latitans</i>	Cascade Caverns salamander		T	(springs)	Y
<i>Eurycea nana</i>	San Marcos salamander	LT	T	freshwater wetland (springs)	Y
<i>Eurycea naufragia</i>	Georgetown Salamander	C		(springs)	Y
<i>Eurycea neotenes</i>	Texas salamander			(springs)	Y
<i>Eurycea pterophila</i>	Blanco River springs salamander			(springs)	Y
<i>Eurycea rathbuni</i>	Texas blind salamander	LE	E	wetland (springs)	Y
<i>Eurycea robusta</i>	Blanco blind salamander		T	aquifer	Y
<i>Eurycea sosorum</i>	Barton Springs salamander	LE	E	(springs)	Y
<i>Eurycea tonkawae</i>	Jollyville Plateau Salamander	C		(springs)	Y
<i>Eurycea tridentifera</i>	Comal blind salamander		T	Aquifer, Caves and Karst	Y
<i>Eurycea waterlooensis</i>	Austin blind salamander	C		Weland (springs) and Caves, Karst could	Y
<i>Gopherus berlandieri</i>	Texas tortoise		T	savanna, shrubland	N
<i>Graptemys caglei</i>	Cagle's map turtle		T	riparian, riverine	Y
<i>Graptemys versa</i>	Texas map turtle			riparian, riverine	Y
<i>Heterodon nasicus</i>	Western hog-nosed snake			desert scrub, grassland, shrubland	N
<i>Holbrookia lacerata lacerata</i>	Plateau earless lizard			savanna	Y
<i>Nerodia paucimaculata</i>	Concho water snake	LT-PDL		riparian, riverine, cultural aquatic	Y
<i>Ophisaurus attenuatus</i>	western slender glass lizard			grassland, savanna	N
<i>Phrynosoma cornutum</i>	Texas horned lizard		T	desert scrub, grassland, savanna	N
<i>Pseudacris streckeri</i>	Strecker's Chorus Frog			cultural aquatic, freshwater wetland	N
<i>Sistrurus catenatus</i>	massasauga			shrubland, coastal,	N
<i>Terrapene carolina</i>	Eastern box turtle			grasslands, savanna, woodland	N
<i>Terrapene ornata</i>	Ornate box turtle			desert scrub, savanna, woodland	N
<i>Thamnophis sirtalis annectans</i>	Texas Garter Snake (Eastern/Texas/New Mexico)			aquatic sites	Y
<i>Trachemys scripta</i>	Red-eared slider			wetland, cultural aquatic	N
FRESHWATER FISHES					
				C. Thomas, T.H. Bonner and B.G. Whiteside. 2007. Freshwater Fishes of Texas: A Field Guide. Sponsored by The River Systems Institute at Texas State University, published by Texas A&M University Press. Editor's Note: All freshwater fishes life history information in this table was sourced directly from the online version; citations are embedded in the online version at http://www.bio.txstate.edu/~tbonner/txfishes/	
<i>Anguilla rostrata</i>	American eel			connected to marine environments	N
<i>Cyprinella lepida</i>	Plateau shiner			gravel and limestone substrates	Y
<i>Cyprinella proserpina</i>	Proserpine shiner		T	pools to swift channels and riffles, spring-clear, cool, spring-fed headwater creeks	Y
<i>Cyprinella sp.</i>	Nueces river shiner				Y
<i>Cyprinodon eximius ssp</i>	Devils River pupfish			larger streams, channels of creeks (in waters	Y
<i>Dionda argentosa</i>	Manantial roundnose minnow				Y
<i>Dionda diaboli</i>	Devils River minnow	LT	T	spring outflow, typically near springrun	N
<i>Dionda nigrotaeniata</i>	Guadalupe roundnose minnow			spring-influenced headwaters	Y
<i>Dionda serena</i>	Nueces roundnose minnow			spring-influenced headwaters	Y
<i>Etheostoma grahami</i>	Rio Grande darter		T	tributaries, creeks, and streams	N
<i>Gambusia heterochir</i>	Clear Creek gambusia	LE	E	springs	Y
<i>Ictalurus lupus</i>	Headwater catfish			gradients, deep spring runs	N
<i>Micropterus treculii</i>	Guadalupe bass			taken in flowing water	Y
<i>Percina apristis</i>	Guadalupe darter			boulders in the main current; moderately	Y
INVERTEBRATES					
				www.bugguide.net – good tool for identification and taxonomic information. www.texasento.net – compilation of information on insects in Texas www.odonatacentral.org – resource for identification and distribution of damselflies and dragonflies	Editor's Note: Most karst invertebrates are likely endemic
<i>Allotxiweckelia hirsuta</i>	A cave obligate amphipod			Caves/Karst	
<i>Almuerzothyas n. sp.</i>	An aquatic mite			Caves/Karst	
<i>Amblycorypha uhleri</i>	A katydid			Savanna/Open Woodland	
<i>Apocheiridium reddelli</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Arethaea ambulator</i>	A katydid			Savanna/Open Woodland	
<i>Arrenurus n. sp</i>	An aquatic mite			Caves/Karst	

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<i>Artesia subterranea</i>	A cave obligate amphipod			Caves/Karst	
<i>Austrotinodes texensis</i>	Texas Austrotinodes caddisfly			Riparian, Riverine	
<i>Baetodes alleni</i>	A mayfly			Riparian, Riverine	
<i>Balconorbis uvaldensis</i>	Balcones ghostsnail			Caves/Karst	
<i>Batrisodes cryptotexanus</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes dentifrons</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes fanti</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes feminiclypeus</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes gravesi</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes grubbsi</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes incisipes</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes pekinsi</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes reyesi</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes shadeae</i>	A cave obligate beetle			Caves/Karst	
<i>Batrisodes texanus</i>	A cave obligate beetle	LE		Caves/Karst	
<i>Batrisodes venyivi</i>	A cave obligate beetle	LE		Caves/Karst	
<i>Batrisodes wartoni</i>	A cave obligate beetle			Caves/Karst	
<i>Bombus pensylvanicus</i>	American bumblebee			Grassland, Savanna/Open Woodland	
<i>Bombus sonorinus</i>	Sonoran bumblebee			Grassland, Savanna/Open Woodland	
<i>Bombus variabilis</i>	Variable cuckoo bumblebee			Grassland, Savanna/Open Woodland	
<i>Brackenridgia reddelli</i>	A cave obligate isopod			Caves/Karst	
<i>Caenis arwini</i>	A mayfly			Riparian, Riverine	
<i>Calathaemon holthuisi</i>	A cave obligate shrimp			Caves/Karst	
<i>Chitrella ellioti</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Cicurina bandera</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina bandida</i>	Bandit Cave spider			Caves/Karst	
<i>Cicurina baronia</i>	Robber Baron Cave meshweaver	LE		Caves/Karst	
<i>Cicurina barri</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina browni</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina caliga</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina caverna</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina coryelli</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina ellioti</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina ezelli</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina gruta</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina holsingeri</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina hoodensis</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina machete</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina madla</i>	Madla Cave meshweaver	LE		Caves/Karst	
<i>Cicurina mckenziei</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina medina</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina menardia</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina mixmaster</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina obscura</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina orellia</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina pablo</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina pastura</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina patei</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina porteri</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina puentevilla</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina rainesi</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina reclusa</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina reddelli</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina russelli</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina sansaba</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina selecta</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina serena</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina sheari</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina sprousei</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina stowersi</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina suttoni</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina trivisa</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina troglobia</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina ubicki</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina uvalde</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina venefica</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina venii</i>	Braken Bat Cave Meshweaver	LE		Caves/Karst	
<i>Cicurina vespera</i>	Meshweaver	LE		Caves/Karst	
<i>Cicurina vibora</i>	A cave obligate spider			Caves/Karst	
<i>Cicurina wartoni</i>	Warton cave Meshweaver	C		Caves/Karst	

Edwards Plateau Species of Greatest Conservation Need

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<i>Cicurina watersi</i>	A cave obligate spider			Caves/Karst	
<i>Cisthene conjuncta</i>	A lichen moth			Forest, Savanna/Open Woodland	
<i>Colletes bumeliae</i>	A cellophane bee			Grassland, Savanna/Open Woodland	
<i>Comaldessus stygius</i>	Comal Springs diving beetle			Aquifer, Riparian	
<i>Daedalochila hippocrepis</i>	Horseshoe liptooth			Woodland	
<i>Dichopetala catinata</i>	A katydid			Grassland, Shrubland	
<i>Dichopetala seeversi</i>	A katydid			Grassland, Shrubland	
<i>Dinocheirus cavicolus</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Eidmennella nastuta</i>	A cave obligate spider			Caves/Karst	
<i>Eidmennella reclusa</i>	A cave obligate spider			Caves/Karst	
<i>Elaphoidella n. sp.</i>	A cave obligate copepod			Caves/Karst	
<i>Haideoporus texanus</i>	Edwards Aquifer diving beetle			Aquifer, Freshwater Wetland	
<i>Heterelmis comalensis</i>	Comal Springs riffle beetle	LE		Aquifer, Freshwater Wetland	
<i>Heterelmis sp.</i>	Fern Bank Springs riffle beetle			Aquifer, Freshwater Wetland	
<i>Heterelmis sp.</i>	Fessenden Springs riffle beetle			Aquifer, Freshwater Wetland	
<i>Heterelmis sp.</i>	Devils River Springs riffle beetle			Aquifer, Freshwater Wetland	
<i>Holcopasites jerryrozeni</i>	A cuckoo bee			Grassland, Shrubland	
<i>Holospira goldfussi</i>	New Braunfels Holospira			Woodland	
<i>Holsingerius samacos</i>	A cave obligate amphipod			Caves/Karst	
<i>Hyaella texana</i>	Clear Creek amphipod			Aquifer, Freshwater Wetland	
<i>Hydroptila melia</i>	A caddisfly			Riparian, Riverine	
<i>Ingolfiella n. sp.</i>	A cave obligate amphipod			Caves/Karst	
<i>Lampsilis bracteata</i>	Texas fatmucket		T	Riverine	
<i>Leucohya texana</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Lirceolus bisetus</i>	A cave obligate isopod			Caves/Karst	
<i>Lirceolus hardeni</i>	A cave obligate isopod			Caves/Karst	
<i>Lirceolus pilus</i>	A cave obligate isopod			Caves/Karst	
<i>Lirceolus smithii</i>	Texas troglobitic water slater			Caves/Karst	
<i>Lymantes nadineae</i>	A cave obligate beetle			Caves/Karst	
<i>Macrotera parkeri</i>	A mining bee			Grassland, Shrubland	
<i>Macrotera robertsi</i>	A mining bee			Grassland, Shrubland	
<i>Marstonia comalensis</i>	Comal siltsnail			Aquifer, Freshwater Wetland	
<i>Mexistenasellus coahuila</i>	A cave obligate isopod			Caves/Karst	
<i>Mexiweckelia hardeni</i>	A cave obligate amphipod			Caves/Karst	
<i>Microceramus texanus</i>	Texas urocoptid			Woodland	
<i>Millerelix gracilis</i>	Edwards Plateau liptooth			Woodland	
<i>Myrmecoderus laevipennis</i>	A narrow-waisted bark beetle			Forest, Woodland	
<i>Nectopsyche texana</i>	A caddisfly			Riparian, Riverine	
<i>Tayshaneta anopica</i>	A cave obligate spider			Caves/Karst	
<i>Tayshaneta bullis</i>	A cave obligate spider			Caves/Karst	
<i>Tayshaneta concinna</i>	A cave obligate spider			Caves/Karst	
<i>Tayshaneta devia</i>	A cave obligate spider			Caves/Karst	
<i>Tayshaneta microps</i>	Government Canyon Bat Cave spider	LE		Caves/Karst	
<i>Tayshaneta myopica</i>	Tooth Cave spider	LE		Caves/Karst	
<i>Tayshaneta valverde</i>	A cave obligate spider			Caves/Karst	
<i>Neotrichia juani</i>	A caddisfly			Riparian, Riverine	
<i>Nitocrellopsis texana</i>	A cave obligate copepod			Caves/Karst	
<i>Oncopodura fenestra</i>	A cave obligate springtail			Caves/Karst	
<i>Oxyelophila callista</i>	A snout moth			Woodland	
<i>Oxyethira ulmeri</i>	A caddisfly			Riparian, Riverine	
<i>Palaemonetes antrorum</i>	A cave obligate shrimp			Caves/Karst	
<i>Palaemonetes texanus</i>	Texas river shrimp			Riverine	
<i>Parabogidiella americana</i>	A cave obligate amphipod			Caves/Karst	
<i>Paraholsingerius smaragdinus</i>	A cave obligate amphipod			Caves/Karst	
<i>Paralimnetis texana</i>	Pointytop finger clam shrimp			Riparian, Riverine	
<i>Paramexiweckelia ruffoi</i>	A cave obligate amphipod			Caves/Karst	
<i>Patera leatherwoodi</i>	Pedernales oval			Woodland	
<i>Perdita dolanensis</i>	A mining bee			Grassland, Shrubland	
<i>Petrophila daemonalis</i>	A snout moth			Grassland, Shrubland	
<i>Phreatodrobia conica</i>	Hueco cavesnail			Caves/Karst	
<i>Phreatodrobia imitata</i>	Mimic cavesnail			Caves/Karst	
<i>Phreatodrobia micra</i>	Flattened cavesnail			Caves/Karst	
<i>Phreatodrobia nugax</i>	Nymph trumpet			Caves/Karst	
<i>Phreatodrobia plana</i>	Disc cavesnail			Caves/Karst	
<i>Phreatodrobia punctata</i>	High-hat cavesnail			Caves/Karst	
<i>Phreatodrobia rotunda</i>	Beaked cavesnail			Caves/Karst	
<i>Plauditus texanus</i>	A mayfly			Riparian, Riverine	
<i>Pogonomyrmex comanche</i>	Comanche harvester ant			Barren/Sparse Vegetation	
<i>Procloeon distinctum</i>	A mayfly			Riverine, Riparian	
<i>Protandrena maurula</i>	A mining bee			Grassland, Shrubland	

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<i>Protophila arca</i>	A caddisfly			Riverine, Riparian	
<i>Pygarctia lorula</i>	A tiger moth			Savanna/Open Woodland	
<i>Quadrula aurea</i>	Golden orb		T	Riverine	Y
<i>Quadrula houstonensis</i>	Smooth pimpleback		T	Riverine	Y
<i>Quadrula mitchelli</i>	False Spike		T	Riverine	
<i>Quadrula petrina</i>	Texas pimpleback		T	Riverine	Y
<i>Rhadine austinica</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine bullis</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine exilis</i>	A cave obligate beetle	LE		Caves/Karst	
<i>Rhadine infernalis</i>	A cave obligate beetle	LE		Caves/Karst	
<i>Rhadine insolata</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine noctivaga</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine persephone</i>	Tooth Cave ground beetle	LE		Caves/Karst	
<i>Rhadine reyesi</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine russelli</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine specia</i>	A cave obligate beetle			Caves/Karst	
<i>Rhadine subterranea</i>	A cave obligate beetle			Caves/Karst	
<i>Seborgia relictia</i>	A cave obligate amphipod			Caves/Karst	
<i>Speocirolana hardeni</i>	A cave obligate isopod			Caves/Karst	
<i>Speodesmus echinourus</i>	A cave obligate millipede			Caves/Karst	
<i>Speodesmus falcatus</i>	A cave obligate millipede			Caves/Karst	
<i>Speodesmus ivyi</i>	A cave obligate millipede			Caves/Karst	
<i>Speodesmus reddelli</i>	A cave obligate millipede			Caves/Karst	
<i>Sphinx eremitoides</i>	Sage sphinx			Grassland	
<i>Streptocephalus linderi</i>	Spinyfinger fairy shrimp			Riverine, Riparian	
<i>Stygobromus balconis</i>	A cave obligate amphipod			Caves/Karst	
<i>Stygobromus dejectus</i>	Cascade Cave amphipod			Caves/Karst	
<i>Stygobromus flagellatus</i>	Ezell's Cave amphipod			Caves/Karst	
<i>Stygobromus hadenoecus</i>	Devil's Sinkhole amphipod			Caves/Karst	
<i>Stygobromus limbus</i>	Border Cave amphipod			Caves/Karst	
<i>Stygobromus longipes</i>	Long-legged Cave amphipod			Caves/Karst	
<i>Stygobromus n. sp.</i>	Neel's Cave amphipod			Caves/Karst	
<i>Stygobromus n. sp.</i>	Devils River Cave amphipod			Caves/Karst	
<i>Stygobromus n. sp.</i>	Fessenden Cave amphipod			Caves/Karst	
<i>Stygobromus n. sp.</i>	Lost Maples Cave amphipod			Caves/Karst	
<i>Stygobromus n. sp.</i>	San Gabriel Cave amphipod			Caves/Karst	
<i>Stygobromus pecki</i>	Peck's Cave amphipod	LE	E	Caves/Karst	
<i>Stygobromus reddelli</i>	Reddell stygobromid			Caves/Karst	
<i>Stygobromus russelli</i>	A cave obligate amphipod			Caves/Karst	
<i>Stygoparnus comalensis</i>	Comal Springs dryopid beetle	LE		Caves/Karst	
<i>Stygopyrgus bartonensis</i>	Barton cavesnail			Caves/Karst	
<i>Tartarocreagris altimana</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris amblyopa</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris attenuata</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris domina</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris grubbsi</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris hoodensis</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris infernalis</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris intermedia</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris proserpina</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris reddelli</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris reyesi</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tartarocreagris texana</i>	Tooth Cave Pseudoscorpion	LE		Caves/Karst	
<i>Tethysbaena texana</i>	A cave obligate crustacean			Caves/Karst	
<i>Texamaurops reddelli</i>	Kretschmarr Cave Mold Beetle	LE		Caves/Karst	
<i>Texanobathynella bowmani</i>	A bathynellid			Caves/Karst	
<i>Texapyrgus longleyi</i>	Striated Hydrobe			Freshwater Wetland	
<i>Texella brevidenta</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella brevistyla</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella cokendolpheri</i>	Cokendolpher Cave Harvestman	LE		Caves/Karst	
<i>Texella diplospina</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella grubbsi</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella hardeni</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella mulaiki</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella reddelli</i>	Reddell harvestman	LE		Caves/Karst	
<i>Texella renkesae</i>	A cave obligate harvestman			Caves/Karst	
<i>Texella reyesi</i>	Bone Cave harvestman	LE		Caves/Karst	
<i>Texella spinoperca</i>	A cave obligate harvestman			Caves/Karst	
<i>Texiweckelia texensis</i>	A cave obligate amphipod			Caves/Karst	
<i>Truncilla macrodon</i>	Texas fawnsfoot		T	Riverine	Y

Scientific Name	Common Name	Status		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place	Endemic in Texas
		Federal	State		
<i>Tyrannochthonius muchmoreorum</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Tyrannochthonius troglodytes</i>	A cave obligate pseudoscorpion			Caves/Karst	
<i>Xiphocentron messapus</i>	A caddisfly			Riparian, Riverine	
<p>J.M. Poole, W.R. Carr, D.M. Price and J.R. Singhurst. 2007. Rare Plants of Texas. Texas A&M University Press, College Station. D.S. Correll and M.C Johnston. 1979. Manual of the Vascular Plants of Texas. The University of Texas at Dallas, Richardson. M.C. Johnston. 1990. The Vascular Plants of Texas: A List Up-dating the Manual of the Vascular Plants of Texas, 2nd Edition. Marshall C. Johnston, Austin. F.W. Gould. 1975. The Grasses of Texas. Texas A & M University Press, College Station. S.D. Jones, J.K. Wipff, and P.M. Montgomery. 1997. Vascular Plants of Texas: A Comprehensive Checklist including Synonymy; Bibliography, and Index. University of Texas Press, Austin. R.A. Vines. 2004. Trees, Shrubs and Woody Vines of the Southwest. Blackburn Press.</p>					
PLANTS					
<i>Agalinis densiflora</i>	Osage Plains false foxglove			Savanna/Open Woodland - Outcrops	N
<i>Amorpha roemeriana</i>	Texas amorpha			Woodland	Y
<i>Argythamnia aphoroides</i>	Hill Country wild-mercury			Savanna/Open Woodland	Y
<i>Astragalus mollissimus var. coryi</i>	Cory's woolly locoweed			Grassland (limestone substrates)	Y
<i>Astragalus reflexus</i>	Texas milk vetch			Savanna/Open Woodland	Y
<i>Astragalus wrightii</i>	Wright's milkvetch			Grassland; Savanna/Open Woodland	Y
<i>Bauhinia lunarioides</i>	Anacacho orchid			Shrubland	N
<i>Berberis swaseyi</i>	Texas barberry			Savanna/Open Woodland	Y
<i>Brazoria enquistii</i>	Enquist's sandmint			with Savanna/Open Woodland matrix	Y
<i>Brickellia dentata</i>	gravelbar brickellbush			Riparian	Y
<i>Brickellia eupatorioides var. gracillima</i>	narrowleaf brickellbush			Riparian	Y
<i>Campanula reverchonii</i>	Basin bellflower			Barren/Sparse Vegetation (granite gravels and outcrops)	Y
<i>Cardamine macrocarpa var. texana</i>	Texas largeseed bittercress			Woodland (oak-juniper)	N
<i>Carex edwardsiana</i>	canyon sedge			Woodland (slopes above Riparian)	Y
<i>Chaetopappa effusa</i>	spreading lestdaisy			Woodland	Y
<i>Clematis texensis</i>	scarlet leather-flower			Woodland	Y
<i>Colubrina stricta</i>	Comal snakewood			Shrubland	N
<i>Crataegus turnerorum</i>	Turners' hawthorn			Savanna/Open Woodland	Y
<i>Croton alabamensis var. texensis</i>	Texabama croton			Woodland	Y
<i>Cuscuta exaltata</i>	tree dodder			Woodland	N
<i>Dalea hallii</i>	Hall's prairie-clover			Savanna/Open Woodland; Grassland	Y
<i>Dalea sabinalis</i>	Sabinal prairie-clover			Grassland; Savanna/Open Woodland	Y
<i>Desmanthus reticulatus</i>	net-leaf bundleflower			Savanna/Open Woodland	Y
<i>Desmodium lindheimeri</i>	Lindheimer's tickseed			Woodland	N
<i>Donrichardsia macroneuron</i>	Don Richard's spring moss			Freshwater Wetland (springs)	Y
<i>Echinocereus coccineus var. paucispinus</i>	Texas claret-cup cactus			Shrublands; Desert Scrub; Grasslands; Woodlands	N
<i>Ephedra coryi</i>	Cory's ephedra			dunes); Grasslands	N
<i>Eriocaulon koernickianum</i>	small-headed pipewort			Freshwater Wetland (bogs)	N
<i>Eriogonum nealleyi</i>	Irion County wild-buckwheat			Savanna/Open Woodland; Grassland	Y
<i>Eriogonum tenellum var. ramosissimum</i>	Basin wild-buckwheat			Barren/Sparse Vegetation (granite gravels and outcrops)	Y
<i>Euphorbia peplidion</i>	low spurge			Savanna/Open Woodland	Y
<i>Festuca versuta</i>	Texas fescue			Woodland	N
<i>Galactia watsoniana</i>	Watson's milk-pea			Woodland (canyons)	Y
<i>Gilia ludens</i>	South Texas gilia			Shrubland	Y
<i>Glossopetalon texense</i>	Texas greasebush			Vegetation (limestone cliffs, ledges, or	Y
<i>Hesperaloe parviflora</i>	red yucca			Savanna/Open Woodland	N
<i>Hexalectris nitida</i>	Glass Mountains coral-root			Woodland	N
<i>Hexalectris warnockii</i>	Warnock's coral-root			Woodland	N
<i>Houstonia parviflora</i>	Greenman's bluet			Savanna/Open Woodland	Y
<i>Isoetes lithophila</i>	rock quillwort			Freshwater Wetland (vernal pools)	Y
<i>Isoetes piedmontana</i>	Piedmont quillwort			Freshwater Wetland (vernal pools)	N
<i>Lythrum ovalifolium</i>	Plateau loosestrife			Riparian; Freshwater Wetlands (seeps)	N
<i>Matelea edwardsensis</i>	Plateau milkvine			Woodland (canyons)	Y
<i>Matelea sagittifolia</i>	arrowleaf milkvine			Shrubland; Woodland	N
<i>Monarda punctata var. stanfieldii</i>	Stanfield's beebalm			Savanna/Open Woodland	Y
<i>Muhlenbergia villiflora var. villosa</i>	villous muhly			Barren/Sparse Vegetation (gypseous soils); Shrubland	N
<i>Nesaea longipes</i>	longstalk heimia			Freshwater Wetland (springs, cienegas)	N

Scientific Name	Common Name	Status		General Habitat Type(s) in Texas These are VERY broad habitat types as a starting place	Endemic in Texas
		Federal	State		
State of the practice resources are listed in each taxa line for more detailed information					
<i>Oenothera cordata</i>	heartleaf evening-primrose			Savanna/Open Woodland	Y
<i>Onosmodium helleri</i>	Heller's marbleseed			Woodland	Y
<i>Packera texensis</i>	Llano butterweed			gravels)	Y
<i>Pediomelum cyphocalyx</i>	turnip-root scurfpea			Grassland	Y
<i>Penstemon guadalupensis</i>	Guadalupe beardtongue			Savanna/Open Woodland	Y
<i>Penstemon triflorus subsp. integrifolius</i>	Heller's beardtongue			Savanna/Open Woodland; Barren/Sparse Vegetation (limestone cliffs, ledges, or outcrops)	N
<i>Penstemon triflorus subsp. triflorus</i>	threeflower penstemon			Savanna/Open Woodland; Barren/Sparse Vegetation (limestone cliffs, ledges, or outcrops)	Y
<i>Phaseolus texensis</i>	canyon bean			Woodland (canyons)	Y
<i>Philadelphus ernestii</i>	canyon mock-orange			outcrops or boulders)	N
<i>Phoradendron hawksworthii</i>	Hawksworth's mistletoe			Woodland	N
<i>Physaria engelmannii</i>	Engelmann's bladderpod			Savanna/Open Woodland	Y
<i>Physostegia correllii</i>	Correll's false dragon-head			Riparian; Riverine; Freshwater Wetland	N
<i>Polygala palmeri</i>	Palmer's milkwort			Shrubland	N
<i>Pomaria brachycarpa</i>	broadpod rushpea			Savanna/Open Woodland	Y
<i>Prenanthes carrii</i>	canyon rattlesnake-root			Woodland (canyons)	Y
<i>Prunus minutiflora</i>	Texas almond			Savanna/Open Woodland	N
<i>Prunus texana</i>	Texas peachbush			Savanna/Open Woodland; Grassland	Y
<i>Salvia pentstemonoides</i>	big red sage			outcrops, boulders, and cliffs); Woodland	Y
<i>Sclerocactus breviphamatus subsp. tobuschii</i>	Tobusch fishhook cactus	LE	E	Savanna/Open Woodland	Y
<i>Selenia jonesii</i>	Jones' selenia			Grassland	Y
<i>Seymeria texana</i>	Texas seymeria			Woodland	Y
<i>Shinnersia rivularis</i>	springrun whitehead			Riverine (riffles)	N
<i>Spigelia texana</i>	Florida pinkroot			Wetland (Bottomland Forest)	Y
<i>Streptanthus bracteatus</i>	bracted twistflower			Woodland; Savanna/Open Woodland	Y
<i>Streptanthus platycarpus</i>	broadpod twistflower			Savanna/Open Woodland	N
<i>Styrax platanifolius subsp. platanifolius</i>	sycamore-leaf snowbell			Woodland	Y
<i>Styrax platanifolius subsp. stellatus</i>	hairy sycamore-leaf snowbell			Woodland	Y
<i>Styrax platanifolius subsp. texanus</i>	Texas snowbells	LE	E	Barren/Sparse Vegetation (limestone cliffs and ledges); Riparian; with Woodland or Shrubland matrix	Y
<i>Tradescantia pedicellata</i>	granite spiderwort			Savanna/Open Woodland	Y
<i>Tragia nigricans</i>	darkstem noseburn			Woodland	Y
<i>Tridens buckleyanus</i>	Buckley tridens			Woodland	Y
<i>Valerianella stenocarpa</i>	bigflower cornsalad			Savanna/Open Woodland	Y
<i>Valerianella texana</i>	Edwards Plateau cornsalad			metamorphic gravels)	Y
<i>Zizania texana</i>	Texas wild rice	LE	E	constant, moderate current, sand to	Y

APPENDIX E – SEAPLANE POLICY

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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.

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

<p align="center">AQUILLA LAKE</p> <p>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.</p>	<p align="center">JIM CHAPMAN LAKE - COOPER DAM</p> <p>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.</p>
<p align="center">BARDWELL LAKE</p> <p>Landings and takeoffs are prohibited north of Highway 34 and in all coves off the main body of the lake.</p>	<p align="center">GRANGER LAKE</p> <p>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.</p>
<p align="center">BELTON LAKE</p> <p>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.</p>	<p align="center">JOE POOL LAKE</p> <p>Landings and takeoffs are prohibited in all lake areas west of the Lakeridge Parkway bridges.</p>
<p align="center">BENBROOK LAKE</p> <p>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.</p>	<p align="center">LAKE O THE PINES</p> <p>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.</p>
<p align="center">CANYON LAKE</p> <p>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.)</p>	<p align="center">LAVON LAKE</p> <p>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.</p>

SPECIFIC RESTRICTIONS ON SEAPLANE OPERATION	
<p style="text-align: center;">LEWISVILLE LAKE</p> <p>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.</p>	<p style="text-align: center;">SOMERVILLE LAKE</p> <p>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.</p>
<p style="text-align: center;">NAVARRO MILLS LAKE</p> <p>Landings and takeoffs are prohibited west of Wolf Creek Park 1.</p>	<p style="text-align: center;">STILLHOUSE HOLLOW LAKE</p> <p>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.</p>
<p style="text-align: center;">PROCTOR LAKE</p> <p>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.</p>	<p style="text-align: center;">WHITNEY LAKE</p> <p>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</p>
<p style="text-align: center;">RAY ROBERTS LAKE</p> <p>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.</p>	<p style="text-align: center;">WRIGHT PATMAN LAKE</p> <p>Landings and takeoffs are prohibited in all coves and bays off main body of lake and in uncleared and shallow areas of the lake.</p>
<p style="text-align: center;">SAM RAYBURN RESERVOIR</p> <p>Landings and takeoffs are prohibited west of Highway 147, north of Highway 83, and in scattered uncleared areas of the reservoir.</p>	

NOTE: The latest revision to this Notice to Seaplane Pilots was completed in March of 2000.

APPENDIX F – PERTINENT PUBLIC LAWS

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The following public laws are applicable to Canyon Lake:

- 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 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 89-272, 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 program.

- 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 91-611, 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 92-463, Federal Advisory Committee Act. - The Federal Advisory Committee Act became law in 1972 and is the legal foundation defining how federal advisory committees operate. The law has special emphasis on open meetings, chartering, public involvement, and reporting.
- 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 93-251, 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 non reimbursable 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 NRHP.
- Public Law 99-662, The Water resources Development Act. - Provides for the conservation and development of water and related resources and the improvement and rehabilitation of the Nation's water resources infrastructure.

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APPENDIX G – ACRONYMS

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AAMPO	Alamo Area Metropolitan Planning Organization
AC-FT	Acre Feet
CRMP	Cultural Resources Management Plan
DC	District Commander
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
DM	Design Memorandum
DoD	Department of Defense
DQC	District Quality Control
EA	Environmental Assessment
EC	Engineer Circular
EM	Engineering Manual
EOP	Environmental Operating Principles
EP	Engineering Pamphlet
EPA	United States Environmental Protection Agency
ER	Engineering Regulation
ESA	Environmentally Sensitive Areas
F	Fahrenheit
FEMS	Facilities and Equipment Maintenance System
FM	Farm to Market Road
FONSI	Finding of No Significant Impact

GBRA	Guadalupe/Blanco River Authority
GCWA	Golden Cheeked Warbler
GIS	Geographical Information Systems
HDR	High Density Recreation
HQ	USACE Headquarters
I	Interstate
IPaC	USFWS Information for Planning and Conservation
KWh	Kilowatt Hours
JBSA	Joint Base San Antonio
LDR	Low Density Recreation
LEED	Leadership in Energy and Environmental Design
MP	Master Plan or Master Planning
MRML	Multiple Resource Management Lands
MSL	Mean Sea level
NAAQA	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act, 1970
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRRS	National Recreation Reservation System

NSRE	National Survey on Recreation and the Environment
NWI	National Wetland Inventory
O&M	Operations and Maintenance
OMB	Office of Management and Budget
OMBIL	Operations and Maintenance Business Information Link
OMP	Operations Management Plan for a specific lake Project
OPM	Operations Project Manager
PDT	Project Development Team
PM	Project Management or Project Manager
PMBP	Project Management Business Processes
PMP	Project Management Plan
PL	Public Law
REAS	Recreation Economic Assessment System
RPEC	Regional Planning and Environmental Center
SH	State Highway
SHPO	State Historical Preservation Office
SMPS	Shoreline Management Policy Statement
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
TCAP	Texas Conservation Action Plan
TCEQ	Texas Council on Environmental Quality

TIP	Transportation Improvement Plan
TORP	Texas Outdoor Recreation Plan
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
TX	Texas
TXDOT	Texas Department of Transportation
VMA	Vegetative Management
US	United States Route
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
USGS	United States Geological Survey
WORD	Water Oriented Recreational District of Comal County
WMA	Wildlife Management
WDA	Workforce Development Area